



Track 4
**Urban planning and policy making in times of un-
certainty, fragility and insecurity**



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Application of a Holistic Land Development Model for City Sustainability: A Flux of Messy Situations Extending the Frontiers of Planning Theory

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Abstract

Existing planning theories are ineffective in explaining and analysing contemporary challenges facing cities in pursuit of sustainable development goals due to insecurity from terror attacks, crimes and general uncertainty. It is argued that diligent management by planners of the land development process, which forms the backbone of much of development control functions and planning legislation around the world, has the capacity to transform existing chaotic cities into liveable and sustainable human settlements that we need. The planning profession has witnessed at least eight procedural theories but while these planning paradigms have enjoyed an historic epoch, they generally lack the tools that planners can effectively utilise in managing the development control system for city liveability and sustainability. Consequently, a new planning theory (paradigm) is needed to transform planning practice to a new level that effectively captures the land development process throughout the life cycle of the built environment. This paper adopts a recently developed real estate (land) development matrix (Kohlhepp, 2012) to model a hypothetical housing project in Lae City, Papua New Guinea, South Pacific. The central thesis of the paper is that there are seven (7) discrete stages and eight (8) tasks in the land development process, which is best left to the planner to manage since s/he holds the key to approving or rejecting a developer's planning application. As with all real world applications of conceptual models, the lines separating the seven stages and the eight tasks can be fuzzy. Findings show that the land development matrix, as an innovative tool, can serve as a descriptive, normative, or predictive model. As a pedagogical tool, the 56-cell matrix can help planning students, practising planners and urban policy makers understand the process, risks, and value creation in land development, thereby easing the smooth transition of existing chaotic cities that we have to liveable and sustainable cities that we need with the proactive support and due diligence of land developers and other members of the land development team.

Keywords: Planning theory, planning authority, planner, land development process, development control, city liveability; city sustainability.

Introduction

This paper consists of an investigation of the challenges facing the application and enforcement of *development control* and how the *land development process* can be used to synergize *development control* for achieving liveable and sustainable cities. This calls for an

overhaul of the existing development control apparatus to accommodate smart planning standards and building regulations that are socially, economically and environmentally sustainable. The author argues that planners are better positioned than other built-environment professionals in diligently managing the land development process that forms the backbone of much of development control functions and planning legislation around the world and, hence, the key to transforming existing chaotic cities to liveable and sustainable human settlements that we all need. Development control (i.e. planning control or development management) is the element of the British system of town and country planning (from which most Commonwealth countries developed their own system) through which local government regulates land use and new building. The concept relies on a "plan-led system" whereby development plans are formed and the public is consulted. Subsequent development by the developer requires planning permission, which is granted or refused with reference to the development plan in the form of a *material consideration*, according to the British Town and Country Planning Act 1990. The case study used in this paper is a hypothetical housing project in Lae City, PNG, illustrating how the land development process plays out in the life cycle of a building project that can literally be replicated by cities that we need.

Since all developments need a land platform, a brief introduction to land in Papua New Guinea is necessary at this juncture. The country operates a dual land tenure system comprising 'Alienated Land Tenure' (ALT), which is land owned and controlled by the State (3%) under specific legislation, and 'Customary Land Tenure' (CLT) accounting for 97% of all land in the country. Customary land (CL) is held by tribes, clans and land groups and its ownership is dictated by local customs and traditional values and beliefs (Power, 2001; Dixon, 2007). Customary land tenure system had existed well before the advent of the early colonizers in the early 1800s (<http://revealinghistories.org.uk/colonialism-and-the-expansion-of-empires.html>, accessed on 21 May, 2016). In 1884, Germany declared a Protectorate over north-east New Guinea, where Lae is situated. In 1914 Germany surrendered its colony of New Guinea to the Commonwealth Troops, a colony that was administered by a British Military Administrator until 1921 when Australia took over (Amankwah, Mugambwa and Muroa, 2009). It was the Australian administration that tried to protect customary land from alienation, but the problem till today is that there are no proper land use guidelines for customary land in PNG because it is governed by customary law (Dixon, 2007; Gilberthorpe, 2007). This is a hindrance to any meaningful operation and enforcement of PNG's Physical Planning Act 1989 used to enforce development control on both alienated land and customary land in the country.

PNG practices a constitutional parliamentary democracy and there is a Commonwealth realm composed of 22 provinces. The National Physical Planning Board (NPPB) under the Ministry of Physical Planning is in charge of matters of national and provincial interests. Provinces are empowered to have their own Physical Planning Boards but the NPPB can intervene at this level if needed. The National Capital District in Boroko, within Port Moresby – the national capital - has a separate Physical Planning Board, while Local Physical Planning Boards only exist within the National Capital District. Municipalities do not have their own local planning authorities: they rely on their respective provincial planning boards. This is one area

where PNG differs from many other countries where municipalities usually have their own planning boards.

The era of 'laissez faire' approaches prior to the emergence of 'formal physical planning' in most countries around the world, witnessed cities that had become 'containers of problems' such as overcrowding, 'anomie', pollution, congestion, disease and crime (Cozens, 2016). However, PNG's Physical Planning Act - No. 32 - 1989 has established a comprehensive mechanism for physical planning in Papua New Guinea at the national and provincial levels. It provides powers for planning and regulation of physical development. The main instruments are provincial development plans, local development plans or subject development plans. The Department of Lands and Physical Planning (DLPP) oversees all matters regarding land registration and physical planning. However, the DLPP has been described by the Minister of Lands as the most corrupt civil service department in PNG (http://lands.gov.pg/Services/Governance/Complaints_Desk.html (accessed on 8 May 2016)). In the same vein, the tool used as Land Information System (LAGIS) in PNG has been found to be fraught with problems, although recommendations have been made for its improvement (e.g. Tumare, Babarinde and Tagicakibau, 2015).

The Physical Planning Boards and the local authorities are in charge of development control. This includes obtaining licences and permits, completing required notifications and site inspections. As is the case in Australia (or the UK), the lawful occupier of any land or buildings will not only have title to their land (a freehold, leasehold, or licence from the actual land owner), but also requires planning title for any buildings on the land, or uses to which the land and buildings are put. As defined by the British Town and Country Planning Act 1990 (legislation.gov.uk, accessed on 27 May, 2016), "development," means "the carrying out of building, engineering, mining or other operations in, on, over or under land, or the making of any material change in the use of any buildings or other land." For the purposes of this Act "building operations" include (i) demolition of buildings (ii) rebuilding (iii) structural alterations of or additions to buildings; and (iv) other operations normally undertaken by a person carrying on business as a builder. In Western Australia, *development* refers to the demolition, erection, construction, alteration of, or addition to, any building or structure and any excavation or other works carried out on the land (Part 1, Section 4, Planning and Development Act, 2005).

Certain types of development are specifically excluded from the definition of development, such as routine building maintenance and repair. Many categories of minor development are classified by legislation as "permitted development" (PD). These are in effect granted an automatic planning permission by law, rather than requiring any specific application for planning permission. Although still defined as "development" these works avoid any need to engage with the planning system and can be undertaken by land owners as a right.

Uses of land and buildings are classified into "use classes" and any change from one use class to another use class is automatically a "material change of use" amounting to development. Some small scale changes between use classes are nevertheless "permitted development" and hence do not require planning permission. Certain types of use or activity do not fall into a specific use class and are termed "sui generis." Any change of use of "sui generis"

land requires planning permission. There is a separate system of control over alterations to buildings which are listed as being of architectural or historic interest ("listed buildings"). Alterations to such a building that affect its character or appearance require "listed building consent" (and may also require planning permission if the scope of the proposed alterations or development is above that classified as permitted development).

Almost all planning permissions are granted conditionally and enforcement action can also be taken to secure compliance with the conditions imposed. Unauthorised development can be the subject of a "stop notice" if there is an urgent need to prevent further harm. A grant of planning permission relates to the land or building(s) concerned. With a few rare exceptions it is not specific to the person, organisation or firm, who obtained the permission (KJM Design and Planning Services; <http://www.kjmdesigns.co.uk/about-us/>, accessed on 15 June, 2016). However, the enforcement of development control measures in many countries is facing some bottlenecks that are accentuated by the fact that developments do change with time and so do crime risks, which liveable and sustainable cities should reduce to the barest minimum (Cozens (2016)).

This paper is divided into five sections. After the introduction in the first section, Section 2 presents the research problem and contributions to knowledge. In Section 3, the method is presented followed by the findings and discussion in Section 4. The conclusion is presented in the last section.

Nature of the Problem and Contributions to Knowledge

A general review of previous studies on the benefits of development control and the challenges militating against the successful enforcement of development control measures reveals some serious criticisms that need to be addressed if our existing cities are to become liveable and sustainable. Most of these criticisms surround the cultural relevance, environmental appropriateness and economic affordability of the planning standards and building regulations that constitute the backbone of many cities' development control system, with particular regard to the developing world.

Dissanayake (1987) acknowledges that development control has significant benefits. First, it forms an integral part of planning practice and is the basic means by which the state intervenes to regulate the use and development of land in order to implement local and national planning policies. Second, it is the part of the planning process in which members of the public come into contact with local planning authorities. However, there are complaints that sluggishness discourages development; that the complexity of development control is excessively costly; and that its nature stifles initiative (Amos, 1980; Dissanayake, 1987). Consequently, Dissanayake (1987) argues, development control is not appreciated by the general public mainly because of the restrictions it imposes on the aims and aspirations of land developers. Although state control of private development in most cities of the world is basically aimed at achieving the objectives of safety and better health in order to create an improved environment for the benefit of the community, it is argued that as the role of the state expanded and the extent of its intervention increased, the definition of the 'environment' subject to

planning control has changed over time. From being wholly concerned with the physical form and content of development, 'environment' now embraces the social and economic consequences of development (Dissanayake, 1987). For example, development control has been used to implement planning strategies for different purposes, such as minimising the negative impact of economic growth, checking the menace of market forces, ensuring social equity and supporting economic growth (Litchfield & Darin-Drabkin, 1980). Consequently, Dissanayake (1987) contends, development control has become a tool that is sometimes used to achieve its original objectives of safety and better health; sometimes to implement planning strategies; and in some cases to do both. The problem is, since development control continues to regulate the use of land while planning strategies have widened in scope, development control on its own has proved incapable of meeting additional demands.

Since development control is used to implement planning policies, which are normally reflected in planning legislation, physical development plans and other associated planning documents, its failure to achieve development planning objectives may be due to the pursuit of inappropriate policies, or the application of inflexible standards and regulations, or both (Koenigsberger, 1975; Rivkin, 1978; McAuslan, 1985). Consequently, many have argued that development control practices are inappropriate, ineffective and inequitable in their operation in most cities of the developing world. They also argue that developing countries stand to benefit little from the transplanting of regulations that have evolved in other countries with differing social, political and economic climates. Furthermore, it is argued that planning agencies in most developing countries lack the manpower and financial resources to implement and enforce efficient and effective development control measures, while the issue of corruption amongst some elected officials, bureaucrats, land officers and planners has actually accentuated the problem (e.g. http://lands.gov.pg/Services/Governance/Complaints_Desk.html, accessed on 8 May 2016).

Many previous studies (e.g. Koenigsberger, 1975; Rivkin, 1978; Amos, 1980; Litchfield and Darin-Drabkin, 1980; McAuslan, 1985; Dissanayake, 1987) focusing on development control have examined many challenges militating against effective and efficient implementation and enforcement of development control measures. Other previous studies have investigated issues surrounding either the three-stage development process (e.g. Appraisal Institute, 2008), comprising: permitting, construction, and absorption of the finished building, or the four-stage development process comprising: acquisition of project site, obtaining necessary approvals, constructing the building and leasing-up and operating or selling the building. However, there is a dearth of studies focusing particularly on how the 'development control system' could be synergized by the holistic, seven-stage 'land development process' both of which constitute mutually reinforcing and mutually supportive urban management tools for achieving city liveability and city sustainability in the 21st century and beyond. The present study is considered compelling and overdue in order to bridge this gap identified in the literature, thereby contributing significantly to the physical planning knowledge base both in terms of a possible extension of the frontiers of planning theory and improving city liveability and sustainability. Furthermore, existing planning theories (paradigms) such as synoptic planning, participatory planning, incrementalism, mixed scanning, transactive planning, advocacy planning, bargaining

and communicative approaches, etc., are implicit or ineffective in explaining and analysing contemporary challenges faced by cities in pursuit of sustainable development goals due to uncertainty, crimes and insecurity from terror attacks (e.g. since September 9/11). Towards this end, this paper is designed to answer the following two research questions:

- (i) What are the key features of the 'land development process' that may be embedded in the existing 'development control' system to facilitate the latter's social, economic and environmental relevance and promote city liveability and sustainability?
- (ii) How can planners invent a new planning theory based on lessons learnt from a feasible, revamped development control apparatus?

Conceptual Framework and Literature Review

The conceptual framework for this paper is provided by the theoretical lenses gleaned from the concepts of *liveability* and *sustainability*. Mercer (2016) defines liveability, the first part, as a concept that assesses which locations around the world provide the best or the worst living conditions. Assessing liveability has a broad range of benefits, ranging from benchmarking perceptions of development levels, to assigning a hardship allowance as part of expatriate relocation packages. However, critics of this concept have argued that no city in the world is really excellent and that liveability is only a relative term. According to the Economist Intelligence Unit Limited (2015), Melbourne in Australia remains the most liveable location of the 140 cities surveyed, followed by the Austrian capital, Vienna. Vancouver in Canada, which was the most liveable city surveyed until 2011, lies in third place (Table 1).

Table 1: The five most liveable cities in the world, 2015

Country	City	Rank (Out of 140)	Overall Rating (100 = Ideal)
Australia	Melbourne	1	97.5
Austria	Vienna	2	97.4
Canada	Vancouver	3	97.3
Canada	Toronto	4	97.2
Australia	Adelaide	5	96.6
Canada	Calgary	5	96.6

Source: *The Economist Intelligence Unit Limited, 2015*

The Economist Intelligence Unit's liveability rating quantifies the challenges that might be presented to an individual's lifestyle in any given location, and allows for direct comparison between locations. Every city is assigned a rating of relative comfort for over 30 qualitative and quantitative factors across five broad categories: stability; healthcare; culture and environment; education; and infrastructure. Each factor in a city is rated as acceptable, tolerable, uncomfortable, undesirable or intolerable. For qualitative indicators, a rating is awarded based on the judgment of in-house analysts and in-city contributors. For quantitative indicators, a

rating is calculated based on the relative performance of a number of external data points. The scores are then compiled and weighted to provide a score of 1–100, where 1 is considered intolerable and 100 is considered ideal. The liveability rating is provided both as an overall score and as a score for each category. To provide points of reference, the score is also given for each category relative to New York (United Nations Headquarters) and an overall position in the ranking of 140 cities is provided. Mercer (2016) evaluates local living conditions in more than 440 cities surveyed worldwide according to 39 factors, grouped in 10 categories as follows:

- Political and social environment (political stability, crime, law enforcement, etc.);
- Economic environment (currency exchange regulations, banking services);
- Socio-cultural environment (media availability and censorship, limitations on personal freedom);
- Medical and health considerations (medical supplies and services, infectious diseases, sewage, waste disposal, air pollution, etc.);
- Schools and education (standards and availability of international schools);
- Public services and transportation (electricity, water, public transportation, traffic congestion, etc.);
- Recreation (restaurants, theatres, cinemas, sports and leisure, etc.);
- Consumer goods (availability of food/daily consumption items, cars, etc.);
- Housing (rental housing, household appliances, furniture, maintenance services); and
- Natural environment (climate, record of natural disasters).

The second part of the conceptual framework - *Sustainability* - embraces the four dimensions of sustainable development, namely: good governance, economic sustainability, social sustainability and environmental sustainability. In this 21st century, sustainability is regarded as a discourse and it includes sustainable building, design, operations, and the collection of policies and strategies that a city can apply to minimise its adverse economic, social and environmental impacts on future generations (<http://www.environmentalleader.com/category/sustainability/#ixzz40CVURHa8> (accessed on 4 February 2016)). Sustainability ensures that ecological concerns, such as the environmental impacts of pollutants, are balanced with socio-economic concerns such as minimising the consumption of limited natural resources to maintain their availability in the future (Rodriguez, Roman, Sturhahn, and Terry, 2002). Using the concept of sustainability (Figure 1), the performance of cities can be assessed based on an adapted “Triple-Bottom Line” model of sustainability (Elkington, 1997), to embrace the environmental, economic, social and good governance dimensions of sustainability (Weber, 2015).

According to Weber (2015), good governance entails processes, decisions and outcomes that sustain natural resources, alleviate poverty and improve quality of life. However, good governance is a complex variable that cannot be easily measured because it includes the state’s institutions and structures, decision-making processes, the capacity to implement projects and the relationship between government officials and the public (World Bank, 1999). Yet, good governance within any legal entity will promote accountability and transparency (Weber, 2015) and it has both political and technical undertones. It relates to a nation’s political

system and how this functions in relation to public administration (Karigawa, Babarinde and Holis, 2016).

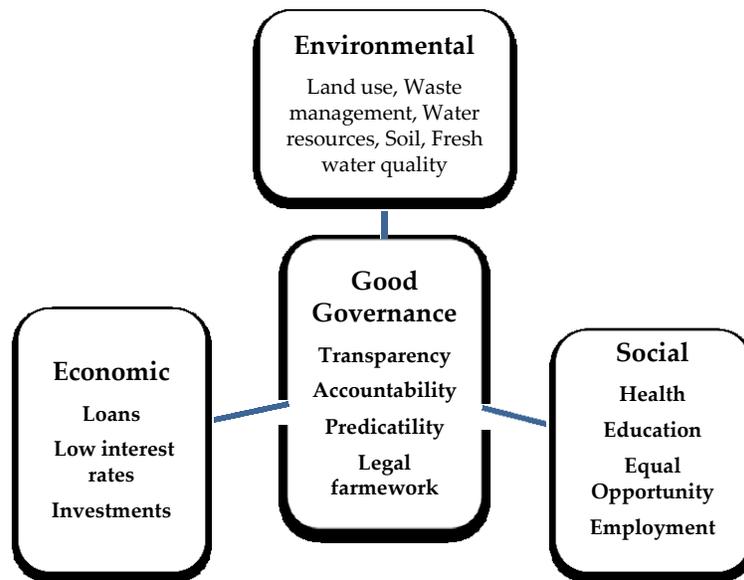


Figure 1: Part 2 of the Conceptual Framework: Sustainability. Source: Adapted from several sources (e.g. Rodriguez, et al., 2003; Karigawa, Babarinde & Holis, 2016)

The environmental dimension of sustainability involves making decisions and taking actions that are in the best interest of protecting the natural world, with particular emphasis on preserving the capability of the natural environment to support human life without undue interference (FAO/UNEP, 1999). Economic sustainability is a term used to identify various strategies that make it possible to use available resources to their best advantage, with a view to promoting the use of those resources in a way that is both efficient and responsible, and likely to provide long-term benefits to the society (Drexhage and Murphy, 2010). Finally, social sustainability occurs when the formal and informal processes, systems, structures, and relationships actively support the capacity of current and future generations to create healthy and liveable communities, while socially sustainable communities are equitable, diverse, connected and democratic and provide a good quality of life (<http://www2.econ.iastate.edu/classes/tsc220/hallam/HallamLectures/SocialSustainability.pdf>, accessed on 24 May 2016). The lesson to be learned from this conceptual framework is that all existing cities should imbibe the concepts of liveability and sustainability in order for them to cope successfully with uncertainties in the future.

Graaskamp (1973) sets the stage for the discussion of complexities and nuances of the (land) real estate development process and argues that each real estate project, unlike many mass-production industries, is unique. Furthermore, the development process is so much a creature of the political process that society has a new opportunity with each major project to negotiate, debate, and reconsider the basic issues of an enterprise economy, i.e., who pays, who benefits, who risks, and who has standing to participate in the decision process

(Graaskamp, 1973; Kohlhepp, 2012). Thus the development process remains a 'high-silhouette topic' for an articulate and politically sophisticated society. Graaskamp expands his definition of real estate development to include the entire economic and physical life of the development as it is planned, built, renovated and redeveloped. This view of the 'real estate (land) development process' appreciates the complexities of and multiple stakeholders in the process as well as the long term nature and on-going management of the real estate enterprise, although Graaskamp's work has been alternatively described as being both too theoretical and too pragmatic.

Research Method

This paper adopts the 'real estate (land) development model / matrix' (Kohlhepp, 2012) (Figure 2) that simulates the actual land development process used in constructing a hypothetical block of twenty-five, 2-bedroom apartments in the City of Lae, PNG. According to Kohlhepp (2012) the matrix is organised around a 56-cell, stage-task matrix (summarised in Table 2), which describes the entire land (real estate) development process in seven stages from the *land banking* stage to the *redevelopment* stage.

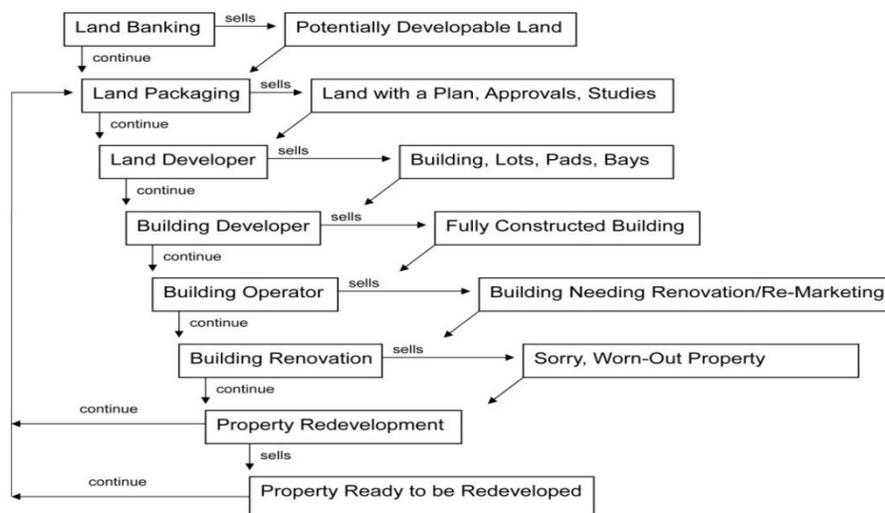


Figure 2: A Schematic Diagram of the Development Matrix

Source: Kohlhepp (2012)

The seven stages in the model are: (i) land banking (ii) land packaging (iii) land development (iv) building development (v) building operation (vi) building renovation and (vii) site redevelopment (Figure 2). Each stage in the development process, according to Kohlhepp (2012), must also address eight categories of tasks indicated in eight rows (many of which are done simultaneously): (i) acquisition (ii) financing (iii) market research (iv) environmental studies (v) approvals and permits (vi) improvement construction (vii) transportation and accessibility concerns, and (viii) sales and disposition.

Kohlhepp (2012) argues that sustainable development and green building techniques are best understood and analysed in the context of the life-cycle of the building, rather than at the beginning of building construction (which is what traditional development control often does). The most important analysis of the sustainable nature of a development is made when the development is seeking various public approvals prior to the construction of horizontal (infrastructure) or vertical (building) improvements. However, Kohlhepp (2012) warns that users of this matrix (Table 2) must remember that, as with all real world applications of conceptual models, the lines separating the stages and the categories can be fuzzy. Nevertheless, he agrees that the model can be used as a descriptive, normative, or predictive model, and as a pedagogical tool, it can help planners and students understand the process, risks, and value creation in land (real estate) development.

Table 2: A 56-cell Development Matrix Comprising 7 Stages (Columns) and 8 Tasks (Rows)

Land Development Matrix	1. Land Banking	2. Land Packaging	3. Land Development	4. Building Development	5. Building Operations	6. Building Renovation	7. Site Redevelopment
I. Acquisition	I. 1.	I. 2.	I. 3.	I. 4.	I.5.	I. 6.	I.7
II. Financing	II.1.	II.2.	II.3.	II.4.	II.5.	II.6.	II.7.
III. Market Studies & Marketing Strategies	III.1.	III.2.	III.3.	III.4.	III.5.	III.6.	III.7.
IV. Environmental Studies	IV.1.	IV.2.	IV.3.	IV.4.	IV.5.	IV.6.	IV.7.
V. Approvals and Permits a. Federal b. State c. Regional Authorities d. Municipal e. Private	V.1.	V.2.	V.3.	V.4.	V.5.	V.6.	V.7
VI. Improvements	VI.1.	VI.2.	VI.3.	VI.4.	VI.5.	VI.6.	VI.7.
VII. Transportation/Accessibility	VII.1.	VII.2.	VII.3.	VII.4.	VII.5.	VII.6.	VII.7.
VIII. Sales and Disposition	VIII.1.	VIII.2.	VIII.3.	VIII.4.	VIII.5.	VIII.6.	VIII.7.

Source: Kohlhepp (2012)

The eight tasks may overlap and the distinctions may be fuzzy and blurred. However, it is important to note that each stage begins with the acquisition tasks and ends with the disposition tasks (Kohlhepp (2012)). Furthermore, the other tasks are not done in any particular order and many are done simultaneously. A developer must *work down a column* or stage to create value in the process. On the other hand, a professional (e.g. a planner) must identify his/her skills in

the task categories and then *work across the row* to determine how s/he fits or profits in the development process (Kohlhepp (2012).

Findings and Discussion

In this section, the two research questions earlier posed in this paper are answered in turn, with particular reference to the hypothetical housing project (a block of twenty-five, 2-bedroom apartments in Lae City, PNG) used as case study.

- (i) *What are the key features of the 'land development process' that may be embedded in the existing 'development control' system to facilitate the latter's social, economic and environmental relevance and promote city liveability and sustainability?***

As hinted under the model specification above, the most important analysis of the sustainable nature of a development can be made when the development is seeking various public approvals (Tables 2 and 3) from the planning authority prior to the construction and renovation of horizontal (infrastructure) or vertical (building) improvements. Furthermore, it should be noted that sustainable development and green building techniques are best understood and analysed in the context of the life-cycle of the building, rather than just at the beginning of building construction or renovation. Therefore, the answer to the first research question lies in how skillfully the planning authority and/or planner is able to accomplish the fifth task (approvals and permits) under each of the seven stages of the development process. For the hypothetical housing project (a block of 25 apartments), Table 3 indicates the minimum responsibilities that the planning authority and any planner acting as consultant to a developer must perform in conjunction with allied institutions/agencies/professionals and the project developer during the life cycle of a project. Consequently, if development control in cities is to become more effective and more relevant for purposes of achieving the liveable and sustainable cities that we all urgently need, then, the key plan approvals and permits in Table 3 must be carefully embedded in the existing development control apparatus.

Table 3: The Planning Authority's Planning Consent Functions in the Holistic Land Development Process for a Hypothetical Block of 25, 2-Bedroom Apartments in Lae, PNG

Task V: Approvals and Permits	1. Land Banking	2. Land Packaging	3. Land Development	4. Building Development	5. Building Operations	6. Building Renovation	7. Site Redevelopment
<p>V. a. Federal /Central Government</p>	<p>V.1. Lands Minister approves the purpose (zoning) of land acquisition/land banking for project development. As a matter of policy, planning authorities must tie the land title to project plan(s) as a condition for granting planning permission as done in the UK, or ask for deed of transfer of land as a proof of land ownership by the developer.</p>	<p>V.2. Minister for Environment and Conservation approves EIA Report; Transportation Minister gives approval; Wildlife Dept. gives approval; Govt. agencies obtain govt. approval of projects on government land.</p>	<p>V.3.</p>	<p>V.4.</p>	<p>V.5.</p>	<p>V.6.</p>	<p>V.7.</p>
<p>b. State / Provincial Government through the Department of Lands and Physical Planning (DLPP)</p>	<p>Request certificate of land title or deed of conveyance; obtain approval from the community.</p>	<p>Approves zoning on both alienated and customary lands; approves conveyance or other legal titles to land. Verifies legal title and survey plan; verifies registration in the Lands Register.</p>	<p>Issues Certificate of ownership and Survey Plan; approves community and transportation plans; issues full or conditional planning consent; verifies EIA Report; project clearance for piped water and sewerage.</p>	<p>Verifies land title and Survey Plan; Building permit issued by the National Capital District (NCD); permit issued by Fire Authority.</p>	<p>Issues certificate of ownership and Survey Plan.</p>	<p>Issues certificate of ownership and Survey Plan. Issues planning consent.</p>	<p>Issues certificate of ownership and Survey Plan. Issues planning consent.</p>

Task V: Approvals and Permits	1. Land Banking	2. Land Packaging	3. Land Development	4. Building Development	5. Building Operations	6. Building Renovation	7. Site Redevelopment
V.	V.1.	V.2.	V.3.	V.4.	V.5.	V.6.	V.7.
c. Municipal / Local Government	Site inspection; approves land subdivision, site location and environmental reports on land to avoid contaminated land; garners public participation; issues interim planning consent	Approves land packaging proposals; issues occupancy permit; collaborates with utility agencies for permits for relevant municipal services, e.g. telephone, electricity, water, etc.	Issues occupancy permit; foundation work approval; regular site inspection.	Issues building permit based on resilient and crime/terror-proof standards; frame inspection; regular site inspection.	Fire rating approval; occupancy permit; regular site inspection.	Frame inspection; occupancy permit; regular site inspection.	Frame inspection; occupancy permit; regular site inspection.
d. Private Developer	For building leases, obtains the landowner's approval; obtains interim planning consent; seeks expert legal advice.	Seeks approval, through a project manager (who should be a planner), from land planning and lending experts on zoning and project financing; obtains professional advice on project plans and feasibility report (where necessary).	Seeks audience with planning authority for plan review where conditions are imposed; obtains short-term bank loan(s); obtain agreements on restrictive covenants, easements and development charges.	Seeks audience with planning authority for plan review where conditions are imposed; obtain long-term bank loan(s); project management services through a planner as project manager.	Project management services through a planner as project manager.	Project management services through a planner as project manager.	Project management services through a planner as project manager.

Source: Author, 2016

Notes: i) There are no Regional Planning Authorities in Papua New Guinea. There are 22 provinces in the country (ii) The private developer will benefit more if a physical planner is appointed as project manager right from the start to provide project management services till completion and hand-over of the project.

(ii) How can planners invent a new planning theory based on lessons learnt from a feasible, revamped development control apparatus?

As a step towards answering the second research question, this paper argues that existing planning theories are implicit or ineffective in explaining and analysing contemporary challenges faced by cities in pursuit of sustainable development goals due to crimes, general uncertainty and insecurity from terror attacks (e.g. since September 9/11). A good planning theory is an attempt at explaining physical planning context that guides planning practice, points planners towards strategies of response, prompts practical insights, anticipates outcomes, reminds us of what we need and what is important when we get stuck and alerts us to problems or crises (Forester, 1987; Fainstein and DeFilippis, 2016). It is contended that most of the existing planning standards and building regulations that planners have used for decades as basis for enforcing development control in cities need to be overhauled and replaced with *smart* planning standards and building regulations that are compliant with *Crime Prevention through Environmental Design (CPTED)* objectives and principles (Cozens, 2016), which should then feed into a new development control apparatus for towns and cities. Unfortunately, this is still a mirage. To make this proposal achievable, all provinces and municipalities would need to organise series of workshops and seminars to brainstorm on smart planning standards and building regulations, which may produce a viable communiqué for approval by those provincial and municipal authorities charged with plan approval functions. Once a functional and legally feasible development control system is agreed by all stakeholders including environmental planning practitioners, policy planners and planners in the academia, this should be followed by the setting up of “schools of thought”, “brainstorming groups” or “think-tanks” in all notable planning associations world-wide, spearheaded by the International Society of City and Regional Planners (ISOCARP). The goal of these think-tanks should be to invent a unified *development-planning theory* that is context-driven or situational and avoids dogmatism in practice, reflects contemporary culture, politics and social issues of our time. The specific goal here is to come up with a *development-planning theory* that is future-oriented and capable of spurring planners into conscious decision-making, while linking direction with action.

This collaborative approach to developing a dynamic, *development-planning theory* obviously differs from the age-long experience where most of the existing eight (8) procedural planning theories (mentioned in this paper) were the outcomes of individual theorists' ingenuity or insights (e.g. Lindblom's science of muddling through, 1989; Etzioni's mixed-scanning, 1968; Friedman's transactive planning, 1973; Davidoff's advocacy and pluralism; 1965). It is high time that a *development-planning theory* became a strong point of reference for liveable and sustainable cities and for preventing urban sprawl. Such a new planning theory should be something that any planner can turn to when unsure of the proper path to follow when searching for solutions in planning practice. It should also be a plausible or scientifically acceptable general principle or body of principles offered to explain city phenomena. To kick-start this discourse and answer the second research question in this paper, we can conceptualise “the cities we need” as follows:

Cities are liveable, sustainable, location-specific and big-picture organisms that are composites of organised, multiple land development projects and built-environment processes, which consist of fuzzy 'stages' and 'tasks' that must be analysed, harnessed, synergized and diligently managed in the context of the life-cycle of buildings, community facilities, public utilities and municipal services so as to promote safety, good health, beauty, economy and their mutual interactions.

Conclusion

This paper is an innovative attempt at bridging the gap between the cities we have and the cities we need not only in the 21st century but also beyond, using the integrated tools of *development control* and *holistic land development process* to achieve the vision of liveable and sustainable cities. Towards this end, the paper adopts a conceptual framework that is woven around the theoretical lenses of *liveability* and *sustainability* as benchmarks for the cities we need. On the theory that sustainable development and green building techniques are best understood and analysed in the context of the life-cycle of the building, rather than just at the beginning of building construction and renovation, the paper adopts the *holistic land development process* to demonstrate the roles that planners and planning authorities can play through plan approvals and permits to make the vision a reality.

Two research questions were answered by the paper, based on a case study of a hypothetical housing project in Lae City, Papua New Guinea. The first question seeks to identify what key features of the 'land development process' may be embedded in the existing 'development control' system to facilitate the latter's social, economic and environmental relevance, city liveability and city sustainability. Findings from the case study reveal that the exercise of *due diligence* by planners and planning authorities, working in concert with other development agencies and professionals during the stages of granting planning approvals and permits to building operations, holds the key to the cities we need. Following up from the first research question, the second research question examines how planners can invent a new planning theory based on lessons learnt from the adoption of a revamped development control apparatus. Findings suggest that the best approach to doing this is for all planners, regardless of where they are, to collaborate and brainstorm on a dynamic, *development-planning theory* that can serve the planning profession as a strong point of reference in their pursuit of liveable and sustainable cities that we really need now and in the future.

References

Amankwah, H.A.; Mugambwa, J.T.; Muroa, G. (2007), *Land Law in Papua New Guinea*; University of Papua New Guinea Press: Port Moresby, Papua New Guinea, 2009.

Amos, F. J. C. (1980), Development Control Reappraised, in: *Value for Money in Development Control*, University of Birmingham, 1-4.

BABARINDE Jacob: Holistic Land Development Model for City Sustainability: Towards a New *Planning Theory*, '52nd ISOCARP Congress 2016'

Appraisal Institute (2008), *The Appraisal of Real Estate*, Thirteenth Edition, Appraisal Institute, Chicago, Illinois, p. 370.

Cities Alliance (2007), *Liveable Cities: The benefits of urban environmental planning*, A Cities Alliance Study on Good Practices and Useful Tools, The Economist Intelligence Unit Limited, Washington, D.C. 20433, U.S.A.

Colonialism and the expansion of empires; Available online:
<http://revealinghistories.org.uk/colonialism-and-the-expansion-of-empires.html> (accessed on 21 May, 2016).

Cozens, P. (2016), *Think Crime! Using Evidence, Theory and Crime Prevention Through Environmental Design (CPTED) for Planning Safer Cities*, Praxis Education, London, UK.

Davidoff, P. (1965), Advocacy and Pluralism in Planning, *Journal of the American Institute of Planners*, 31 (4), 331–338.

Dissanayake, L. (Undated), Effectiveness of the Development Control System for the City of Colombo, Sri Lanka, Working Paper No. 36, Based on an MSc Dissertation, 1987.

Dixon, K. (2007), Working with mixed commons/anticommons property: Mobilizing customary land in Papua New Guinea the Melanesian way, *Harvard Environmental Law Review*, 31, 219.

Drexhage, J. and Murphy, D. (2010), *Sustainable Development: From Brundtland to Rio 2012*; International Institute for Sustainable Development (IISD), New York, NY, USA.

Elkington, J. (1997), *Cannibals with Forks: Triple Bottom Line of 21st Century Business*; New Society Publishers: Stoney Creek, CT, USA.

Etzioni, A. (1968). *The active society: a theory of societal and political processes*, Free Press, New York, USA.

Fainstein, S. and DeFilippis, J. (2016), *Readings in Planning Theory, 4th edition*, Blackwell Publishers Oxford, England, and Malden, Massachusetts, USA.

FAO/UNEP (1999), Development of the Land Cover Classification System (LCCS); Available online: <http://www.fao.org/docrep/008/y7220e/y7220e06.htm> (accessed on 5 May 2015).

Forester, J. (1987), *Planning in the Face of Conflict*, ISBN 0-415-27173-8, Routledge, New York, USA.

Friedman, J. (1973), *Retracking America: A Theory of Transactive Planning*, Anchor Press/Doubleday, Garden City, New Jersey, USA.

BABARINDE Jacob: Holistic Land Development Model for City Sustainability: Towards a New *Planning Theory*, '52nd ISOCARP Congress 2016'

Gilberthorpe, E. Fasu solidarity: A case study of kin networks, land tenure, and oil extraction in Kutubu, Papua New Guinea, *Am. Anthropol*, 109, 101–112.

Graaskamp, J. A. (1973), *The Fundamentals of Real Estate Development*, The Urban Land Institute, Washington, DC: USA.

Karigawa, L., Babarinde, J. A. and Holis, S. S. (2016), Sustainability of Land Groups in Papua New Guinea, *Land Journal*, Volume 5, No. 14, 1-23.

Koenigsberger, O. H. (1975), Planning Legislation in Developing Countries, in: *Proceedings of the Town and Country Planning Summer School*.

Kohlhepp, D. B. (2012), *The Real Estate Development Matrix*, Paper Presented at the American Real Estate Society Meetings on 21 April, at St. Petersburg, Florida, USA.

Lindblom, C. E. (1959), The science of "muddling through", *Public Administration Review*, 19 (2), 79–88.

Litchfield, N. and Darin-Drabkin (1980), *Land Policy in Planning*, George, Allen & Unwin, London, UK.

McAuslan, P. (1985), *Urban Land and Shelter for the Poor*, Earthscan, London, UK.

MERCER (2016), Western European Cities Top Quality of Living Ranking, MERCER Press, London: UK.

Minister of Land's Indictment of the Department of Lands. Available online: http://lands.gov.pg/Services/Governance/Complaints_Desk.html (accessed on 8 May 2016).

KJM Design and Planning Services; Available online: <http://www.kjmdesigns.co.uk/about-us/>, accessed on 15 June, 2016.

Power, A.P. (2001), Land Mobilisation Programme in Papua New Guinea: Land Group Incorporation: Village Guide and Legal Guide; Available online: <http://www.pngbua.com/300socialsciences/management/landdevelopment/indigenouslandgroupsregistration1.html> (accessed on 25 May 2016).

Rivkin, M. D. (1978), Some Perspectives on Urban Land Regulation and Control" in: *Urban Land Policy Issues and Opportunities*, World Bank Staff Working Paper, No. 283.

Rodriguez, S.I.; Roman, M.S.; Sturhahn, S.C.; Terry, E.H. (2002), Sustainability Assessment and Reporting for the University of Michigan's Ann Arbor Campus; Report No. CSS02-04; Centre for Sustainable Systems, University of Michigan: Ann Arbor, MI, USA.

BABARINDE Jacob: Holistic Land Development Model for City Sustainability: Towards a New *Planning Theory*, '52nd ISOCARP Congress 2016'

Social Sustainability; Available online:

<http://www2.econ.iastate.edu/classes/tsc220/hallam/HallamLectures/SocialSustainability.pdf> (accessed on 24 May 2016).

Sustainability; Available online:

<http://www.environmentalleader.com/category/sustainability/#ixzz40CVURHa8> (accessed on 4 February 2016).

Tumare, J., Babarinde, J. A., and Tagicakibau, M. (2015), A Conceptual Framework for Multipurpose Land Information System (MPLIS) Application for Land Management in Papua New Guinea, *Melanesian Journal of Geomatics and Property Studies*, Volume 1, 69-80.

Weber, M. (2015), The Role of Good Governance in Sustainable Development, 2015; Available online: <http://www.wri.org/blog/2015/02/qa-mark-robinson-role-good-governance-sustainable-development> (accessed on 20 July 2015).

World Bank (1999), *Governance and Development*; The World Bank, Washington, DC, USA.

When Planning Becomes Litigation: Comparative Case Studies of the Ideologies of Appeal Decisions in New South Wales and Ontario

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A STRACT: Planning appeals are at the apex of the planning process. The impact of decisions of courts and tribunals about the proper interpretation of legislation and policy extends well beyond the individual dispute, trickling down to the day-to-day work of planners and local officials. Unfortunately, planning scholars have largely left examination of planning appeals to legal scholars, essentially divorcing the legal realm from the administrative realm. In this paper, I examine the ideological conflicts inherent in progressing a planning dispute into the legal realm – that is, into an arena where the public interest nature of planning encounters the traditional tendency of courts to protect private property rights. In this paper, I conduct a comparative case study of planning appeals at the New South Wales Land and Environment Court and the Ontario Municipal Board where the material issue is “acquired rights”, known as “Existing Use Rights” in New South Wales and “Legal Non-Conforming Use” rights in Ontario. Acquired rights essentially protect private property owners when a new planning regulation makes their formally lawful use of their land unlawful, pitting private property interests against the broader public interest considerations of planning regulations. Using case survey methodology, I compare how the Land and Environment Court and the Ontario Municipal Board balance the traditional judicial tendency to protect private property rights by liberally interpreting acquired rights with the public interest desire of government to limit the conditions under which someone can continue a use which is prohibited by current planning regulations. Given the influence that the planning appeal decisions have over development assessment decisions at the local level, knowing this balance – and how it might conflict with conception of “good planning” of local officials and the general public – adds an essential piece of the puzzle that is the planning process.

1.0 INTRODUCTION

Whether through legislation that frames the urban planning process or through appeal bodies such as courts or tribunals, where implementation of that framework is reviewed, the law plays an integral role in the planning process. The law provides the boundaries within which public authorities make decisions. When there is a disagreement about those decisions, courts and administrative tribunals provide a forum for review. Planning appeals are at the apex of planning processes and their impact extends well beyond the individual dispute (Willey 2000; Booth 2007; Edgar 2013b; McAuslan 2003; Mualam 2014; Pearson & Williams 2009). For that reason, as McAuslan (1980, p.xii) says, it is important to gain knowledge about “...what our lords and masters are up to and how they say it.” Unfortunately, planning scholars have largely left examination of planning appeals – their justification, composition, resolution and impact – to legal scholars and as such, planning appeals remain theoretically underdeveloped (Willey 2007; Mualam 2014; McAuslan 2003). Essentially, planning scholars have divorced the legal realm from the administrative realm, when in reality both are integral parts of the planning process. When it comes to understanding planning from both a procedural and substantive standpoint, a large piece of the puzzle is missing.

In this paper, I contribute to narrowing what Willey (2007, p.1675) describes as a “chasm in planning knowledge” by drawing on McAuslan’s (1980) notion of “planning ideologies” to examine the ideological conflicts inherent in progressing a planning dispute into the legal realm, where the public interest nature of planning encounters the traditional tendency of courts to protect private property rights. I focus on cases where the New South Wales Land and Environment Court (LEC) and the Ontario Municipal Board (OMB) have considered what the Supreme Court of Canada in the case of *Saint-Romuald (Ville) v. Olivier* [2001] 2 S.C.R. 898 has termed “acquired rights,” (known as “existing use rights” in New South Wales and “legal non-conforming use rights” in Ontario) which protect private property owners when a new planning regulation makes their formally lawful use of

their land unlawful. This area of law pits private property interests against the broader public interest considerations of planning regulations. Using a selection of cases, I compare how the LEC and OMB balance the traditional tendency of courts to protect private property rights by liberally interpreting acquired rights with the public interest desire of government to limit the conditions under which someone can continue a use which is prohibited by current planning regulations. Given the influence that decisions in the legal realm have over development assessment decisions at the local level, knowing this balance – and how it might conflict with conception of “good planning” of local officials and the general public – adds an essential piece of the puzzle that is the planning process.

2.0 PLANNING DISPUTES IN THE COURTS: THE LITIGATION

Law has a profound impact on urban development. As McAuslan (2003, p.139) explains, the law “...defines the system of urban government, it establishes the system of urban planning and regulation of land development, and it delimits the powers of the urban planners and managers.” In particular, development controls represent a significant intrusion into private property rights, essentially confiscating – as Binnie J. put it in the *Saint Romuald* case – through controls such as zoning some of a landowner’s rights to do what they want with their land. For landowners, then, development control is effectively the “...sharp end of the planning system...” (McAuslan, 1980, p.147; see also Booth 2002). As a “check” on government intrusion into private property rights, most common law jurisdictions, Australian states and Canadian provinces included, have established judicial (courts) or quasi-judicial (administrative tribunals) bodies which oversee local development assessment decisions. In New South Wales, the appellate body for environmental and planning matters is the Land and Environment Court (LEC), a “specialist court” established in 1980 (Ryan, 2002; Stein, 2002). In Ontario, the Ontario Municipal Board is a quasi-judicial administrative tribunal that hears appeals against local planning decisions (although the courts play a role too, as discussed below). While the exact date of origin of the OMB is not clear, it is much older than the LEC, with its roots being traced to at least the early 1900s (Krushelnicki, 2003).

In general, there are two ways in which a local planning decision (made by either council or local committees – such as the Committee of Adjustment in Ontario) may be challenged: through an application for judicial review or a merit appeal. **Judicial review** can only be conducted by a court, and it involves a judge reviewing *how* an administrative decision was made and declaring invalid decisions that it finds were made arbitrarily or inappropriately (Willey, 2000; 2004). Here, a judge considers such questions as: Was the decision-maker biased? Did they take into account any irrelevant considerations? If the judge overturns a decision in a judicial review, the matter is sent back to the original decision-maker for re-hearing; in other words, the whole process starts again. In the end, the decision might be the same (so long as it is made using proper processes). **Merit appeals** represent a much more attractive avenue for unhappy property-owners (Edgar, 2013b). While in a judicial review, a judge is reviewing the decision-making *process*, in a merit appeal the appellate body (either a court or, more likely, an administrative tribunal) is reviewing the *outcome*. Essentially, the appellate body is standing in the shoes of the original decision-maker, hearing evidence and exercising its judgment about the merits of the case (England 2014). Ultimately, the appellate body can substitute its own (often subjective) decision to grant a development application that was refused in the first instance by council. Since the LEC consists of both judges and commissioners, it hears both judicial reviews and merit appeals in the area of planning. In Ontario, merit appeals of planning decisions are heard by the OMB, an expert tribunal with quasi-judicial powers (Krushelnicki, 2003), while applications for judicial review are heard by the Ontario Divisional Court.

Importantly, the impact of merit appeal decisions extends well beyond the individual dispute, “trickling down” to local officials who consider development applications in the first instance and who do not want their decisions to be overturned on appeal (Edgar 2013b; Pearson & Williams 2009). Local officials may be coerced into approving applications they may otherwise have denied (Willey, 2000). As Edgar (2013b, p.77) explains: “The potential for decisions to be appealed to a tribunal puts the primary decision-maker in the position of having the tribunal ‘over its shoulder’.” Moreover, planning appeal decisions can also impact future policy development (Willey 2000; 2004; Edgar

2013b; Mualam 2014; Pearson & Williams 2009; Booth 2007). For this reason, it is important for planning scholars and planning practitioners to understand what is happening in this “other” planning system. Does a planning matter change when it move from the administrative (and sometimes political) realm into the judicial or quasi-judicial realm? In the administrative realm, a planning matter can involve multiple parties, including council, the developer, other levels of government and objectors. In the legal arena, the same matter is transformed into an adversarial contest between (most often) the council and the developer, presided over by a judge or commissioner who relies heavily on expert evidence to make a decision. In this forum, oftentimes narrow points of law – rather than the planning merits – become the deciding factor of the case (Edgar, 2010; 2011; Stewart 1999; Willey 2004; 2007). As England (2014, p.41) questions: “Merits review requires members of the legal profession to adopt a ‘planning hat’ so as to adjudicate the planning merits of a particular decision... Should legal professionals, trained in the intricacies of legal interpretation and doctrinal analysis, be required to take on this other disciplinary role? Are they up to the task of adjudicating planning disputes?”

This paper focuses on the following question: *Are the courts in any way biased towards a particular ideology that might influence how they approach planning disputes?* Indeed, McAuslan identified in 1980 a tendency of the courts in the UK to protect the interests of private property owners in planning matters. According to him, at any one point in time, planning law can be seen as the outcome of the competition between the ideologies of private property, the public interest and public participation. The ideology of private property – originating in the common law and traditionally espoused by courts – views the law as a vehicle through which to protect private property interests. On the other hand, the ideology of the public interest sees law as a vehicle for advancing the public interest (if necessary, against the interests of private property) as determined by the government. In opposition to both of these, the ideology of public participation views the law as a tool for protecting a citizens’ rights to have a say in development decisions, not because they are personally affected, but because it is their democratic right to express community concerns. According to McAuslan, the traditional tendency of courts is to ensure that the interests of landowners prevail over broader social, environmental and economic concerns – in other words, over public interest factors – and community concerns. Adshead (2014) recently revisited McAuslan’s study and found that the dominance of private property interests in the courts in the UK remains strong. While the public interest is allowed to operate in some areas, it is always “...under the terms of private interest” (Adshead 2014, p.192). Other planning and legal scholars since McAuslan – including Sperling (1997), Edgar (1999; 2011; 2013a), Booth (2002), Edgeworth (2008), England (2014) – have acknowledged that while throughout history there have been periods where the courts have become more sympathetic towards broader public interest concerns (especially after World War II), the ideology of private property remains deeply entrenched. Is this the case in the Land and Environment Court? And how does this compare to the Ontario Municipal Board?

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In order to examine whether the decisions of the LEC and OMB reflect the “traditional” tendency of courts to favour private property interests, I am examining cases in one area of planning law wherein the clash between private property rights and the government’s desire to implement public interest plans is prominent – that of acquired rights. In NSW, these are known as “Existing Use Rights” (EURs) and in Ontario they are known as Legal Non-Conforming Use (LNCU) rights. In both cases, these acquired rights arise when a legal planning instrument (in New South Wales, typically a Local Environmental Plan; in Ontario, a zoning by-law made pursuant to an Official Plan) makes a previously lawful use of land unlawful. Where a change involves “up-zoning,” or changing to a more valuable zoning (for instance, rural to residential), this is not likely to cause an issue: the landowner has an economic incentive to change in accordance with the new plan. However, where the change involves “down-zoning,” or changing to a less valuable zoning (for instance, high-density residential to low-density residential), there is no economic incentive for the landowner to change in accordance with the new plan and they will likely wish to continue, or even intensify or expand, the “existing use” (Whitehouse, 2012). In that situation, acquired rights protect the landowner’s right to

continue to use their land as they were before that use become prohibited by the new planning regime. As Whitehouse (2012, pp.1375-1376) observes, the law of acquired rights attempts to strike “the appropriate balance between the rights of landowners whose uses of their land are affected (usually adversely) by planning changes and the public expectation that the planning change envisaged by a new plan will actually be achieved.”

In his study of EURs cases from in the LEC up to 1999, Edgar (1999) found that while the Court’s approach had fluctuated over the years, by 1999 it tended to favour the interests of the landowner/applicant. He found that this was at the expense of broader environmental concerns reflected in local plans. This echoed McAuslan’s (1980) findings – confirmed more recently by Adshead (2014) – that in development appeals, UK Courts tend to favour protecting private property rights by focusing on narrow physical amenity issues (such as siting, building design, landscaping, overshadowing, views) at the expense of broader social, economic, environmental, financial and general need concerns (which he saw as “public interest” considerations - non-physical concerns that were much harder to prove with evidence). If the courts rejected a development application, it was because it negatively impacted the physical amenity of the property in question or of neighbouring properties, not because it violated wider social, economic and similar public interest concerns. Are Edgar’s (1999) and McAuslan’s (1980) findings still valid today?

3.1 *The Legislative Regimes in NSW and Ontario*

In New South Wales, EURs are enshrined in the *Environmental Planning and Assessment Act, 1979*. Section 107(1) states that “except where expressly provided in this Act, nothing in this Act or an environmental planning instrument prevents the continuance of an existing use.” Furthermore, in recognizing that it would be an unreasonable restriction on private property rights to “freeze” existing uses in time, Part 5 of the *Environmental Planning and Assessment Regulation, 2000* states that council may give development consent to alter, extend, enlarge, expand, intensify or rebuild an existing use. There are some caveats set out in the EPAA and the EPAR, however, restricting when a property owner may make any changes to their existing use and over the years, these restrictions have tightened (Whitehouse, 2012; Hewitt & Gerathy, 2011). For instance, approval can only be given for changes that are minor and do not involve an increase of more than 10% of the floor space. Perhaps most significantly, any changes **must be for the existing use and for no other use**. Prior to 2006, a landowner could apply to change an existing use to any other prohibited use (making properties with EURs particularly valuable¹ [Cummins, 2006; Hewitt & Gerathy, 2011]), but in 2006 the legislature amended the Regulations to put strict limits on this right and now a property owner with EURs can only change a commercial use to another commercial use and a light industrial use to another light industrial use. So, while EURs are indeed protected by legislation, they have, over time, become more limited in accordance with the government’s desire to ensure planning regimes (which in effect govern the current and future character of an area) are implemented.

In Ontario, there is a similar legislative context. LNCU rights are enshrined in the *Planning Act* which, like the EPAA in NSW, provides the framework for planning in Ontario. Section 34(9)(a) of the *Planning Act* establishes LNCU rights by stating that a by-law cannot prohibit any particular use of property provided that use existing lawfully on the date the zoning by-law was passed and that use has continued since. Similar also to NSW, there is an acknowledgment that LNCU rights are not frozen in time and that there is potential to extend or enlarge them. Subsection 34(10) of the *Planning Act* permits municipalities to amend a by-law to allow for the expansion or enlargement of a LNCU. If such an amendment has not happened, or the landowner does not wish to apply to amend the by-law, he or she may apply to a municipality’s Committee of Adjustment for a “minor variance” to enlarge or extend a LNCU or to change the use to one that is similar to the purpose for which it was used on the date of the by-law or to one that is more compatible with permitted uses in the by-law. The predecessor of section 34(9) was included in the *Municipal Act* until 1959, when it was moved to the *Planning Act*. Unlike in NSW, the legislative framework surrounding acquired rights in Ontario does not appear to have changed significantly in recent years. As will be seen

below, where municipalities have attempted to narrow LNCU rights through by-laws, the Courts have ruled these by-laws to be beyond municipal jurisdiction.

3.2 Methodology for the current study

In this study, I have employed the case survey methodology, similar to Edgar (2006a; 2010; 2011; 2013a; 2013b) and McAuslan (1980). Edgar (2013b) recently used this methodology in his study of the precautionary principle in merit appeals at the Land and Environment Court; he read each case in his sample to ascertain how the precautionary principle was applied. According to Edgar (2013b, p. 64), “this methodology enables the researcher to see how the tribunal analyses the evidence and applies rules, policies and principles to make findings and draw conclusions.” In the present case study, I analyzed how the LEC and OMB interpreted and applied acquired rights, and whether they tended to favour protecting the interests of private property owners or restricting acquired rights in the name of the broader public interest as represented by local councils.

In order to locate EURs cases in NSW, I searched through the NSW Caselaw website using the search term “Existing Use Rights.” This produced a list of 378 cases, spanning the years 1998 to 2015. Focusing on cases after 2005 (when legislation in NSW was changed to limit EURs, as discussed above), I further refined my search to cases where EURs were a material and not a tangential issue. In other words, similar to McAuslan’s (1980, p.162) study of the ideology underlying development assessment appeals in the UK, I focused on cases where the court’s consideration of EURs was “sufficiently at the forefront of the decisions that something of the ideology behind them [could] be detected.” Of the 378 cases, the issue of EURs was a material issue since 2005 in 53 cases; all but three of these cases were decided before the LEC. Broadly, these can be grouped into two “types” of EURs cases: the first type involves a judge of the LEC defining the nature of a proponent’s EURs because, as noted above, any changes made to a property with EURs must be only for that use and no other use. Generally, a liberal approach to the characterization of EURs (e.g., “warehouse”) favours the interests of the landowner while a narrow approach (e.g., “warehouse for the storage of alcoholic goods”) restricts what landowners can do with their property. The second type of cases are merit appeals, where (usually) a Commissioner of the LEC determines, on its merits, whether a development application to rebuild, alter, expand, intensify, etc... an existing use should be approved. Generally, characterization cases precede a merit appeal because oftentimes first the use must be characterized before a decision on whether it can be expanded can take place.

In order to locate cases concerning LNCU rights, I searched the CanLII.org database using the search term “Legal Non-Conforming Use.” This produced a list of 139 cases, spanning years from 1961 to 2015, of which 47 dealt with LNCU rights as a material issue. For the sake of comparison with NSW, I limited my analysis to cases decided between 2005 and 2015: 31 cases. Unlike in NSW, many of these cases were not decided by the Ontario Municipal Board; in fact, the OMB was the decision-making forum in only 15 of the 31 cases. The other 16 cases were heard by various levels of courts, including the Ontario Superior Court and Ontario Divisional Court, and involved issues such as an owner being charged with a provincial offence for violating a by-law (and thus using LNCU rights as a defence) or an owner (or objector or Council) challenging the non-issuance (or issuance) of a building permit. In the bulk of these 15 cases heard by the OMB, the case was a merit review of a Committee of Adjustment’s decision about a request for a minor variance involving a LNCU. While I focused on merit appeals at the OMB for the purposes of this study, where a case before a higher Court involved examining the merits of either allowing the continuance or expansion of LNCU rights, I included them in this analysis to get a clearer picture of the overall approach to interpreting and applying LNCU rights in Ontario.

4.0 DISCUSSION OF RESULTS

In examining the cases from both NSW and Ontario, it soon became clear that there are a few “key cases” that greatly influence the approach taken to acquired rights in NSW and Ontario. These cases were often cited by the LEC in NSW and by the OMB and lower courts in Ontario in the cases

examined for this study. In NSW, in 2005, a very important case in the realm of EURs was decided which has been used since that year as a Planning Principle:ⁱⁱ *Fodor Investments v Hornsby Shire Council* [2005] NSWLEC 71. This case set out a “test” to be used by the LEC and development assessment planners in determining future development applications based on EURs. In that case, the Court stressed that even though current planning controls did not apply to properties with EURs, they still must be taken into account in determining how the proposed development will impact adjoining properties and how the bulk and scale of the proposed development would relate to what is permissible on surrounding sites. In effect, then, the Court was acknowledging the importance of **compatibility** with neighbouring properties, if not **conformity**. Importantly, the *Fodor* case was handed down by the LEC at a time when the NSW state changed the *EPAA* to narrow EURs, as noted above. Since 2005, the *Fodor* case has been relied upon by the LEC to justify considering current planning controls when EURs are an issue, even though they could not be used as a basis for refusing an application (even though, in many cases, that is the effect of the decision). For instance, in the case of *Pei Long Wu v Lane Cove Council* [2012] NSWLEC 1218, the applicants were denied permission by the LEC to demolish an existing house and rebuild a four-storey dwelling, even though site benefited from EURs, because it would not be in harmony with the existing and desired future character of the area. In making its determination, the Court referred to the current planning controls as well as future planning controls that were currently in draft form. The *Fodor* case, and cases in which it has been applied (particularly in the urban context, as discussed below), seems to reflect a desire on the part of the Courts (first signaled by the legislature) to bring EURs properties more in line with current planning controls.

The situation is different in Ontario, where the case of *Saint-Romuald (Ville) v. Olivier* provides guidance to lower courts and other decision-makers with respect to interpreting and applying LNCU rights. This case was handed down by the Supreme Court of Canada in 2001 and while the case arose in Quebec, the language of the relevant statute was very similar to section 34(9)(a) of the *Planning Act* and thus it holds great weight in decision-making surrounding LNCU rights in Ontario. While the *Fodor* case has been used to justify the importance of taking into account local planning controls when considering EURs, the *Saint-Romuald* case is often cited to reinforce the importance of protecting LNCU rights in the Ontario cases and not limiting them. In *Saint-Romuald*, Binnie, J. noted at paragraph 12 that the concept of “acquired rights” developed to counter concerns about confiscation without compensation by protecting lawful existing uses: “It is, I think, a sound principle that the Legislature could not have contemplated an interference with vested rights...” The case further stands for the proposition that acquired rights are not frozen in time, in that there is some flexibility in conducting the protected use, which over time can be conducted more intensively (as long as the intensity does not increase so much to become a new use) and can be adapted “to the demands of the market or the technology that are relevant to it...” (para 19).

Saint Romuald was cited in another important, oft-cited case in which the OMB (later affirmed by the Ontario Division Court, which denied City of Ottawa’s leave to appeal) struck out a portion of the City of Ottawa’s zoning by-law regarding non-conforming rights: *TDL Group Corp. v. Ottawa (City)*, 2009 CarswellOnt 7336 (O.M.B.). In this case, the City of Ottawa passed a by-law that attempted to narrow the LNCU rights of property owners by extinguishing LNCU rights where a building was voluntarily damaged or demolished. The OMB interpreted this by-law as reflecting a desire on the part of the City of Ottawa to “encourage” property owners to end non-conformity. In its ruling, the OMB, citing the *Saint Romuald* case, clearly stated that it is beyond the jurisdiction of a municipality to limit or coercively extinguish LNCU rights through its by-laws, beyond what is permitted in the *Planning Act*. The Board stated that landowners have a right “...to continue with a legal non-conforming use. In fact, the Supreme Court of Canada decisions stand for the proposition that such a use may be expanded within the confines of the building, may be intensified as part of the pre-existing activity, and finally, of particular relevance to the case at hand, may see ‘renewal and change’...” (para 10). According to Polowin and Gafni (2010, p.3), this decision continues to represent “a warning to cities across the province that the courts will not tolerate attempts by municipalities to overreach their powers under the *Planning Act* and the law to contravene legal non-conforming rights.” Thus, these two influential decisions in Ontario seem to reflect a clear

intention of the Courts and OMB to protect the LNCU rights of landowners – an intention that is not as strong in NSW. In fact, in 2008, the LEC in NSW in the case of *BYT Nominees Pty Limited v North Sydney Council* [2008] NSWLEC 164 ruled that local councils can eliminate Existing Use Rights through their Local Environmental Plans. In this case, North Sydney Council essentially extinguished the EURs of the applicant when it changed its Local Environmental Plan to make the use to which he was putting his land (previously prohibited, but protected by EURs) permissible. Because the use was now permissible, it no longer enjoyed EURs and the new planning controls were used as a basis for refusing his development application.

In the context of the legislative framework and these “key” cases, there appears to be a greater tendency to favour the rights of private property owners to continue and intensify or expand LNCU rights in Ontario versus in New South Wales, particularly in cases heard by the OMB. For instance, at the OMB, where cases involving LNCU rights typically revolve around whether or not to allow a landowner who enjoys LNCUs to expand or otherwise alter the buildings which enjoy LNCU rights, the decision in most cases (11/15) favours the landowner. In comparable cases before the NSW LEC, the interests of the landowner were favoured (either through a wider characterization of EURs or a favourable merit appeal decision) over Council in only 19/53 cases. Even taking into account all cases in Ontario since 2005 whose material issue has been LNCU rights, there still seems to be a (slight, but certainly greater than NSW) favouring of protecting the private property rights of landowners with LNCU rights (16/31). This is not to say that the OMB does not consider public interest factors in their decision or that all of the cases involved an adversarial contest between the landowner and council, with the landowner emerging victorious. In Ontario, “interested parties” also have the right to appeal the minor variance decisions of Committees of Adjustment. So some of the OMB cases involved neighbours challenging the decision of a Committee of Adjustment to grant a minor variance (see, for instance, *Asgharzadeh v. Ellacot, Clark, Sigouin & Nicholcon* PL091025 02/06/2010 and *Naeyaert v Clifford* PI081313 20/08/2009). But even in those cases, where the “interested party” used public interest arguments, the OMB tended to put the interests of the landowner with the LNCU rights at the forefront, often citing the *Saint Romuald* and/or *TDL Group Corp* case to emphasize the importance of protecting LNCU rights.

So are private property rights more protected by Courts and tribunals in Ontario than in NSW? Based solely on the number of cases which favour landowners versus local government, it would appear that in NSW, Courts are more favourable towards deferring to the interest of local government. However, when one begins to delve beneath the numbers, one finds a different picture – a picture which reveals that even though the LEC might favour limiting EURs, it has not foregone its focus on protecting private property rights, after all. When one looks at the EURs cases from NSW as a whole, it is clear that the largest “category” of cases involves the LEC rejecting an application which would increase residential density. In NSW, 50% of EURs cases since 2005 (34 cases) involve a landowner wanting to somehow increase density (usually by rebuilding a Residential Flat Building with more units in it) in an urban environment – an endeavour which is often vehemently opposed by neighbours (see, for instance, Thistleton, 2014). Moreover, most of these 34 cases arose in metropolitan Sydney, most commonly in the inner-city suburbs that, according to RP Data (as set out by Kusher, 2014), encompass councils with some of the highest median house prices in New South Wales and in fact, Australia. Indeed, for cases in Metropolitan Sydney involving an application to increase residential density, 5 cases favoured the property owner and 20 cases favoured the decision of the council to reject the development. For example, in *Jojeni Investments Pty Ltd v Mosman Municipal Council* [2014] NSWLEC 120, a property owner applied to demolish an existing dwelling with two flats and build a RFB with three flats in a low-density residential zone. The case centred around the characterization of the existing use (“duplex” versus “RFB”) and the Court decided that the proponent could only rebuild two flats. Outside of Metro Sydney, the situation appears to be different, with a relatively even split between decisions favouring council (4) versus landowners (4) where increasing residential density is concerned. In comparison, in Ontario, LNCU rights cases involve many different types of uses, from pig farms and jetboat docks to trailer parks and quarries and most of these cases arose in rural environments, as opposed to high-growth, political charged inner-city environments. For whatever reason, only two

out of the 31 LNCU cases in Ontario involved increasing residential density in an urban environment. This is not to imply that the impact of development in rural environments is somehow less important, but in Sydney at least, where increased density is proposed in established urban neighbourhoods, the Court is faced with not just balancing the private property rights of the landowner against the public interest (that is, broader social, environmental and economic concerns), but also against the private property interests of multiple surrounding properties. And this has resulted in the Court, more often than not, limiting EURs.

Indeed, when one looks more closely at the cases in which the LEC has sided with Council and rejected a development application, in almost every case, the application is rejected not based on wider public interest concerns (e.g. wider social, environmental or economic concerns), but in order to protect the private property rights (e.g. amenities such as views, sun access, privacy, etc...) of landowners in the immediate vicinity. Even when neighbours are not present to raise amenity concerns, the potential impact on their amenity was a primary concern of the Court. For instance, in the case of *Bonim Stanmore v Marrickville Council* [2004] NSWLEC 671, the proponent submitted a DA to demolish an existing club building and rebuild residential townhouses. The proposal was supported by Council planners, but ultimately rejected by Council. Despite both the proponent's experts and the Court-appointed expert supporting the application, the Court decided that the impact of the townhouses on the surrounding residents would be "unacceptable." So, while the Court decided against the landowner, private property rights were still the main concern – *but the private property rights of neighbours, not the landowner seeking to exercise his EURs*. The Court appears to be somewhat more sympathetic to the EURs of private property owners in rural areas or in the commercial realm, where the impact on adjoining private residential properties does not appear to be as much of a concern. For instance, in the case of *Sgro v Greater Taree Council* [2014] NSWLEC 1113, the proponent applied to demolish a caravan park, service station and caravan sales centre with EURs in order to build a "Service Centre," including a Shell and Hungry Jack's, which would amount to a total of over 700m² additional floorspace. The Council argued that a Service Centre is a very different use than what already existed and raised concerns about the impact of the Service Centre on the local village. However, in its decision, the Court seemed to ignore these concerns, finding that in fact, the proponent would be re-building an existing use and it on its merits, the application should be approved.

As such, in both Ontario and NSW, private property rights continue to be a main concern of the courts – in Ontario, the focus is on preserving the LNCU rights of landowners, while in NSW, the focus is on preserving the amenity of neighbouring properties, particularly in high-growth urban environments. So while McAuslan (1980, p.152) concluded in his study that "...the evidence does show that there is an increasing willingness to move from physical amenity considerations towards more economic and social considerations as being considerations which it is proper to take into account in determining a planning application," this research seems to confirm Edgar's (1999) finding that the tendency in the judicial realm is to favour protecting private property rights. In Ontario, where LNCU rights are at issue, the majority of decisions are favourable towards the landowner/applicant. In NSW, EURs are limited in the name of protecting the private property rights of neighbours.

5.0 CONCLUSIONS

Given the impact of court decisions on the planning process and on planning policy, it is important that planning scholars begin to examine how decisions are being made in the legal arena and, in particular, whether that arena favours one particular outcome over another. The literature has identified a tendency on the part of the courts and other appeal bodies to favour the interests of private property owners over more "public interest" concerns such as environmental protection, economic development or social equity. In the area of Existing Use Rights in New South Wales and Legal Non Conforming Use Rights in Ontario, that assertion seems to hold true. In Ontario, decisions of the Ontario Municipal Board about "minor variances" to Legal Non-Conforming Use rights heavily favour private property owners and LNCU rights are vehemently protected by upper-level Courts. While the Land and Environment Court is, at least in the majority of the sample cases,

ruling in favour of Council, it is not usually doing so for broader public interest reasons. Essentially, protection of the private property rights of neighbours seems to have supplanted protection of the private property rights of EURs-holders to rebuild or expand their properties. But the focus is still private property rights, not broader public interest concerns. The NSW case in particular suggests that the Courts tend to be protective of the status quo, particularly in established residential areas; however, in a fast-growing city like Sydney where the need for infill in those established residential areas has been recognized by the State government in successive metropolitan plans, the Court's tendency to protect the amenity of private property owners in these neighbourhoods is problematic. The fact that the need for infill housing in Sydney was not raised any of the sample cases dealing with residential intensification suggests that the focus of the Court is on private property impacts at the neighbourhood level, not on wider metropolitan issues. This has broader implications for the implementation of metropolitan-wide strategies going forward.

R F R N C S

Adshead, J 2014, 'Revisiting the ideologies of planning law', *International Journal of Law in the Built Environment*, vol. 6, no.1/2, pp. 174 – 193.

Booth, P 2002, 'From property rights to public control: The quest for public interest in the control of urban development', *Town Planning Review*, vol.73, no.2, pp. 153-170.

Booth, P 2007, 'The control of discretion and the common law tradition', *Planning theory*, vol.6, no.2, pp.127-145.

Cummins, C 2006, April 8, 'Developers lose valuable land rights', *Sydney Morning Herald*. Available at www.smh.com.au/news/business/developers-lose-valuable-land-rights

Edgar, A 1999, 'The more things change the more they stay the same', *Local Government Law Journal*, vol.5, pp.42-54.

Edgar, A 2006a, 'Dispensing with Development Standards by the Land and Environment Court', 12 LGLJ pp.112-128.

Edgar, A 2010, 'Participation and responsiveness in merits review of polycentric decisions: A comparison of development assessment appeals', 27 EPLJ, pp.36-52.

Edgar, A 2011, 'Decision-makers, Expert Witnesses and Advocates: The Roles of Planners in Merits Appeals', *Urban Policy and Research*, vol.29, no.3, pp.293-307.

Edgar, A 2013a, 'Between rules and discretion: Legislative principles and the "relevant considerations" ground of review', 20 AJ Admin L, pp.132-148.

Edgar, A 2013b, 'Institutions and sustainability: Merits review tribunals and the precautionary principle', *The Australasian Journal of Natural Resources Law and Policy*, vol.16, no.1, pp.61-81.

Edgeworth, B 2008, 'Planning law v property law: Overriding statutes and the Torrens system after Hillpalm v Heaven's Door and Kogarah v Golden Paradise', 25 EPLJ, pp.82-97.

England, P 2014, 'The legal basis for Australian environmental planning and governance', In Jason Byrne, Neil Sipe and Jago Dodson, eds. *Australian Environmental Planning: Challenges and Future Prospects*. (pp.39-48). London: Routledge.

Hewitt, J & Gerathy, K 2011, February 8, 'What use existing use rights? Revisiting Iris Diversified Property Pty Limited v Randwick City Council [2010] NSWLEC 58', *News alert*. Available at www.hwlebsorth.com.au

Krushelnicki, B 2003, *A practical guide to the Ontario Municipal Board*, Markham, LexisNexis Canada Inc.

Kusher, C 2014, August 21, 'Australia's top 25 most expensive suburbs: RP Data', *Property Observer*. Available at: <http://www.propertyobserver.com.au/finding/residential-investment/34746-australia-s-top-25-most-expensive-suburbs-rp-data.html>

McAuslan, P 1980, *The ideologies of planning law*, Oxford, Pergamon Press.

McAuslan, P 2003, *Bringing the law back in: Essays in land, law, and development*, Aldershot, Ashgate.

Mualam, N 2014, 'Where Planning Meets the Law: The Rise of Appeal Tribunals for Deciding Land-use Disputes', *Journal of Planning Literature*, vol.29, pp.1-16.

NSW Department of Planning 2006, March 31, *Changes to existing use rights. Planning Circular*. Available at www.planning.nsw.gov.au

NSW Planning and Environment 2014, *A Plan for Growing Sydney*. Available at: <http://www.strategy.planning.nsw.gov.au/sydney/the-plan/>

Pearson, L & Williams, P 2009, 'The New South Wales planning reforms: Undermining external merits review of land-use decision-making?', 26 EPLJ, pp.19-34.

Polowin, M & Gani, E 2010, 'The evolution of legal non-conforming rights', 4 D.M.P.L. (2d), Issue 13, pp.1-4.

Ryan, P 2002, 'Court of hope and false expectations: Land and Environment Court 21 years on', *Journal of Environmental Law*, vol.14, no.3, pp.301-315.

Sperling, K 1997, 'Going down the takings path: Private property rights and public interest in land use decision-making', *Environmental and Planning Law Journal*, December, pp.427-436.

Stein, P 2002, 'Specialist environmental courts: the Land and Environment Court of New South Wales, Australia', 4 *Envtl. L. Rev.* 5 2002, pp.5-25.

Stewart, A 1999, 'Effects of the Land and Environment Court', *Environmental and Planning Law Journal*, vol.16, no.6, pp.482-496.

Thistleton, R 2014 March 22, 'Nimbys obstruct high-density planning' *Financial Review*. Available at: <http://www.afr.com/real-estate/nimbys-obstruct-highdensity-planning-20140321-ixbwh>

Whitehouse, J 2012, *Development and Planning Law in New South Wales*, Sydney, CCH Australia LTD.

Willey, S 2000, 'Planning appeals: The impacts of conflicting planning philosophies between judicial and executive planning bodies - a rural planning case study', *Urban Policy and Research*, vol.18, no.3, pp.329-354.

Willey, S 2004, 'The merits of merit-based planning appeals: observations from Australia', *International Planning Studies*, vol.9, no.4, pp.261-281.

Willey, S 2007, 'Planning appeal processes: reflections on a comparative study', *Environment and Planning A*, vol.39, pp.1676-1698.

Wood, D & Myers, J 2006, 'The Planning Act: What's new, what remains, what you should know – Legal Non-Conforming Uses under the Planning Act'. Available at: www.woodbull.ca

ⁱ For instance, as set out in Cummin (2006), up until the changes in 2006, a developer could purchase an industrial site with existing use rights in a low-density residential area with a plan to convert it to another prohibited use such as a shopping centre or apartment building. According to Cummin (2006), "this gave the owner of a site with existing use rights a great commercial advantage." Indeed, developers purchased sites specifically because they held EURs.

ⁱⁱ Planning Principles are cases decided by the Land and Environment Court in which the Court sets out “principles” which may be applied by both the Court and Councils in future cases with similar circumstances to promote consistency in decision-making. They are not legally-binding on either the Court or Council, but they are set out by the Court as providing guidance to decision-makers.

The future of urban living - New forms of work, planning for the unknown in Amsterdam

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Abstract

While economic growth has not (yet) regained its pre-crisis size and austerity measures are strong and stringent, housing markets in consumption cities such as Amsterdam are booming again. The need to build large numbers of homes is great and hard to resist. Amsterdam is popular and grows with an average of 11.000 inhabitants each year. The council would like to relieve the pressure on the housing market and thus guides and enables the construction of 50.000 houses within the city borders up until 2025. However, the focus on housing quantities and quick hand-over of the new housing stock needs to be complemented with other activities, aims, and values. High-density housing is not the only thing we need in the cities of the future. Besides a home, what kind of urban living will the citizens of the future be looking for? And how will the evolution of work influence the contemporary city and its metropolitan region?

The Future of Urban Living is a research-by-design project with a focus on Amsterdam's Metropolitan Region. Currently in the preparatory phase, the article will give an insight into the issues that are currently being considered by the project team of the Spontaneous City International. Furthermore, this paper will elaborate on the principles underlying the research and the methodology to be used, providing an introduction to the use of scenario's in spatial planning, with references to publications of leading institutes on the subject.

1. Introduction: Researching 'The future of urban living'

Do we know how we will live in the city in the future? Is there insight into the changing relationship between dwelling - working - and spare time? And what does this potential transition mean for the organization of areas, investment in buildings and the nature of the planning process? In urban planning, there are signs of awareness we should not be building houses and develop urban areas that only address short-term needs and promptly become obsolete and dysfunctional. A focus on housing, quantity and speed is insufficient. Urban areas need to be sustainable, resilient and attractive, creating value for the city in the long term.

Urban life is continually subject to change and develops at an increasing pace, as a result of technological innovation, social developments and insights, as well as through all sorts of coincidences. This applies to both major cities in the Netherlands as well as centres in other European countries and beyond. The great themes of today, such as migration, climate change, changing perceptions of economy, digital technology and robotics have had and will continue to have a profound effect on daily life, politics and urban planning. Professor Klaus Schwab, founder and executive chairman of the World Economic Forum, announce the dawn of a new (technological) Fourth Industrial Revolution (Schwab, K., 2016) - the first three being the transport and mechanical production revolution of the late 18th century; the mass production revolution of the late 19th century; and the computer revolution of the 1960s. Dutch Professor Jan Rotmans (Erasmus University in Rotterdam the Netherlands, focusing on sustainable transitions and system innovations) states on his website 'We do not live in an era of change, but a change of era', a view he elaborates on in the book 'Change of era - Netherlands tilts' (Rotman, J., 2014).

'The future of urban living' is a research-by-design project, which is currently in the preparatory phase. While writing this article in June 2016, a scoping document has already been distributed. This document is a short, well-designed note which gives an overview of the first ideas about the project. It proposes the themes and goals of the study, the use of scenarios and research methods. The scoping document is used as a starting point to initiate an open dialogue with stakeholders: Preliminary discussions on collaborations between different governmental and research partners have been held, including the municipality of Amsterdam, The Netherlands Environmental Assessment Agency, the Amsterdam School of Real Estate,

the RUAF foundation and the research initiator: The Spontaneous City International. This article is based on the scoping document prepared by the research team.

In the context of this research, what we define as 'urban living' goes beyond dwelling and providing housing. It includes all forms of activity, ranging from work to leisure, and hence education, health, and everything else that contributes to creating a society in a city and its region.

The aim of this study is to gain a better understanding of the spatial principles, frameworks and development strategies which in the future will contribute to shaping the living environment in the city. The focus will be on the way we will work in the future, with work as a basic human activity, raising questions such as;

- What does this mean for the daily life of the users in their city? Does the daily rhythm change, how will people spend their time in the future, and what impact does this have on mobility and other spatial patterns?
- What are the implications for the organization of space and use, in buildings, areas, cities and regions?
- What does this mean for investing parties and the role of the government?
- What are potential consequences for planning strategies and tools? What type and degree of management will planning processes require? What is uncontrolled, what should be facilitated, what should be monitored? What effect will this have on the process that underlies spatial planning?

To gain insight into this subject, 'research by design' is used, exploring how the transformation of (mono-functional) business parks and areas of work into attractive living environments can be accomplished, with flexible mixed-use development which can absorb the transition to new work. Subsequently the outcomes are applied to test cases in the Amsterdam Metropolitan Area.

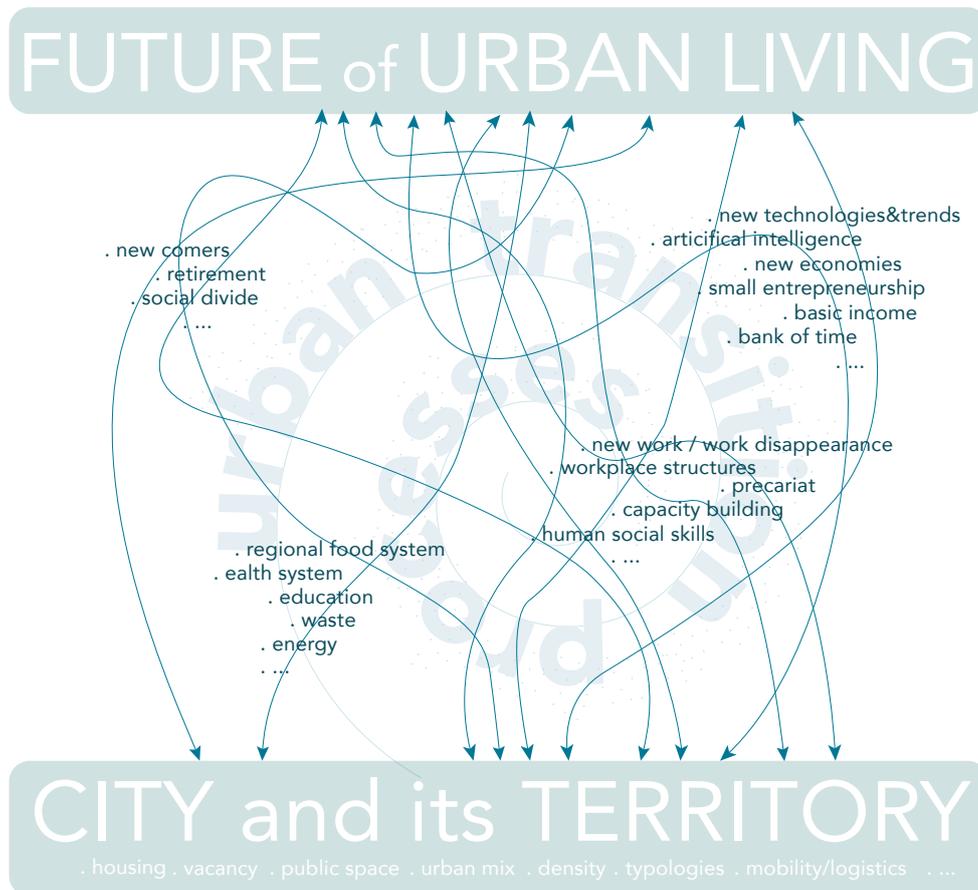


image 1 - Themes which are part of the urban transition processes and could influence both the future of urban living as well as the city and its territory. Source: the Spontaneous City International (2016) p.4

2. Development in the Amsterdam Metropolitan Area - vision for 2025

In the Metropolitan Area of Amsterdam, a huge acceleration is set in motion, expressed in the ambition to build approximately 50,000 new homes within the city limits until 2025 (Gemeente Amsterdam, 2016). One important keyword is flexibility, i.e. the degree to which the development strategy provides for change and accommodates adaptability. The other keyword is high quality of life, where high density dwelling is combined with developments such as new forms of work, changes in care, the pursuit of circular processes etc. The strategy is created to ensure that development leads to attractive and sustainable urban areas, that complement the characteristics of their specific environments.

After consultation with the City of Amsterdam, in response to the policy document, it was stated that they recognize the issues outlined by the research team in the proposal 'the future of urban living', and are mainly interested in the transformation of mono-functional areas to mixed urban environments. The focus is currently on high density combined with a high pace. But how do you deal with the dilemma of large numbers on the one hand and the many uncertainties on the other?

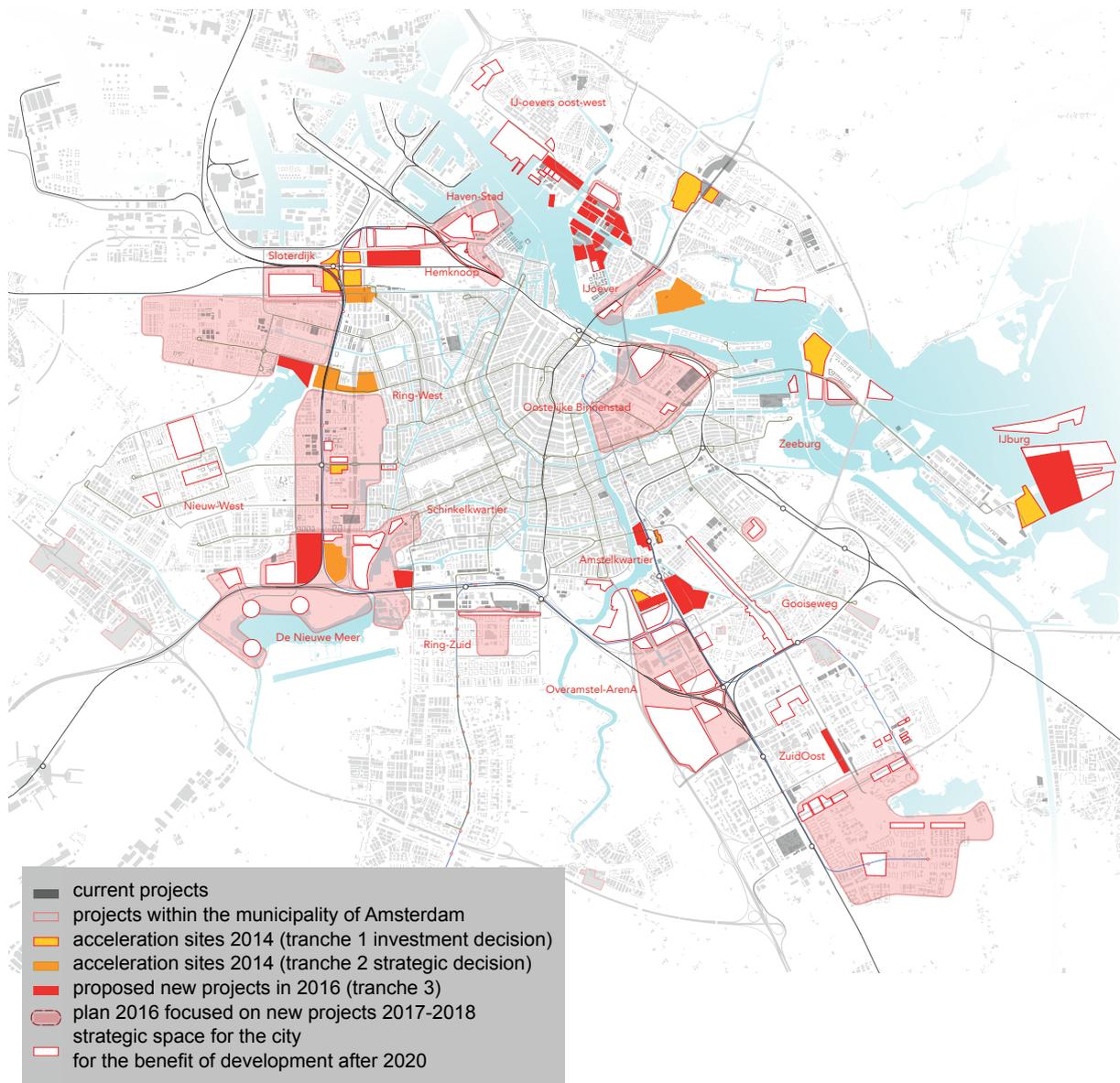


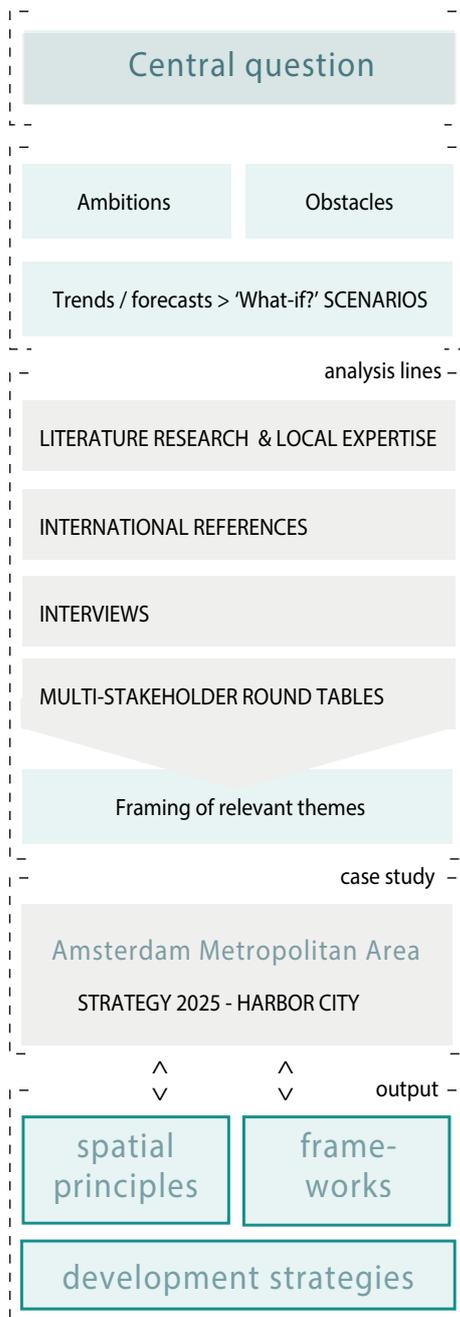
image 2 - map 'Space for the city' showing potential housing locations in and around Amsterdam, published in 'Koers 2025' source: Gemeente Amsterdam (2016) p.57

3. Central question

How can existing (mono-functional) areas and business parks be transformed into flexible and attractive mixed urban areas, which can absorb the transition to new work? In other words: At present, which urban / morphological / functional principles, and what institutional preconditions / frameworks and strategies can be used, to in the future create an interesting mixed urban environment?

4. Methodology

The methodology for the research 'the Future of Urban Living' includes the elements represented in the scheme below.



5. Collective formulation of ambitions and obstacles

It is important that all stakeholders in an area actively participate, by formulating ambitions and obstacles, to be able to understand what their specific goals and dilemmas are.

Recent years have shown that the municipality, and other authorities such as the province, do not have the only say when it comes to a vision for the development of the city. Instead of slipping back into pre-crisis business-as-usual practises, we should harvest the innovations that were generated during the economic crisis: Current and future residents, entrepreneurs and investors have conquered their place on the stage.

Ambitions are the main objectives, collectively formulated by all stakeholders involved in the transformation of the area. This may include one or several main ambitions, and their content should indicate the scope and direction for the longer term.

Obstacle are the blockages that impede the realization of the ambitions, such an outdated planning tools, too much control by government, the quality of accessibility, environmental pollution etc.

These stakeholders also have specific interests in the transition and development of the city and its metropolitan region and face specific dilemmas:

1) Developers and investors: In terms of real estate, in what type of qualities should be invested to create a sustainable long-term investment? The Urban Land Institute (ULI) in the Netherlands carefully keeps track of the emerging trends in high density developments, urban living and attractive environments and

image 3 - scheme representing the research methodology
Source: the Spontaneous City International (2016) p.7

- what these means for investment.
- II) Housing Corporations: The current focus is on the core stock and high density. What is needed, to ensure that the property development becomes part of building an attractive urban area?
 - III) New types of investors: Many new investors are emerging, all eager to join; ranging from individual clients, and small groups of clients to various forms of cooperatives and collectives of clients (in the Netherlands known as CPO's, collective private developments). They want space to develop their own initiative. A great current example is Living LAB Buiksloterham in Amsterdam North (Circulair Buiksloterham, 2016), who is experimenting with circular principles.
 - IV) Citizens: What is needed to make a city in which an entrepreneurial spirit can be combined with urban citizenship? In this year's Internationale Architecture Biennale in Rotterdam, new forms of civic economy are being explored (IABR, 2016).



Image 4 - Fixed spatial and institutional frameworks, enabling flexible and bespoke infill is nothing new in the city of Amsterdam. In the 17th century, city expansion to the west of the center was organised in this way. The painting by Gerrit Adriaensz. Berckheyde (1671-1672) of 'the curve of the Herengracht' shows this development in progress. Soucre: Abrahamse, J.E. (2011) cover image.

6. What-if..?: Scenario's

What will be the impact of technological change, social trends, and major issues such as migration, climate change, and a new industrial revolution? It is obvious that we cannot know what the future will bring. At this moment we only have (weak) 'signals' of what the future might hold. Scenario's, instead of more common, short-term trend analysis and forecast of the latest developments, can help us to think and anticipate the unknown. They can be employed as a tool to explore this possible impact, and used by policy makers to better deal with complexity and uncertainty in decision making, improving strategic policymaking and its outcomes (Dammers et al. 2013).

Scenarios are characterised as follows (Dammers, 2013):

- Stories about the future
- Regarding a strategic policy-issue
- For the long-term: 10 to 40 years
- In words, images and numbers
- In plural: alternative directions
- Combining imagination with realism

Although some researchers claim that there are scarce examples of the application of scenario planning techniques in the field of urban planning (Stojanović, M, ea. 2013), it is a frequently used a well documented (albeit in Dutch) method in the Netherlands, on different governmental levels. A large player in this field is the Netherlands Environmental Assessment Agency (PBL - Planbureau voor the Leefomgeving). They have eloquently described the use of the scenario method in 'Making scenarios for environment, nature and space: a guideline' (Dammers, E., ea. 2013). An international publication in English is created by the European Environment Agency (EEA, Alcamo, J., 2001). However, there is not one correct way to use scenarios 'the way in which scenarios are created, is dependent on the goals the scenarios serve, the types of scenarios that are made, the resources that are available, etcetera. There is no single best way to do it' (Dammers, E., ea. 2013, p.8).

6.1 About scenarios, and the use of qualitative, exploratory, normative scenarios in this study

Scenarios make statements, based on knowledge and information about the past, about the different directions in which a combination of developments could occur in the future. This may be a future which is deemed possible, but could also consider futures that are desirable, or a combination of both. In addition, scenarios could focus on social and physical developments that occur more or less autonomous, but also on policy developments that are largely controlled by policymakers themselves. For the purpose of this study, the emphasis is more on expectations, wishes and creative ideas; It will consider possible or desirable futures and autonomous or policy developments.

Two types of scenarios can be distinguished: qualitative and quantitative (EEA, 2001). In this study qualitative scenarios will be used. The future will be depicted or described in the form of words and visual symbols: mainly narrative texts (story lines), representations of the future (maps, artist impressions, photomontages) or a combination of the two.

Then the degree of exploration: ranging from dominant scenarios, via restricted exploratory scenarios, to highly exploratory scenarios. This study will be using highly exploratory scenarios: current developments will be taken to the extreme, new developments will be detected and developed, and radically different directions in which developments can proceed will be explored. This approach will clarify the limits of developments, and encourage out-of-the-box thinking, as well as expand the understanding of emerging issues and policy alternatives, facilitate open discussion about the future and contribute to vision development.

Finally, descriptive and normative scenarios can be distinguished. We will be looking at normative scenarios, that are focused on exploring normative uncertainty, for example several policy goals that could be pursued, as well as changing values and norms in society.

6.2 Extreme 'What-if?- scenario's: Starting point for the scenario's in this research

Uncertainties about the future on a national level are central in a study called the 'horizon scan' published by PBL in 2013. In this research, PBL acknowledges that in scenario studies uncertainties often 'lose out'. 'But some of these uncertainties occur later as the dominant uncertainty in new scenario studies' (p.61). Therefore, PBL has included four 'what-if' scenarios in their publication that, to date, have not yet been published. These are trend breaches or discontinuities in developments of which it is conceivable that they happen. However, these 'What-if's' are more surprising and extreme than the uncertainties on which consensus has more or less been established.

The research team is interested in these scenarios, as we consider those requirements that could develop in the long term, but at this moment are still considered to be unlikely, of particular relevance for this research. The four extreme scenarios presented are (PBL, 2013, p.61):

1. What if our life expectancy increases to 120 years in 2050?
2. What if efficient cities are controlled by big data?
3. What if a breakthrough in the storage of electricity is achieved?
4. What if weather and climate extremes greatly increase over the next 20 years?

6.3 Investigating future changes in work in the form of scenario's

During the preparatory phase of the study, we will be looking at the potential and relevance of extreme scenarios that focus on the question 'What if, in a few decades, we are no longer able or willing to work in the traditional way?' In their research PBL suggests that technological innovations will significantly change the world, but 'how is difficult to predict over such a long period. In the field of digital media, biotechnology, nanotechnology and robotics anticipated innovations seem to be most radical' (PBL, 2013, p.23-24). The research team wonders:

- What if robotics replaces many more jobs in certain parts of the labour market? What will be the impact of robotics and the automation of for example, office work? What impact does this have on the size and location of businesses?
- What if the labour market becomes even more flexible? What impact does this have on the workplace and the use of space per worker? Will this lead to (further) office vacancy?
- When new media further enters the work environment, will the workplace change accordingly?
- What if workplace activities are (even) less tied to location, timing and duration? Organizations with a network character may operate in a way that is less bound to a single location. That can transform living and commuter behaviour; more freedom in the choice of location of residence, and changing commuting patterns (the end of congestion?). What will be decisive in the choice of a dwelling; attractiveness of the living environment, the quality of the facilities, or ..?
- What if the lines between leisure and work, work and home, public and private, blur even further?

Let us assume that these changes in our daily lives and our activities, become reality - what would that mean for the design of our cities? These types of relatively extreme 'What-if' scenarios serve to stretch the mind: It does not mean we must literally 'plan' for such activities, but we must ensure that such developments are not made impossible when they actually occur, by the way we plan our cities. Urban areas should be developed in such a way that they are sufficiently flexible and accommodate the unknown.

6.4 Methods to develop scenarios

As a first step, the research team will prepare outline scenario's. These will serve as a starting point for roundtable discussions, testing the limits. During these discussions, the experts will reflect together on the presented scenario's. Potentially, use can be made of infographics to depict the scenarios and stimulate the discussion. Then, the direction and number of scenarios will be established, after which they will be elaborated in three ways:

- I) Storylines; written based on literature review, with different source such as previous scenario studies, recent studies, policy advice, newspaper articles, etc. In addition, the team will rely on their own expertise and logical reasoning.
- II) Stakeholder Participation; by actively involving various experts and groups in the development of the scenarios. A panel has already been formed, which will continue to evolve, and which will be called upon several times during the project. These people are both representative of the various governments, as well as creative outsiders.
- III) Design; visualized in maps, location plans, photo montages, etc. The analysis that will be carried out (research by design) will provide important insights, for example on the future geographical or spatial patterns

The research team has chosen these three types, as they do not only best suit our goals, it is also where our expertise lays. This means we will not be undertaking any data analysis. This is something the city of Amsterdam does quite frequently themselves, usually focusing on a particular project and strongly related to feasibility (either programmatic or financial-economic, or both).

7. Analysis

7.1 Four Analysis Lines

The format for the process encompasses the following research techniques:

- I) Literature Research
Sources such as primary publications including journal articles, dissertations and reports, websites and grey literature.
- II) International references from within the European Union
The already extensive network of the research team, which covers several European countries, will provide the basis for a pool of experts in the field of spatial development, which may suggest different trends, concepts and projects in their local area. The purpose of this part of the research is the collection and comparison of recent best practices in European cities experiencing similar pressures. This will contribute to the distilling of key principles and can serve as input for the development of the what-if scenario's.
- III) Interviews and the input of local knowledge
Mapping of stakeholders and individual in-depth interviews with various stakeholders (both public and private parties as well as knowledge institutes) and know-how of studies of various government agencies and other relevant institutions (such as the department of Space and Sustainability of the City of Amsterdam).
- IV) Multi-stakeholder round table discussions
A round table is a way to collect additional information, and make an inventory of expectations, experiences, issues, solutions and opinions. The different outline scenarios will be used as a starting point, focusing the discussion. The roundtable participants participate on the basis of their experience, as experts in the various research topics. By bringing them together, the participants can encourage each other (contrary to the in-depth interviews, which will provide other outcomes).

During the initial phase of this study, a preliminary meeting was already held with a variety of experts in different fields, ranging from architecture, the transformation of existing buildings and areas, and city and place making, to urban agriculture. The municipality and province were also part of this meeting.

7.2 Framing of relevant themes

The information gathered using the different research methods described in the four analysis lines will be framed into distinctive themes, which will then be filtered into the output.

8. Case in Amsterdam Metropolitan Area

An area in Amsterdam has been selected to serve as a tangible local case study. The City of Amsterdam has proposed an area West of the city centre, called 'Port-City area', reaching from the area surrounding the train station Amsterdam-Sloterdijk to the waterfront at the 'Houthavens'.

The area is large: it covers a similar amount of space as the historical city centre of Amsterdam, and to walk from east to west will take about 45 minutes, covering 3,5 kilometres.

The municipality proposes this zone, as it has been reviewed as 1 of the four areas within the city exploring the spatial possibilities for area development, as part of the strategy 'Koers 2025'.

Currently the area has the following characteristics:

- Functioning, growing port, near the city centre
- Relatively mono-functional work area, comprising several sub-functions: station area, business park, urban work area, port and industrial area.
- Key sectors: manufacturing, trade and transport
- The area is fragmented by major infrastructure: highway, rail, large green spaces
- Crucial to the transformation into an attractive, mixed urban area is the reduction of environmental nuisance and overcoming barriers.



image 5 - aerial image of the Port-City area, west of the city centre of Amsterdam
Source: Google Earth (2016)

- Relatively unknown to current residents of Amsterdam
- Variety of spatial characteristics related to: building typologies (height, volume and footprint of buildings); size of plots, density and mix; availability of amenities, facilities and public/green space, etc.

In 'Koers 2025' the analysis of housing stock shows that currently, 700 units are being built in the Port-City area, with a possible acceleration to an additional 3600 units, which could help the city of Amsterdam to reach the target of adding 45.000 units to the housing stock before 2025. This means the area will be providing nearly 10% till 2025, with the potential to accommodate an additional 6700 units (Gemeente Amsterdam, 2016, p.44). The policy document states that 'Central task in the Port-City area is the gradual transformation of a mono-functional work area around the Sloterdijk node to a mixed urban living - working environment taking into consideration the incumbent business' (Gemeente Amsterdam, 2016, p.41). A gradual transformation entails a step-by-step approach: 'Looking at the size, diversity and quality of



Image 6 - Aerial photograph of a part of the Port-City Area, looking North-West. In the center Amsterdam-Sloterdijk train station surrounded by offices, with in the back Westpoort harbour area.
Source: General aerial photography (2014)



Image 7 - Streetview of the Isolatorweg in the Port-City Area, looking South. Business park with single and two story units.
Source: Google Streetview (2014)

the Port-City area a fixed scenario has not been chosen, (...) rather a gradual transformation process has been decided upon'. The final decision on the development of the area will be taken in 2025. However, the municipality recognizes that there is currently need for action: "To initiate the gradual transformation, to ensure quality and to gain public support, it is necessary to take a number of first steps in the coming years in both planning as well as execution' (City of Amsterdam, 2013 p.7). The research 'The future of urban living - New forms of work, planning for the unknown' will contribute to this.

9. Research output and products

The results of the study will be translated into three types of outcome:

- a) Spatial and functional principles:
Urban, morphological and functional principles, linked to different typologies for buildings and public spaces (relating to density, mixed use, flexibility, and adaptability for many different types of initiatives).
- b) Frameworks and public values: Both public as well as institutional preconditions and frameworks. What are the conditions to make projects feasible? These frameworks can be spatial (landscape, street patterns, circular principles) as well as more conceptual (heritage, community, resilience etc.)
- c) Development Strategies. Which strategies are suitable to achieve development in the desired form? These three outcomes are more than site-specific. They will generate general outcomes that can be applied to a range of locations in various cities to prepare them for future changes.

These outcomes will be shared in three ways:

- I) The principles, frameworks and development strategies will be summarized in the form of a book.
- II) One or more events held in 'Pakhuis de Zwijger' - an independent platform for creation and innovation in the city, with daily inspirational programs on creative industry, the city and global trends (de Zwijger, 2016).
- III) A website / user-fed platform for various stakeholders to actively participate in the process, sharing articles, essays, official documents, photos, video interviews, videos, etc.

We intent to start the second and third products during the research process, so that they can actively contribute to the content of the research, and enrich the dialogue.

10. Conclusion: working towards a paradigm shift

The long term goal of this research is to generate new insights for urban planning, spatial design, policy makers and politicians, such as:

- The evolution of land use and associated business models, replacing the traditional master planning approach by strategic planning with flexibility, diversity of production activities and a mix of functions as core principles.
- New models for policy makers to facilitate a better interaction in the relations between the city and the surrounding area, creating advantages in the use of space and the changing dynamics of living and working.
- Develop planning techniques that are currently used limited, by putting them into practise, and by doing so creating an additional base for the implementation of these methods, such as a multi-stakeholder approach and extreme scenarios, more specifically a design approach to generate scenarios (in the scenario studies of PBL thus far the design approach has been rarely used - PBL 2013, p.8)
- A guideline for adjustments of policy frameworks to facilitate new flows, nodes and networks.

Eventually, a paradigm shift with a real impact on the way both citizens as well as professionals in the spatial field shape the cities we live in, will contribute to the creation of a resilient future for the city.

- Alcamo, J., (2001) Scenarios as tools for international environmental assessments. European Environment Agency, Copenhagen, 31 pages
- Circulair Buiksloterham (2016) project Living Lab en Manifest [online]
Available at: <http://buiksloterham.nl/get/9986/1301/living-lab-en-manifest--samen-optrekken> [Accessed 17 06 2016]
- Dammers, E., S. van 't Klooster, B. de Wit, H. Hilderink, A. Petersen & W. Tuinstra (2013) Scenario's maken voor milieu, natuur en ruimte: een handreiking. PBL, Den Haag, 110 pages.
- Gemeente Amsterdam (2016) Koers 2025 Ruimte voor de stad [online]
Available at: <https://www.amsterdam.nl/gemeente/volg-beleid/koers-2025-amsterdam/> [Accessed 17 06 2016]
- Gemeente Amsterdam (2016) Koers 2025 Ruimtelijke Ontwikkelstrategie Amsterdam 2016-2025 - Samenvatting [online]
Available at: <https://www.amsterdam.nl/gemeente/volg-beleid/koers-2025-amsterdam/> [Accessed 17 06 2016]
- Gemeente Amsterdam, Dienst Ruimtelijke Ordening, Haven Amsterdam (2013) Transformatiestrategie Haven-Stad 'Sterke Stad – Slimme Haven' [online] Available at: <https://www.amsterdam.nl/gemeente/organisatie/ruimte-economie/ruimte-duurzaamheid/ruimte-duurzaamheid/publicaties-ruimte/haven-stad/> [Accessed 17 06 2016]
- IABR (2016) [online] IABR 2016, the next economy. Available at: <http://iabr.nl/nl/editie/iabr2016> [Accessed 17 06 2016]
- PBL in samenwerking met CPB (2013), Welvaart en Leefomgeving. Horizonscan, Den Haag: PBL. 90 pages
- Schwab, K. (2016), *The Fourth Industrial Revolution*. World Economic Forum, 199 pages
- Stojanović, M., Mitković, P., Mitković, M. (2014) The scenario method in urban planning. Facta Universitatis. Series: Architecture and Civil Engineering Vol. 12, No 1, 2014, pp. 81 - 95.
- Rotmans, J. (2014) Verandering van tijdperk - Nederland kantelt. 208 pages
- Zwijger, de (2016) About us [online] <https://dezwijger.nl/over-ons/about-us/> [Accessed 17 06 2016]

References for images:

- 1) the Spontaneous City International (2016) Concept voorstel 'the Future of urban living' unpublished
- 2) Gemeente Amsterdam (2016) Koers 2025 Ruimte voor de stad [online]
Available at: <https://www.amsterdam.nl/gemeente/volg-beleid/koers-2025-amsterdam/> [Accessed 17 06 2016]
- 3) the Spontaneous City International (2016) Concept voorstel 'the Future of urban living' unpublished
- 4) Abrahamse, J.E. (2011) De grote uitleg van Amsterdam - stadsontwikkeling in de zeventiende eeuw. Uitgeverij Thoth, 429 pages.
- 5) Google Earth (2016) Amsterdam Sloterdijk [online] Available at: www.google.com [Accessed 17 06 2016]
- 6) General aerial photography (2014) Luchtfoto Amsterdam-Sloterdijk [image]
Available at: <http://www.nieuwwestexpress.nl/nl/page/4579/luchtfoto-amsterdam-sloterdijk> [Accessed 17 06 2016]
- 7) Google Earth (2014) Isolatorweg, Amsterdam [online] Available at: www.google.com [Accessed 17 06 2016]

Masterplanning as Trouble Shooting. Networks of professionals replace planning authorities in the planning of Arnhem Central

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Abstract

This paper presents a case study of the masterplan of Arnhem Central realized between 1996-2016. Shifting public policies and public-private partnerships were utilized to try to fill the void caused by global and local economic crises as well as the decline of both policy-related and professional services retained by national and local authorities.



Policy context

Planning in the Netherlands – does it still exist?

In November 2009 Dutch architect Willem Jan Neutelings spoke the following words in an address to the Congress Architecture 2.0 organised by the NAI: *“Five years ago, we were commissioned to design a new building for the Shipping and Transport College at the Lloyd Pier in Rotterdam. In our naive belief in the soundness of our business we went to the city’s urban development department. We enquired after the planning rules in force at the pier. The answer was that there was no urban development plan for this area. We asked why. The answer was that the department did not have a masterplan for this area because the*

municipal department charged with land distribution had not commissioned one. We fell off our chairs in surprise! The planning department proposed to solve this problem by paying our practice to design our own masterplan for the Lloyd Pier. Then our building would certainly fit within the urban context.(...) This remarkable principle has now been now elevated to standard policy. The urban planning department has no particular plans to create any more designs. The market is relied upon to come with good ideas which will subsequently be declared masterplans by the planning department.”ⁱ

Neutelings' narration shows the evident confusion of an architect unexpectedly cast in the role of master planner. More recently, other Dutch architects similarly occupied in the field of master planning also expressed doubt about the shift from public to private-led urbanismⁱⁱ. While this shift might appear sudden from their perspective, it had in fact had been just one consequence of a complex and global landslide that has been affecting urban planning in the Netherlands since the 1970-s. Far-reaching changes in urban patterns and organizations at local national levels were related to the intensified communications, accessibility, transportation, production and consumption in the global, late-capitalist network society.ⁱⁱⁱ

In the Netherlands, where the foremost task of urban planning had traditionally been social housing, the emerging urban demand for increased offices, industrial estates, and high-end housing and shopping facilities constituted a sea change. The overwhelming force of market-driven demands and increased prosperity flooded the field of urban planning. Concepts such as place branding and the entrepreneurial city came up, pushing the formerly predominant social agenda to the background, and with it local and national government as the monopolist of urban planning.^{iv} At national level urban and regional planning had been incorporated in the ministry of VROM since 1982, until this ministry was abruptly abolished in 2012. Its habitual production of national policies and regulations just did not suit the Zeitgeist anymore.^v

From the 1990-s onward municipal departments tasked with urban design and planning decreased their workforces and minimized their activities, and, also under the influence of EU regulations, processes for procurement of planning services were instigated, further loosening the grip of public authorities on the domain of urban and regional planning. Place making and city branding were developed as tools in a competitive global array of regions and metropolitan areas. The focus on urban areas as 'motors for the economy' fostered new interpretations of governance.^{vi} The introduction of the concepts of entrepreneurialism, competitiveness, and risk-taking also ushered in a new focus on the main actors in governance alliances.^{vii} This development brought new opportunities for architects to take on urban planning tasks, not just in the Netherlands, but in many places competing in the global economy. As Manadipour has argued, *“place making within the entrepreneurial city with design has become a means of becoming distinguishable from others, a means of product differentiation. (...) Big splashes in the media that can change the image of a place in the world are one of the major expectations of urban authorities when they employ big-name designers”*.^{viii}

Place making - design, governance, or both?

This development in turn raises questions about the capacity of designers to participate in governance. Planning processes are often lengthy and complex; both duration and number and diversity of stakeholder interests normally far exceed that of a single building. If architects and other designers are seriously expected to take responsibility for master

planning, they, as well as the stakeholders surrounding them, including the commissioning stakeholders, should agree on the role, skills, capacities and level of involvement of the designer as planning professional. Based on the empirical experience described in the case study of Arnhem Central, I argue that a key element of such capacity lies in the ability to integrate quality of design with '*collaborative practice*' skills.^{ix} A masterplan will need to engage with a large number of different governance issues over a lengthy period of time, during which time many changes can be expected to occur, including economic and political upheavals.

This case study looks at what happens in this regard with a masterplan by a design professional. After the initial production of the design its afterlife, in which its real value and use will be tested and tried, commences. The task of mediating the design, communicating, disseminating, enlisting stakeholders, inviting diverse views, moderating and adapting, would traditionally have been undertaken by the municipal urban department. The case study demonstrates that to some extent this also shifts when the planning professional is a designer. Within the well-versed team of planners, architects, clients, consultants and builders from different companies the design professional may be found to be the continuous factor, rather than the public authority which relies on external project managers after the dissolution of its municipal urban department. In the 'flexible society' much of the expertise and knowledge that comes from continued attendance and focus on a long-term process, has become fragmented as mutual ties of loyalty between institutions and corporations and their functionaries have been severed.^x

Under those conditions, how can the designer as planning professional attain the necessary fluency in "*policy discourses about the qualities of places, developing collaboration among stakeholders in policy development as well as delivery, widening stakeholder involvement beyond traditional power elites, recognising different forms of local knowledge, and building rich social networks as a resource of institutional capital through which new initiatives can be taken rapidly and legitimately*"?^{xi} What happens when a public-private project is actually under way? How does the governance situation affect the outcome as the result of the changes in management and control? How are technical setbacks dealt with? And, finally, what happens when there are financial setbacks, which is inevitable given the ubiquity of underestimating the costs of public projects?^{xii} These are some of the questions that this paper will address, albeit summarily and sometimes implicitly since this paper does not provide the opportunity for an exhaustive study, as all these issues did come up during the Arnhem Central Masterplan, and are frequent and to be expected occurrences in master planning.

Case Study

When UNStudio first became involved in Arnhem Central in 1996, it was not as a first choice of designer – hence the qualification of troubleshooter; the location had already been the subject of many studies and plans for many years by various urban designers. However, UNStudio was the first designer to elaborate a more integral approach to the masterplan, and to be appointed as designer and subsequently also supervisor of the masterplan.



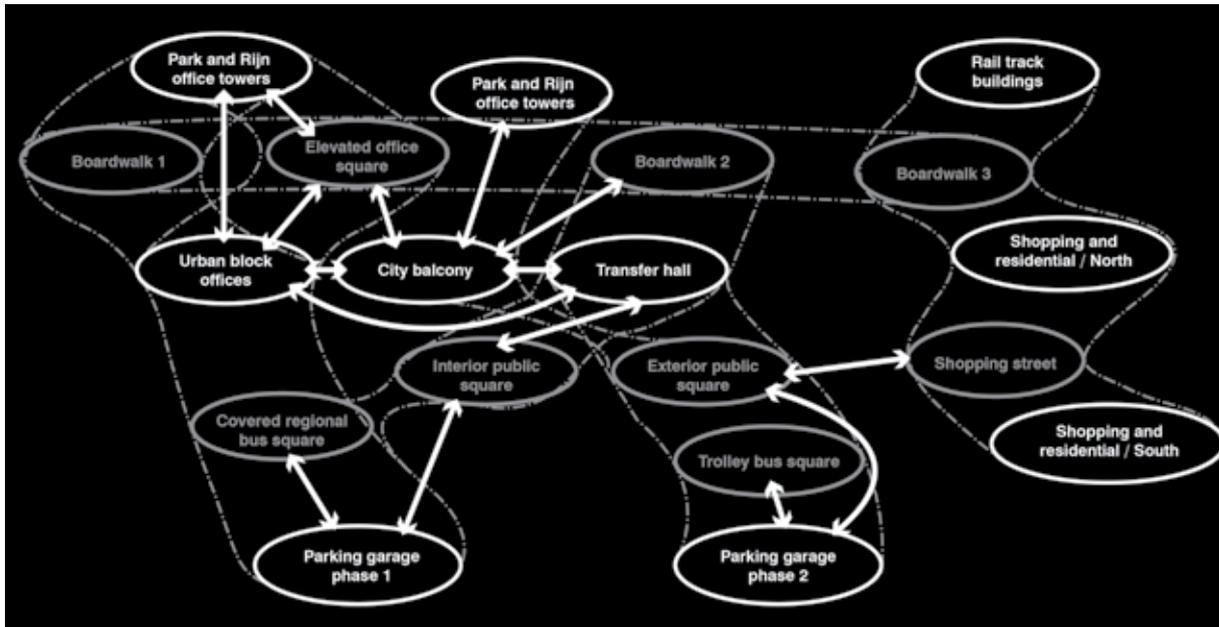
Model: Masterplan Arnhem by Teun Koolhaas, 1992, brochures: assorted designs by others

Five important extrinsic needs motivated the design of Arnhem Central:

1. The existing temporary post-war station had long been insufficient and needed urgent replacement.
2. The station needed to continue to be fully operational while construction was going on.
3. The station needed to become a node in the high speed rail link to Germany.
4. Connections to the city center needed to be improved.
5. There was a need for external funding.

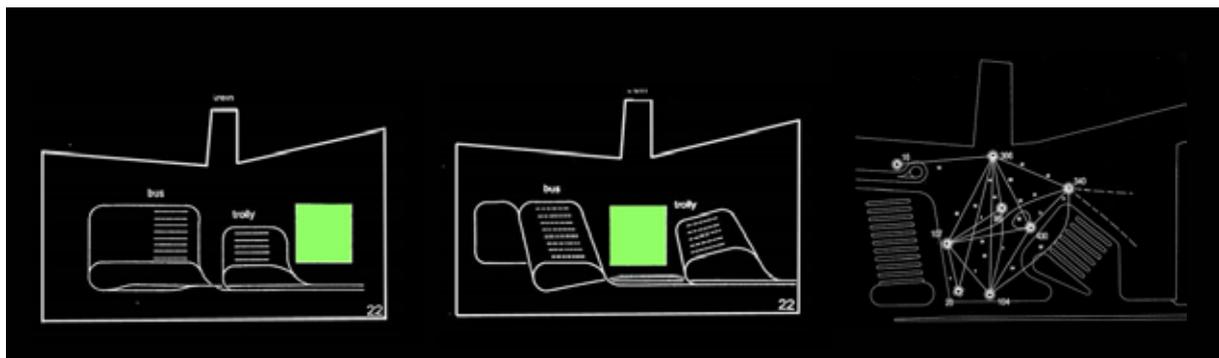
Integral approach

Architecture and urbanism exist to fulfill societal requirements and in any situation several different needs co-exist which are not always neatly aligned. Identifying multiple needs is essential to a more equitable approach.^{xiii} The masterplan was seen as a dense network of larger and finer grains, long-reaching and shorter strands. For example, relating to the last point: neither of the two main owners of the station location, the municipality and the national railways, were in a position to initiate and see though the entire project by themselves. The addition of commercial program on the site - primarily the office towers - was a consequence of the need to part-finance the public project from private sources. This meant involving project developers. An official national policy of 'intensive ground use' also qualified the project for a governmental subsidy. When the intensive ground use subsidy period ended, new co-funding was necessary, instigating a need to interpret and adapt the design to fit in with the new policy strands being woven into the network.



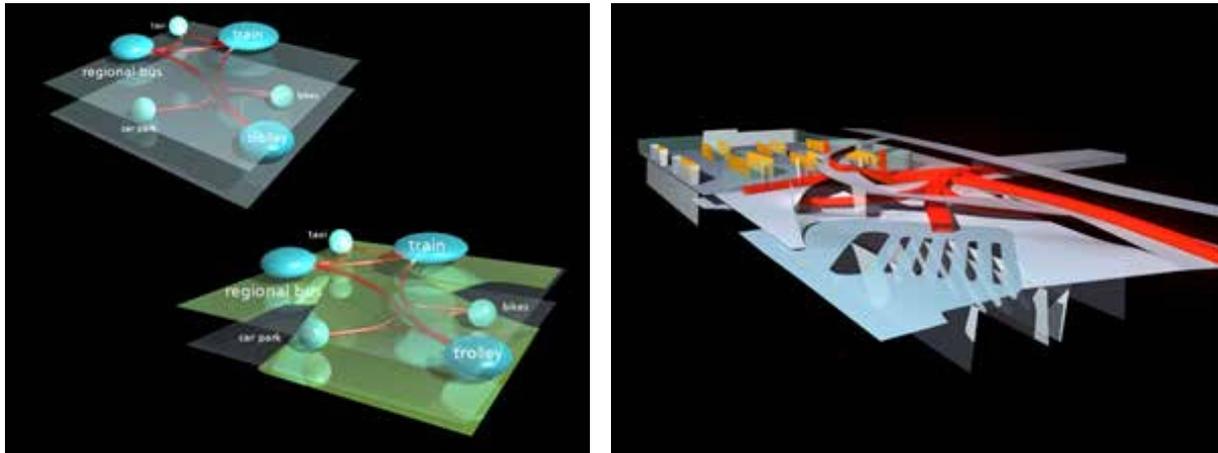
Bubble diagram of Masterplan components

Trying to respond equitably to multiple needs, each with various consequences and potential directions, helps to identify the major design problems and organise the design according to those findings. In Arnhem Central the search to slot the numerous components into a coherent organisation that responded to the identified needs revealed obstacles. The masterplan design solution that addressed the aforementioned five extrinsic needs in one integral gesture was the repositioning of the station as a transfer hub in the centre, not to the side of the location.



Transfer hub (former station square) placed centrally

The central placement, creating a pedestrianized and roofed-over central hub area, was made possible by the use of multiple ground levels, with some functions placed (partially) underneath others, rendering the project very compact. Different program items are not stacked or placed beside each other, but fuse into each other, negating the idea of second-rate versus first-rate spaces. With the goal of minimising the crossing of traffic flows and garnering efficient access to the various modes of transit, studies were made into the slight natural height differences of the site, passenger flows, lines of sight, and traffic volumes.



Studies and model of passenger flows over different levels of transfer hub

The layering and partial merging of programs such as the underground car park and bicycle storage, bus terminal, transfer hub zone, including some shopping, and the elevated office towers has resulted in a highly compact landscape of doubled ground usage. This urban landscape assimilates and connects the different program elements into its folds.

The two office towers form an integral part of the masterplan, and are directly connected to its deepest underground level, as well as to the transfer hub. The towers, which were controversial due to their height and positioning, were needed to finance the development, but from a design perspective can also be seen as an orientation device for the city as a whole, in the same way that a twist element inside the transfer hub orients the passengers. Thus, the vertical elements are programmatically and physically related to the contiguous, enveloping landscape, as well as to each other.

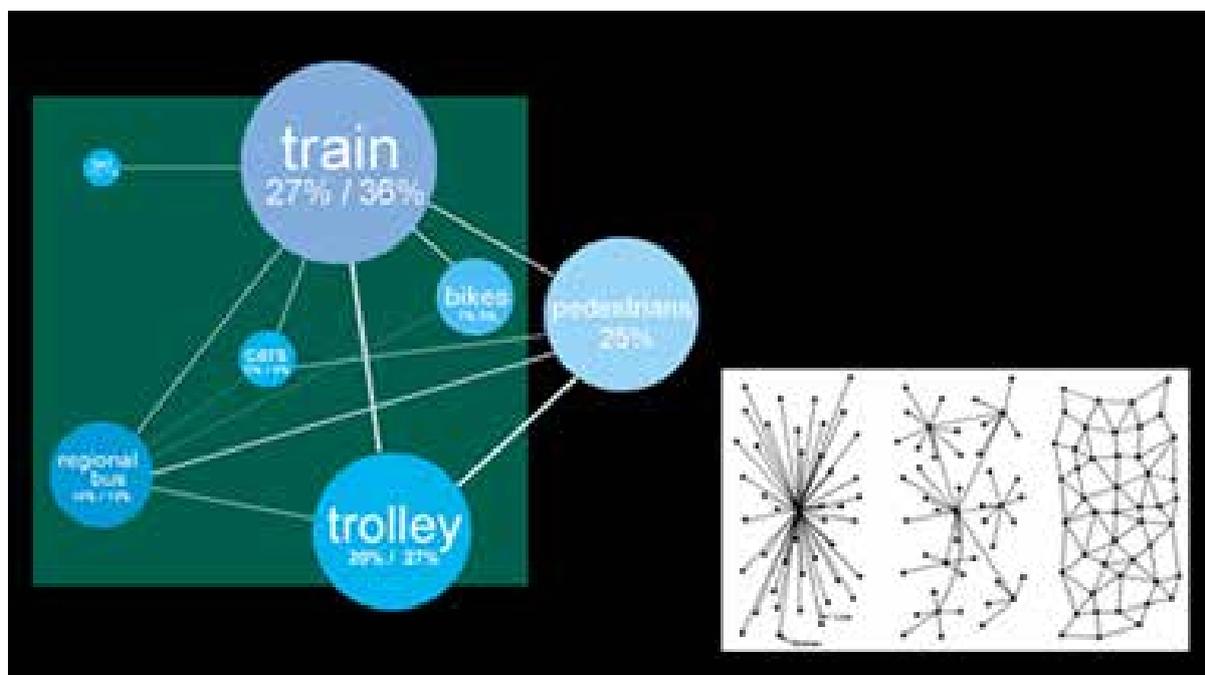
A series of exploded sections, rather than elevations, guided the design development, with the sectional model being its most reliable touchstone throughout.

The central component of the transfer terminal organises and links the different transport-related, commercial programs and levels of the project. It was built last, allowing the station to remain operational, albeit uncomfortably, while all the other components were built around, on top and underneath it. The central void space of the transfer hub gives passengers fluid access to all programs. Bus passengers, train passengers and users of the offices and conference centre all use the transfer hub as a roofed-over lobby, waiting area and passage to and from the town.

Stakeholder management

The Masterplan area was co-owned by the municipality and the NS, the Dutch national railways. Traditionally, the latter was used to exercising certain institutional power. From the mid 19th Century onward the railway station has taken a central place within the urban constellation as an easily recognizable, busy and iconic manifestation of mass mobility. But should this tradition be continued? Was an iconic NS station really necessary? The existing station, built after the previous one had been destroyed in the Second World War, was generally deemed inadequate. The city was ready to take over the initiative from the NS. This stakeholder prioritization was supported by analysis which showed that occupation-wise the NS did not represent the majority interest on the location. Of all visitors passing the location

on an average day, fewer than 40 per cent were going to and from the railway station. The remainder would be changing from one bus to another, or switching between bus, bicycle, foot or car. A very important stakeholder-related question therefore was: who gets to decide what happens on this location?



Passenger numbers and network reference; aiming for the most efficient distribution of connections

In the subsequent masterplan, bus terminal and train station are joined into an integrated public transportation area that has replaced the local iconicity of the railway station with a contemporary, more diffuse and diverse identity.

The symbolic representation of institutional stakeholderhood through a building has been completely abandoned in the masterplan. Instead, the passenger has become the leading stakeholder influencing the design of the masterplan. Pedestrian accessibility is the common denominator and determining factor. The intersection of different traffic systems is reduced to a minimum to optimize pedestrian access to all facilities. Light falls through from above onto the lower entrances to the station, garage and offices and creates clear and lengthy vision lines, aiding pedestrian orientation and wayfinding. Pedestrian movements, transport systems, light, construction and the distribution of the programs are thus fused in one continuous landscape.

The entrepreneurial city and the railway station as urban regenerator

Conflicts, risks and ideology

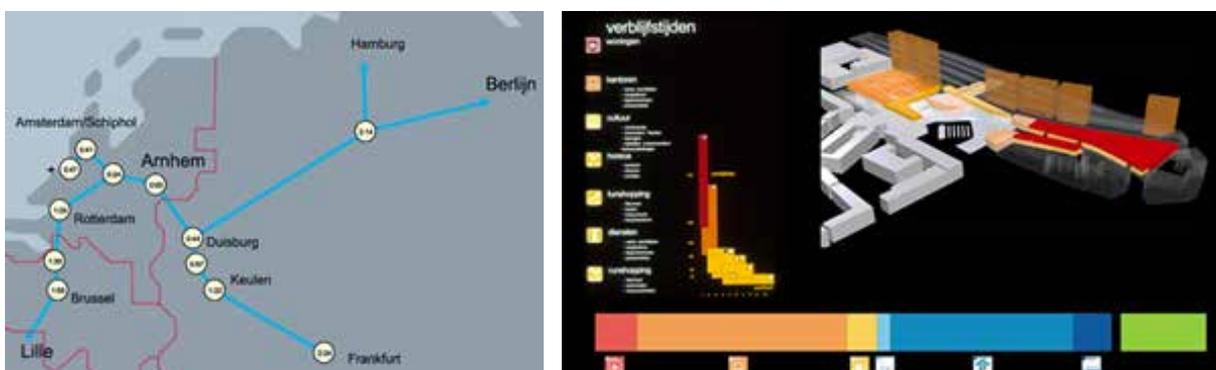
Place making and urban regeneration initiatives have seen widespread attention focused on railway locations. In the closing decade of the 20th Century a renewed attempt was

made to reinstate the railway station as a supreme node in the network of flows. In many places worldwide, processes were begun to turn old, dilapidated station structures and their tired, second-rate environs into vibrant urban places, complete with contemporary ancillary, commercial, functions. The railway station was re-positioned as a prime site with potential for geo-economic maps to be redrawn as the result of intensifying connectivity, permitting power and money to be drawn into the region by sheer force of planning will. This practice of public infrastructure-orientated urban transformation appealed to an emerging movement of city-branding: to an ideology of architectural iconicity as a value-adding investment tool; and to municipal and regional economic competitiveness.

The problem is that the global flows of commerce and mobility that many railway station regeneration projects tap into carry risks, as well as rewards. The heavy addition of commercial functions threatens to turn railway stations, which are prime civic, public spaces into shopping malls, which are private, commercial spaces and always in danger of falling out of public favour. Moreover, the new high-speed links destined to increase regional importance and make the location more central, more important, and above all richer, can be scrapped or turn out to be far less effective than calculated. Besides these pragmatic considerations, there is a deeper, sociocultural, and architectural question to be asked: how do the forceful yet precarious global flows engage with local identities?

In the words of Doreen Massey: *“How in the face of all this movement and intermixing, can we retain any sense of local place and its particularity? (...) Can't we rethink our sense of place? Is it not possible for a sense of place to be progressive; not self-enclosing and defensive, but outward-looking? A sense of place which is adequate to this era of time-space compression?”* xiv

Arnhem Central can be seen as an attempt to realise a contemporary, global context-aware, local space of flows. An early-stage map-diagram highlights the position of Arnhem as a potential-filled node in a continuous high speed rail line from Brussels to Berlin. The planned-for direct high speed connection did not materialize, although it is a stop for the ICE. This did not affect the masterplan majorly, however, since in view of the relational balanced approach, with equal attention paid to small-scale local connectivity on site.



Regional connections versus local durational occupancy

Conclusion

Masterplanner as troubleshooter – a relational network approach

In the course of nearly 20 years in the making of Arnhem Central UNStudio was tasked with both the master planning and attendant supervising of the project, along with its architectural design and implementation and was active in both roles throughout. Unsurprisingly then, as a project and a process it was a true hybrid of architecture and master planning. And equally unsurprisingly, various problems, challenges and setbacks associated with both disciplines came up.

Being simultaneously master planner, designer and supervisor meant never being able to hand over to someone else a problem or setback that occurred. Walking away from one set of responsibilities (the planning issues, not UNStudio's core occupation at that time), would undoubtedly affect the outcome of the other (the architecture, UNStudio's fundamental vocation).

The execution of both roles entailed continuously maintaining and activating an extensive network. Thus, the human factor; the people taking part in that masterplan network, both within UNStudio and many other collaborators, is crux to master planning, as it has always been. The design professional tasked with master planning needs to avail over a network comprised of many different experts capable of unlocking governance, technical and investment resources. Furthermore, consideration of conflicting interests is essential. Any identification with just one stakeholder contains a risk. Sometimes, as in Arnhem Central, visualizations of the stakeholder positions can generate ground-breaking insights. Even then, the designer as master planner needs to remain careful in choosing alliances.

It is likely that architects and other design professionals in the future will continue to be tasked with master planning in many parts of the world. They will find themselves confronted with changes, conflicts, upsets and disturbances relating to governance, finances and technology. The vagaries of the global economy will continue to make such master plans risky, but regained central control by public authorities will in many cases remain unlikely. More theoretical planning research into situations where master plans are realized with ongoing involvement by architects would lead to more insights and further understanding of these contemporary situations.



The integrated transfer zone includes an expansion that generates 80.000 square metres of office space, 11.000 square metres of shops, 150 housing units, a new station hall, a fourth railway platform, a railway underpass, a car tunnel, storage for 5.000 bicycles and a garage for 1.000 cars.

ⁱ Neutelings, Willem-Jan, 2009, Rotterdam source: <http://www.neutelings-riedijk.com/index.php?id=57,419,0,0,1,0>

ⁱⁱ Koolhaas, Rem, 2015, source: <http://www.fastcodesign.com/3044008/rem-koolhaas-theres-been-very-little-rethinking-of-what-cities-can-be>. De Graeff, Reinier, 2012, source: <http://www.dezeen.com/2012/08/28/public-works-architecture-by-civil-servants-by-oma-at-venice-architecture-biennale-2012/>

ⁱⁱⁱ Castells, M., (1996), *The rise of the network society*, Blackwell Oxford; Harvey, D., (1990), *The condition of postmodernity*, Blackwell; Soja, E. (1989), *Postmodern Geographies the Re-assertion of Space in critical social theory*, Verso, London

^{iv} Franzen, Agnes, Vorm blijven geven aan de ruimte Nieuwe allianties in de stadsontwikkeling, source: http://www.bk.tudelft.nl/fileadmin/Faculteit/BK/Over_de_faculteit/Afdelingen/Real_Estate_and_Housing/Organisatie/Medewerkers_RE_H/doc/Agnes_Franzen_artikel_idvds.pdf

^v Kroeze, R., Keulen, S., Van VoMil, via VROM naar IenM: hoe beleidsmakers en managers geschiedenis kunnen gebruiken, 2015. Source: <https://www.historici.nl/geschiedenis-en-actualiteit/paper/van-vomil-vrom-naar-ienm-hoe-beleidsmakers-en-managers>

^{vi} Harvey, D., "From managerialism to Entrepreneurialisms: the transformation in Urban Governance in Late Capitalism", *Geofriska Annaler. Series B, Human Geography*, Vol. 71, No. 1, *The Roots of Geographical Change: 1973 to the Present* (1989), pp3-17

^{vii} Hall, T. and Hubbard, P., 'The entrepreneurial City; new urban poitics, new urban gepgraphies?' *Progress in Human Geography*, 20, 2 (1996), pp 163-174

^{viii} Manadipour, A., 2006, 'Roles and Challenges of Urban Design', *Journal of Urban Design*, Vol. 11. No. 2, 173–193, June 2006

^{viii} Healy, P., 2003, "Collaborative Planning in Perspective", *Planning Theory* 2003; 2; 101

^{ix} Sennett, R., *The Corrosion of Character*, 1998
Healy, P., 2003, "Collaborative Planning in Perspective", *Planning Theory* 2003; 2; 101

^x Flyvbjerg, B., Skamris Holm, M., and Buhl, S., "Underestimating Costs in Public Works Projects: Error or Lie?" *Journal of the American Planning Association*, vol. 68, no. 3, Summer 2002, pp. 279-295.

^{xi} Graham, S. & Healey, P. (1999), *Relational Concepts of Space and Place: Issues for Planning Theory and Practice*, *European Planning Studies*, Vol. 7, No 5, 1999, Taylor & Francis Ltd.

^{xii} Massey, D., "A Global Sense of Place", *Space, Place and Gender*, University of Minnesota Press, 1994, p 327

EFFECTS OF CHANGING LAND USES ON INTRA-CITY ROADS IN CALABAR MUNICIPALITY, CROSS RIVER STATE, NIGERIA

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SYNOPSIS

The rapid rate of changing land uses in cities has reached alarming proportions. Changes in both road usage as well as the physical network of intra-city roads are traceable to changes in the use of land. These changes have profound effects in the cities we live in today.

INTRODUCTION

Calabar Municipality is one of the Local Government Areas in Cross River State. It has a population of about 183, 681 people (National Population Commission, 2006) and an area of 142 square kilometers. It is located in the South South geo-political zone of Nigeria. It lies between Latitude 4°57' and 5°04' North of the Equator and Longitude 8°18' and 8°24' East of the Greenwich Meridian. Calabar Municipality is bounded in the North West by Odukpani Local Government Area and Calabar River, in the East by Akpabuyo Local Government Area and the Southern shores are bounded by the Calabar South Local Government Area (Figure 1).

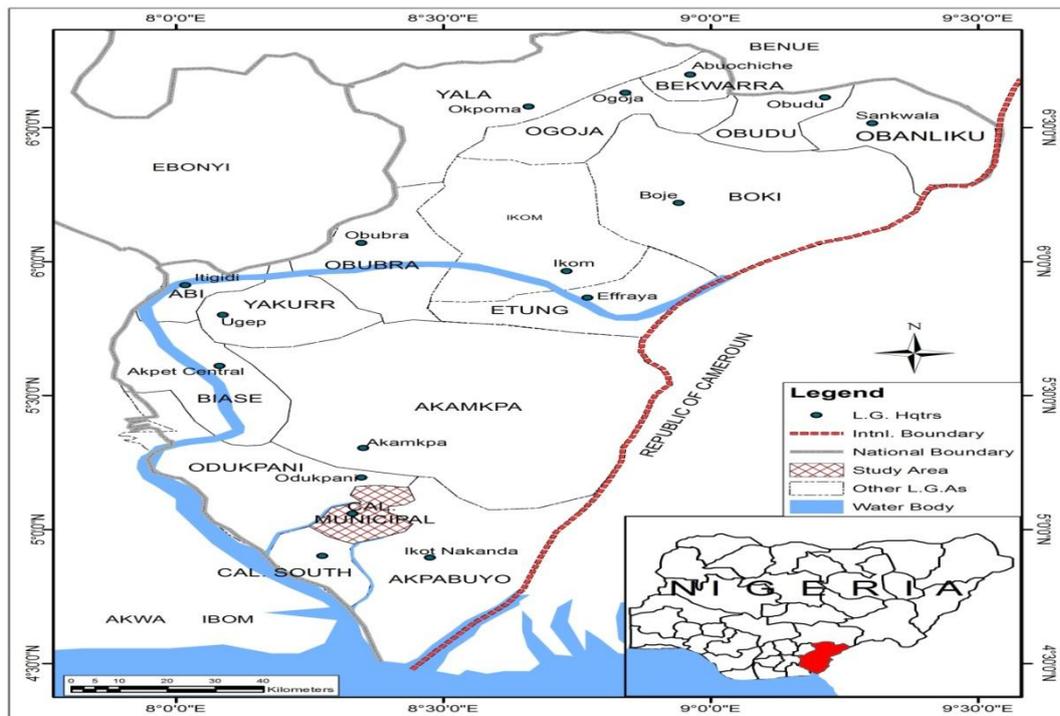


Figure 1: Calabar Municipality on the map of Cross River State

Source: GIS Department, Ministry of Lands and Town Planning, Calabar, Cross River State

Calabar Municipality has witnessed an increase in economic activities which has brought about changes in its land use pattern. In particular, there has been rapid conversion of land uses along roads as developers compete to market their properties. This growth has taken place without any cognizance of implication of their actions on the future state of the city.

In other locations, change in the use of land along intra-city roads in the study area have created problems such as traffic congestion, parking problems, accidents, haphazard/indiscriminate display of signpost/billboards, over stretching of road infrastructures and noise pollution. As cities grow and develop, changes are inevitable especially change in the use of land, that is why it is pertinent to carry out regular studies on land use and transportation, as well as establish certain measures or strategies to improve the environment. Hence, it is against this background that this present study was conceived.

Aim and Objectives of the Study

The aim of this study was to assess the effect of changing land uses on intra-city roads in the study area. The objectives of the study are to:

1. conduct a survey to identify the factors influencing changing land use in the study area
2. conduct a survey to identify the problems associated with changing land use along intra-city roads in the study area,
3. calculate the rate and nature of changing land use in the study area and,
4. determine the statistical influence of changing land use on traffic issues in the study area.

REVIEW OF RELATED LITERATURE

Changing land use has critical connection between economy, housing, policy, jobs, and environment. Rodrigue and Notteboom, (2009) noted that changes in the locations of commercial, business and other socio-economic activities are influenced by the transport network. In recent times, frontier expansion and population growth have primarily accelerated land use change (Adger and Brown, 1994; Richards, 1990). Changing land use can occur from either direct or indirect decisions to alter the current use of land. Changing land use is usually associated with costs which may be social, physical or economic. A number of factors account for the changing pattern of land use in any given location. Such factors mostly result from individual and social responses to changing economic conditions which are mediated by institutional factors.

Some researchers have summarised factors that influence changing land use to include social, economic, institutional and so forth. Adebayo (2009) stated that for economic reasons, land and buildings will continue to change in use from a lower order to a higher status in order to attain optimal use. Hill (1989) enumerated the factors to include: personal choice, legislation, government policies and plans, decision of developers or transportation entrepreneurs, the nature of the land itself and the availability of technology to develop the land. Turner and Meyer (1991) listed the possible factors that drive land use change to include: population, level of affluence, technology, political economy, political structure, attitude and values, while Garrison and Deakin (1992) enumerated some factors that give land value to include: transportation, land use location, topography and land features such as views, building type, quality and size. On the other hand, Lambin, Geist and Lepers (2003) pointed out that many of the land use changes that occur are due to ill-defined policies and weak institutional enforcement. Martinez (2000) noted that land use and transportation interaction is the result of human behaviour and these interactions between land use and transportation are played out as the outcome of the decisions made by residents, businesses and governments.

On the other hand, changing land use is a growing problem confronting policy, planning and decision making at all levels. It links problems and opportunities in urban and metropolitan communities to the larger issues of economic growth and environmental quality (Skole, 2002). Transportation problems arising from the conflict with land use in Nigeria have received some emphasis in the works of other researchers. According to Duruzochi (1999),

these problems (road accidents and traffic congestion) are experienced on a daily basis by the common people. Fadare and Adeosun (2007) noticed that road transport problems are more pronounced in urban centres and the problems are a complete phenomenon in terms of diverse causes and implications on time, lives and properties, while Ato and Abimaje (2012) observed that in many Nigerian cities these problems are as a result of the structural defects of roads.

METHODOLOGY

Primary data were obtained from the field survey; traffic count, observation, measurement and recording as well as questionnaire administration. Secondary data were derived from the land use map of the study area. The study adopted the systematic sampling technique to obtain data through questionnaire administration. Respondents were systematically selected along the major roads until the required sample was obtained. In each of the major roads, respondents were selected from every 4th building. The skipping range was determined by dividing the total number of buildings along the sampled roads by the sample size (1,847/461).

Purposive sampling technique was adopted in the selection of roads. Twenty six roads out of a total of 256 roads were purposively selected for study since most of the land use changes were noticed along these roads. This number (26 roads) represents 10% of the total number of roads which is statistically accepted as the minimum sample size for a study; however the method of road selection was not random.

RESULTS/FINDINGS

Table 1 reports the findings of the residential questionnaire.

Table 1: Factors influencing changing land use in the study area

Factors	Number	Percentage (%)
Increase in Demand	113	27
Individual Preferences/Choices	97	23
Condition of Road/ Access	82	19
Availability of Infrastructures	69	16
Government Policies	65	15
Total	426	100

Source: Field Survey (2014)

Table 1 shows that the residents living along the roads in our study felt that different factors influence changing land use. One hundred and thirteen, representing 27% of the respondents, believed that increase in demand for commercial and public land uses influenced changing land use in the area. Ninety seven, representing 23% of the respondents, were of the opinion that individual preferences (personal choices) influenced changing land use in the area. A total of 82 respondents representing 19% of the respondents agreed that the condition of the road/ good access offered by roads influenced changing land use in the area, 69 respondents, 16% of the total, stated that availability of

infrastructures influenced changing land use in the area, and the remaining 65 respondents agreed that government policies influenced changing land use in the area.

The Residential questionnaire also examined the problems associated with changing use.

Table 2: Problems associated with changing land use along intra-city roads

Problems	Number	Percentage (%)
Traffic Congestion	147	35
Parking Problems	140	33
Noise Pollution	65	15
Accident	44	10
Indiscriminate/haphazard display of bill boards/signposts	30	7
Total	426	100

Source: Field Survey (2014)

Table 2 displays the list of problems presented to the residential surveyed population and also shows the results of their selections. One hundred and forty seven, representing 35% of the respondents, agreed that traffic congestion was the major problems noticed along intra-city roads as a result of changing land use. One hundred and forty, representing 33% of the respondents, noted that parking problems were the major problems noticed along roads. Fifteen percent (65) respondents noted that noise pollution was the major problem; ten percent (44) felt the main problem was an increase in accident and the remaining 7% (30) felt that indiscriminate/haphazard display of bill boards/signposts was the major problems noticed along roads as a result of changing land use in the study area.

Land use change in the study area was measured. This was done using 2010 and 2014 land use maps. Table 3 shows the results of this mapping analysis.

Table 3: Rate and nature of changing land use

S/n	Land Use Classes	Area (Hectares) covered in 2010	Area (Hectares) covered in 2014	Change (Difference) between 2010 and 2014	Annual Rate of land use change (Hectares) between 2010 and 2014	Nature of change
1	Residential	184.05	128.78	55.27	11.1	Decreased
2	Commercial	63.31	104.11	40.80	8.2	Increased
3	Public	88.57	99.54	10.97	2.2	Increased
4	Circulation	70.04	70.04	0	0	No Change
5	Green Area	26.08	26.08	0	0	No Change
6	Industrial	14.44	17.94	3.50	0.7	Increased
	Total	446.49	446.49			

Source: Field Survey (2014)

The juxtaposition of the 2010 and 2014 land use map revealed that there has been a substantial increase in commercial, public and industrial land uses while there has been a decrease in the residential land use.

The rate of land use change was obtained by dividing the difference in area each land use covered between 2010 and 2014 by five years. The result showed that commercial land use increased by 40.80 hectares at the annual rate of 8.2 hectares, public land use increased by 10.97 hectares at the annual rate of 2.2 hectares, industrial land use increased by 3.50 hectares at the annual rate of 0.7 hectares while the residential land use decreased by 55.27 hectares at the rate of -11.1 hectares.

It was noted that the residential land use decreased due to conversion and infiltration of residential land uses by commercial as well as public and industrial land uses. The green area and circulation land uses did not witness changes as new green areas were not developed and the existing roads were not expanded within this period.

In order to determine the statistical influence of changing land use on traffic, the multiple regression analysis technique was adopted. Table 4 shows the result of the statistical analysis.

Table 4: Result of statistical influence of changing land uses on traffic

Model	R	R Square	Adjusted R Square
1	.733 ^a	.537	.474

Source: Author's Data Analysis (2014)

The result of the analysis showed that the value $R = 0.733$ and $R^2 = 0.537$. The coefficient of determination $R^2 = 0.537$ implies that 53.7% of the variation in traffic volume in the study area can be explained by the changes in the predictor variables (Residential, commercial and public land uses). This implies that the extent to which changing land uses affect traffic volume is 54%. It also means that this effect is statistically significant.

CONCLUSION

This study on effect of changing land uses on intra-city roads in Calabar Municipality, Cross River State revealed that significant changes have taken place in the land use structure of our study area over the past five years, particularly; the public and commercial land uses have witnessed significant changes. Moreover, the changing land uses have also created residential concerns about traffic congestion, inadequate parking, over stretching of roads, accidents and noise pollution.

The result indicated that changing land use has significant effect on roads in the study area; this implies that increase in the rate of changing land use will lead to a corresponding increase in traffic volume and traffic density in the area. This in turn will impact negatively on the traffic, housing and economic situation of the area and the environment as well. The findings of this study agree with the findings of Okon (2008) that overconcentration of vehicles and commercial activities have great implications on intra-city and environmental quality in terms of noise pollution, accidents, safety, security and aesthetics. However, to accurately measure this effect, we need to improve our study methods.

There is need for sustainable land use planning to address challenges of unregulated land use change so as to mitigate the effects posed by changing land use on roads. The municipal planning authority should adopt improved methods and establish regular monitoring of change in the area in order to prevent the negative effect these changes may unleash on the environment. Since some of the changes or conversion of land uses are done without the consent of the Municipal Planning Authority. Monitoring will enable stringent enforcement and implementation of development control measures by the Municipal Planning Authority so as to curb the rapid and unauthorised conversion of land uses.

On the whole, there is need to work towards collaborative solutions to the challenges posed by changing land uses along intra-city roads so that we can sustainably create the cities we need in future.

REFERENCES

- Adebayo, M. O. (2009) Impact of Urban Land Use Changes on Property Values in Metropolitan Lagos. *Medwell Journals*, 4 (1), pp. 111 - 117.
- Adger W. N. and Brown, K. (1994). *Land use and the Causes of Global Warming*. Chichester, England: John Wiley and Sons, p. 57.
- Ato, E. S and Abimaje, J. (2012) Problems of Intra-urban Transportation in Idah: A Challenge to Urban Management. *Journal of Environmental Design*. University of Uyo, Uyo, Nigeria, 7 (2): 139.
- Duruzoechi, N.F. (1999). *Urban Transportation Problems*. Owerri: Imoco Printing and Publishing Company Limited, pp. 61 - 63.
- Fadare, O. and Adeosun, T. (2007) Analysis of the Effects of Mobile Phones on Drivers' Behaviour in Lagos, Nigeria. *Journal of the Nigerian Institute of Town Planners*, 30(1): 43.
- Garrison, W. L. and Deakin, N. (1992). *Land use and Public Transportation*. 2nd ed., New Jersey: Prentice Hall, p. 39.
- Hill, R. D. (1989). Land use Change. Proceeding of the Asahikawa-Sapporo International Symposium, Hong Kong University Press, p. 112.
- Lambin, E. F, Geist, H. J. and Lepers, E.(2003). Dynamics of Land-use and Land-cover Change in Tropical Regions. *Annual Reviews of Environmental Resource*. pp. 205 – 211.
- Martinez, F. J. (2000). Towards a Land use and Transport Interaction Framework. In: Hensher, D. A. and Butten, H. J. (Eds). *Handbook of Transport Modelling*. New York: Pergamon Press, pp. 145-164.
- National Population Commission (2006). Population Figure of Calabar Municipality Local Government Area, Cross River State, Nigeria. Available at www.population.gov.ng. Accessed on May 16,2012.
- Okon, I. E. (2008). Intra-city Transportation and Land use Planning in Nigeria: The case of Port Harcourt Metropolis. River State. Unpublished Ph.D Research Thesis Department of Geography and Regional Planning. University of Calabar, Calabar. Nigeria.
- Richards, J. F. (1990). *Land Transformation in the Earth as Transformed by Human Action*. Cambridge: Cambridge University Press, pp. 163-178.
- Rodrigue, J. and Notteboom, K. (2009). Transportation and Economic Development. In: Rodrigue, J., Comtois, C. and Slack, B. (Eds.). *The Geography of Transport Systems*. 2nd ed., Hempstead: Department of Economics and Geography, Hofstra, University, Hempstead, USA. pp. 103 – 106.

Skole, L. D. (2002) Tracking Change for Land use Planning and Policy Making. Available at <http://web1.msue.msu.edu/msue/iac/transition/papers/LandUsePlan.pdf>. Accessed on June 10, 2013.

Turner, B. L. and Meyer, B. L. (1994). Global Land Use and Land Cover Change: An Overview. In: Meyer W. B. (Ed.), *Changes in Land Use and Land Cover: A Global Perspective*, Cambridge, Cambridge University Press, pp. 89 - 91.

Intergovernmental Organizations and Human Settlements; how the world polity is shaping the debate on cities

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Abstract *The period between 2015 and 2016, the “Year of Sustainable Development”, represents a crucial point in time while a set of global agreements concerning the development goals, the climate and human settlements, are negotiated and endorsed by the international community. This new round of documents includes like ever before a specific attention to urban areas and their management tools. Within the many sectors addressed in international agreements and national policies, cities emerge as a specific field for measures to reduce environmental footprints, enhance social inclusion, and promote green economic development.*

This article reflects on the urban connotation emerging from the ongoing global policy formulation in the intergovernmental arena (the Sustainable Development Goals, the United Nations Framework Convention on Climate Change, the Post-2015 Framework for Disaster Risk Reduction and the New Urban Agenda) to report the centrality and tendencies of urban planning in the global agenda for 2030 and beyond.

This evolution place cities, their management tools and professionals at the core of global strategies for sustainable development, to implement locally the international policy directives.

1. Introduction

The international community over the past 50 years has engaged in the challenging domain of sustainable development. The United Nations system, together with most international organizations has been strongly concerned in the definition of a common framework for discussion and action. The economical, ecological, cultural and social sectors mutually and jointly contribute to sustainable development. The mutual relation of the latter sectors triggers trade-offs when one domain overpowers others.

As the majority of global population lives in cities and urbanization and urban life become dominant phenomena worldwide, the challenges related to cities have gained the fore of international debate.

More specifically intergovernmental agencies, funds and programmes or the UN GA itself affirmed the relevance of urban policy and planning to address sustainable development and its goals. From an Intergovernmental Organization (IGO) perspective it seems to emerge a great attention to cities and their management systems (thus including the urban planning discipline) to turn human settlements and their capital (buildings, citizens, infrastructures etc.,) into active input for sustainable development.

This crossroad is also accompanied by an evolution of planning theory that opened to emerging themes (i.e. those related to sustainability) and become more responsive to new forms of public management, decision making processes, communicative rationality and the various forms of participation, collaboration and co-ordination (Campbell S. , 1996) (Jessop, 2004); (Harvey, 1989); (Habermas, 2001); (Davidoff, 1965); (Susskind, 1999); (Healey P. , 1997)). While some core of the planning practice stays at municipal level and it is bound to comply with obligations required by statutes (i.e. land-use, development, behavioural and systemic norms, and eventually building rights), new dimensions, tools and approaches to

urban development are introduced to comply and achieve the objectives set through international policy co-ordination.

In the last decades the attention of IGOs on cities has been considerably growing. One of the very first attempts to provide a shared framework and principles of sustainable development has been provided by the Stockholm declaration, outcome document of the United Nations Conference on the Human Environment (1972). The declaration contains 26 principles among which specific attention to human settlement is paid, especially with respect to the management and reduction of environmental externalities.

The last two decades are marked with milestones in international agreements such as the Kyoto protocol (and the UNFCCC), and the Millennium Development Goals. Environmental responsiveness of states' policies emerged as widespread concern in several countries; cities emerged as structural component.

At this point in time, between mid 2015 and November 2016, several of the international agreements that have inspired governments' policies will be re-negotiated.

The international community is currently engaged in a very extensive and inclusive consultation phase towards the adoption of the Sustainable Development Goals (September 2015), the new United Nations Framework Convention on Climate Change at COP21 (December 2015), the new Urban Agenda at H III Conference (October 2016), and the Post-2015 Framework for Disaster Risk Reduction (March 2015). These last are also known as global process. The global process' outcomes will considerably be reflected in the principles of next future governments' policies to achieve for example "Inclusive, safe, resilient and sustainable cities and human settlements" (proposal for SDG 11).

In parallel the planning theory and practices is characterised by a "reinvigoration of theoretical discussion within the discipline" (Fainstein, 2000, p.451) in which a number of contributions (i.e. Fainstein, 2000; (Marcuse, 2011) (Campbell H. , 2012); (Friedmann, 2008)) were suggesting theoretical references to reframe planning discourse and proposing key directions of contemporary planning to overcome the uncertainties of the practices while a strong role and effectiveness of urban planning is called by cities, citizens and the Intergovernmental community. The relations between planning and institution are very strict (Kim, (2011); Neuman, (2012)), while probably the linkages between cities and diplomacy – when considered from an urban planning discipline perspective- seem to be less natural and show a certain difficulty to enter into the debate (LeFèvre (2012),). Growing urban inequalities, asymmetric welfare delivery, a notable ineffectiveness of the planning practices to address urban development and to manage the implementation of its provisions have triggered the evolution of planning practices. More recently the discipline seems to build capacity in the orientation of decision-making process, to adopt a governance approach and most of all it recognizes itself within a policy tools approach. This step might be considered a deal to clear the doubts that may identify and confine the planning practices to the city plan. Indeed this broadening of planning discipline builds stronger links to the activities and mandates of IGOs, that certainly can drive deep changes in the way planning and urban management is addressed. On one side in fact, planning can be seen as one of the governments' tool to implement or design states' public policies (especially those with territorial impact and focus), on the other it provides a wide array of tools to implement and support these programmes.

Intergovernmental Organizations

International Organizations -IO, and Intergovernmental Organizations –IGO, are one of the most important heritages of the XX century world wars. Since the 1940s there has been a proliferation of International Institutions, treaties and arrangements among states accompanied by a deepening of regional integration as formal representation of the institutionalization of world polity and politics (Simmons and Martins, 2001). While the fields of this international politics arena were traditionally related to security, economics and monetary domains, trade, justice and human rights, it is of great interest to note that the evolution of IOs efforts on development become increasingly relevant also for the urban studies and planning domain, this evolution is due to the process of specialization that IGOs have undergone.

The main advantages to conceive policy and strategies in IGO regimes is due to: the agency and agenda setting influence; their socialization capacity; the capacity of IOs to increase the systemic efficiency because of their centralization (concrete and stable organizational structure and supportive administrative apparatus managing collective activities); and independence (the authority to act with a degree of autonomy and neutrality according to the mandate). Given these features the role of IOs as platforms for dialogue, exchange and policy formulation can be fully validated; from a network analysis perspective it also emerges that much of these IOs capacities derives from the high degree of centrality and resources mobilization that these institutions are able to deploy. The benefits of international regimes are concerned to the bundle of benefits related to international norms and agenda setting and to institutional and policy coordination. The first set, of norms and agenda setting, are more rooted in the legitimacy of internationally socialized processes rather to the authority of the international regimes. The UNFCCC can be taken as example: in fact the salience and legitimacy of a norm built by nearly two hundred parties under the auspices of an IGO does not entail any evidence that this architecture is the most effective and efficient to tackle climate change (content related), but rather because multilateralism has attained a degree of legitimacy to govern a common such as the environment is (process related).

The second set of benefits refers to the effective capacity of IOs to engage (at different degrees, ranging from non-opposition to actual commitment) the parties in cooperative behaviors and convergence of national policies to internationally agreed goals (usually endorsed with the unanimity principle). This core attribute has again process and content related implications. On the side of the process, it is of interest the degree to which IOs are able to establish forms horizontal (intra-state) and vertical (inter-state) forms of institutional coordination. Concerning the content of states engagement, the matter is reflected in the capacity of IOs to mobilize MSs to a common strategy for development –i.e. the SDGs, providing fundamentals principles of convergence to national policies.

2. Cities and IGOs

A meaningful entry point to the matter of urban development, planning and intergovernmental organizations stays in sustainable development and cities. Sustainability, and its declination of sustainable urban development is a field which both the IGOs and planning theory have faced since the 1970s since the 1972 UN Conference on the Human Environment. The planning discipline has been responsive on the matter of urban sustainability, since the early times when IGOs introduced such topic in their agendas, for example to explore the contradictions and directions of planning of cities in the mid 1990s at the crossroad among more environmentally sustainable strategies, programmes to promote the economic growth in cities, or strengthening social justice and cohesion (Campbell S. , 1996), while it should be noted that the planning debate soon moved to the urban dimensions of sustainability (i.e. (Wheeler & Beatley, 2004) for a comprehensive review) thus focusing on: land use and urban design, transportation, energy and materials use, spatial economic development, green architecture, and to the research of measures for their improvement.

The linkages between IGOs and planning were not just established on content related matters as for example debated by urban studies and planning authors over the last two

decades, both by framework contributions to build a common understanding of urban sustainability and its strategies and tools (Beatley, 1995); (Camagni & al., 1996); Wheeler, (Wheeler, 2000); (James, 2014)), as well as by more technical references providing design guidelines and reporting indicators for green cities (Beatley, 2012); (Jenks & Dempsey, 2005); (Bell & Morse, 2008). But indeed on the policy implications of sustainable urban development, and to the opportunity of intergovernmental co-operation and co-ordination.

The actions for sustainable development taken at city level are crucial to mobilize expert and sectorial knowledge and tools (i.e. planning tools) to support and implement political commitment and societal engagement (Breheney, 1992).

In the intergovernmental arena, urban development has reached the international debate in the 1980s (considering the report "Our Common Future", (1987), as the follow-up to the UN Conference on the Human Environment). The contribution of urban growth to achieve sustainable development is critical (UNECE, 2012).

Since the first decade of the XXI century the majority of world population lives in cities. (UNDESA, 2014) reports 54% of global population to live in cities (2014). It is important to recall that urbanization and agglomeration processes, trough their spatial dimension, generate economic and social benefits, innovation and societal progress.

Urban dynamics, in fact, touch all the four areas of sustainability, including culture -urban governance as additional pillar to the traditional three (social, economic and environmental). In addition, the spatial and physical dimension of urban structures, are rather rigid and characterized by long lifecycles. This put the stake of decision makers on sustainability of cities, and also on the opportunities for building sustainable human settlements (United Nations, 2012). The latter also recognise that the building of a "green" city is equivalent to the building of sustainability (Beatley, 2012).

It is important to note that the opportunity to effectively make the best use of urban development trends is often put at risk by several factors. A first element resides in the complexity of these processes, and their mutual linkages; the second, and probably most important, concerns the capability of urban governance to adequately cope with and respond to these challenges.

In 1991, the Sustainable Cities Programme (UNCHS) provided a first definition of sustainable city as "where achievements in social, economic and physical development are made to last" (United Nations Human Settlements Programme, 2002). If definition was fully in line with the Brundtland Commission definition of sustainable development¹, it is unresponsive to the need of limiting the environmental footprint of human settlements.

The preparation of Rio Conference on Environment and Development in 1992, promoted the reflection and analysis of urban conditions. UN GA resolution (A/RES/66/288, 2012), better known as Rio Declaration, has marked with a specific section the role of cities and human settlements. Points 134 to 137 of the Declaration are dedicated to the principles of urban sustainability in accordance with the three pillars of sustainable development. With the role of indicating the long term strategy, the Declaration, provided MSs with no action oriented materials; Agenda 21 too, did not explained how the principles of sustainable cities could be translated into measures. The Agenda instead, achieved positive results engaging local authorities and citizens to build awareness on the outcome of Rio Conference.

In the second part of the 1990s nations reported on the progress towards achieving more sustainable cities in the occasion of Habitat II Conference (UN Conference on Human Settlements), held in Istanbul in 1996. The conference also adopted the Habitat Agenda that still did not included climate change as one of the threats for cities (United Nations, 1997). The most recent events (World Urban Forum 2002, World Summit on Sustainable Development 2002, and Rio+20) have consolidated a framework for the achievement of sustainable cities. The framework is structured around four thematic pillars: social development, economic development, environmental management and urban governance.

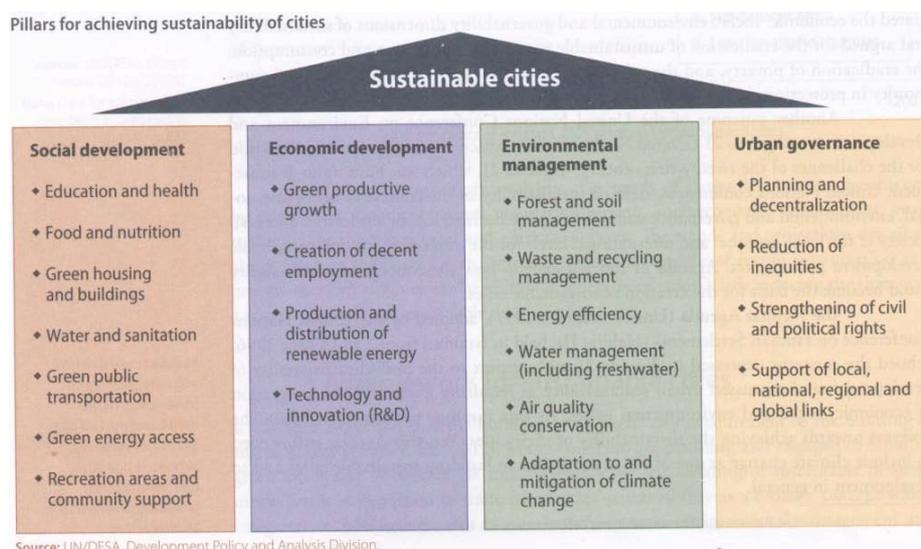


Figure 1 UNDESA Pillars for Sustainable Cities

3. Processes and IGOs Activities

In mid 2012 Rio+20 Conference gave mandate to open an inclusive and intergovernmental process on sustainable development. In January 2014 the Office of the Special Advisor of (UN) Secretary-General on Post-2015 development planning released a briefing note addressed to government representatives and IOs to update on the status and timeline of upcoming global processes (the Post-2015 Development Agenda: Process and State of the Debate, January 2014).

In the present juncture there is a rather complex and overlapping phase of preparation to several international agreements. It is however possible to try to provide a classification in clusters (figure 1).

3.1.1 Post-Rio+20 Intergovernmental process

Rio+20 conference recommended to establish an inclusive and transparent intergovernmental process on sustainable development goals under the auspices of the UN GA. The resulting Open Working Group (OWG) on Sustainable Development Goals was established in 2013 and includes over 70 MS with representation of regional groups. The group works at drafting a set of sustainable development goals, SDGs, to guide sustainable development strategies and frameworks of policy and actions in the next decades. SDGs are meant to revamp the experience of Millennium Development Goals that lacked on monitoring system, and thus on results. A High Level Political Forum on sustainable development was also established to supports the OWG with actions including guidance and recommendations

for sustainable development and follow-up and review progress in the implementation of commitments. The first meeting of the OWG held in spring 2013 considered 8 cluster themes to be included in SDGs; cluster 5 focused on "sustainable cities and human settlements, promoting sustainable consumption and production, climate". The 79th UN GA in 2015 adopted the Sustainable Development Goals, which include specific provisions for cities. Goal 11: "Make cities and human settlements inclusive, safe, resilient and sustainable" contains specific targets against which cities will be monitored.

3.1.2 *Climate change*

The United Nations Framework Convention on Climate Change is the parent treaty of Kyoto protocol. Since its adoption in 1992 signatories have met annually in Conference of the Parties (COP). COP21 successfully endorsed the Convention, which is now in the process of adoption in the countries. The main pillars include: convergence towards a common long term vision emissions cut including carbon pricing, and stakeholders inclusion and PPP to for low carbon and climate resilient development.

3.1.3 *Thematic events*

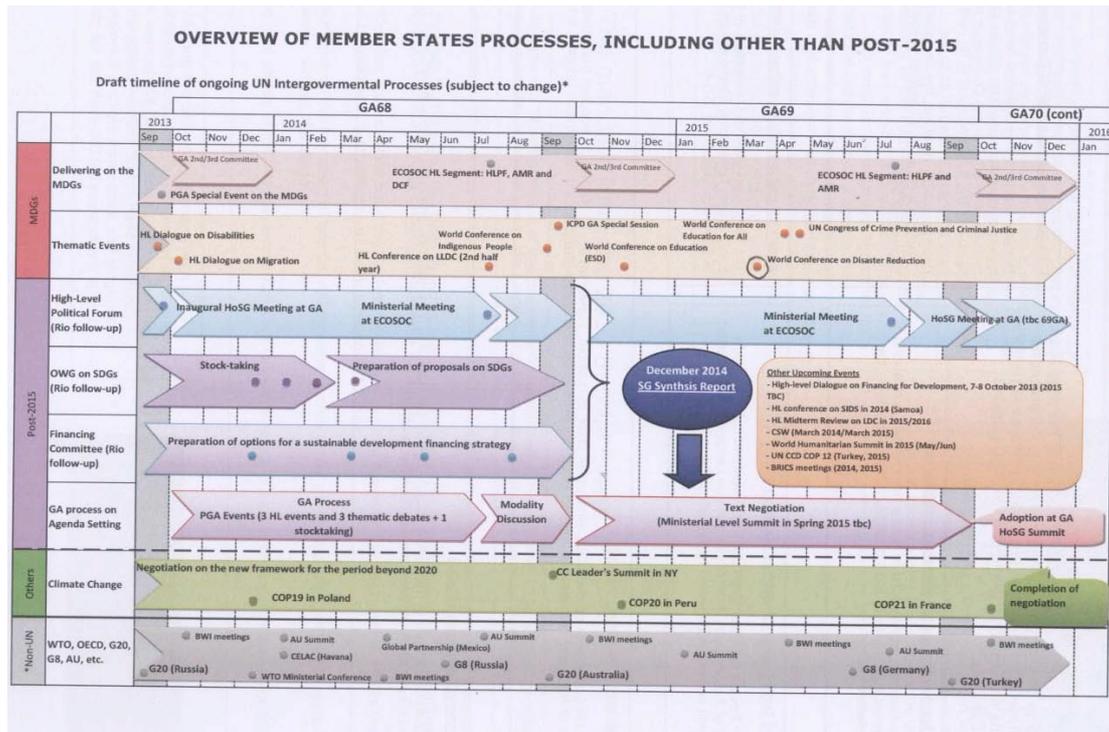
Under thematic events the outcome documents of UN Programmes are grouped.

C1) Third world conference on Human Settlements, under the leadership of UN-HABITAT, to take place in Quito, Ecuador, in October 2016.

The conference is called to deliver the New Urban Agenda (Member States and IOs contribution) and the City We Need support document (contribution of partners and stakeholders, including NGOs and major groups). H III will be the major global event on human settlements and the 5 UN Regional Commissions (ECOSOC, Europe, Latin America and Caribbean, Western Asia, and Asia Pacific) are in the process of preparing Regional Reports to provide delegates with a snapshot of challenges and priorities faced by human settlements in the regions. Regional Reports represent a good occasion for debate and research on the status of global human settlements, while the New Urban Agenda will strengthen political commitment on cities.

C2) Third world conference on Disaster Risk Reduction, under the leadership of UNISDR, that took place in Sendai, Japan, in March 2015.

The conference has adopted the Sendai Framework for Disaster Risk Reduction 2015-2030, with renewed priorities to reduce human life and economic losses as consequence of natural disasters, while improving the resilience of cities.



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First the set of processes related to the Post-Rio+20, which is entrusted to adopt the new set of Sustainable Development Goals coming to a synthesis in September 2015; second, a set of “thematic events”, part of the UN Post-2015 Development Agenda; the third track is the one of the UN Framework Convention on Climate Change; the last (not reviewed in this study) related to non-UN processes.

4. Challenges and Priors in the IGO urban development dialogue

The following section focuses on the key elements of the debate among scholars on the matter of cities and global agreements. The synthesis of the following key themes is the result of an extensive literature review of the past ten years (2015-2005) of the issue of a selected sample of journals² and is based on a few more than one hundred contributions.

A first group of elements deals with the role of local authorities and public administrations (Satterthwaite, 2008) and 2005), and the patterns of engagement/exclusion in decision making of stakeholder groups, especially those identified as the target groups and implementation stakeholders of the global strategies.

Several contributions and arguments in the global debate on development agenda used to focus mostly on macro elements, i.e. large increases in international co-operation and aid, debt relief/loans or national poverty reduction strategies, while the most exposed level of implementation stays at city level, in the role of local authorities and the required changes at public administrations in sectors such as: urban infrastructures (i.e. water and sanitation, health care and education), financing and land management. The effectiveness and efficiency of local services and decision-making processes and the capacity to raise and spend money to improve citizens' welfare is considered the key aspect to make the difference between either unsuccessful/partial implementation and temporary results (within the window of

foreign or international assistance) or improved and long term capacity of local stakeholders and public bodies in the delivery of projects.

Local authorities and their decisions are the deal of the executive steps for investing international funds to transform comprehensive policy goals, such as those of the SDGs, into concrete actions and projects on the ground to end poverty, improve sustainability and offer adequate living conditions to most.

Next to the role of local authorities, a critical issue of sustainable urban development as conceived in intergovernmental arena, is the patter of interaction, and certainly inclusion/exclusion of stakeholders to the latter processes.

The direct consequence of the latter two elements can be explained referring to the contribution of (Lefebvre, 2012) on the role of local authorities (an implementation player) in the preparatory phase of global agreements. Taking as example the climate change agreements, cities are key players given the density and spatial organization of consumption facilities (i.e. buildings, transport networks, goods consumption), the need of local coordination to implement emission reduction plans, and third because the endeavours to limit climate change may not be only concentrated at high levels (i.e. state level) but requires control and engagement of an intermediate institution. However, the same agreements does not contain binding obligations directly upon cities. The institutionalization of city involvement has followed two main directions: the first, related to the legal status of cities in negotiations, the second to the contribution of cities to climate change agreements. While the climate change agreements (Kyoto and UNFCCC) attribute to cities an important role and responsibility in addressing climate change, there are difficulties for cities to join the negotiations in a substantive way. Cities are faced by three main concerns, first to be recognised for their critical role in achieving GHG emissions reductions; second to be supported in their actions ranging from capacity building to carbon finance and technology transfer; third to be included in consultations and negotiations on climate related policy formulation.

The difficulties of cities inclusion are multifaceted. On one side the demand of cities is to add a new category of stakeholders at a new level of power to overcome the contradiction expressed above: cities are meant to be important by the agreements but the assistance to this level for implementation and the role of these actors in negotiation is not institutionalized or substantially formalized. On the other side, following the second direction hinted above, the nature of cities involvement is limited to the capacity of cities to act on specific climate related target (and therefore the capacity of local authorities to coordinate with national commitments and pursue long term strategies, often conflicting with the logics of mayors' selection), the limited scope and territorial extension of cities, but is also rooted in the UNFCCC preamble. With respect to these difficulties, a fundamental role is played by associations and city networks such as ICLEI, UCLG and Metropolis that strive to tighten the gap between global norms and local level, and therefore between policy making and implementation.

However, it is important to point out that to the past cycle of intergovernmental agreements with attention on cities lacked of a strong involvement of local authorities and clear targets for cities. The new season of documents, first of all the new set of Sustainable Development Goals, include specific goals for cities and a wide consultation process is taking place involving all societal sectors. It is partially disappointing to point out that the selected journals over the considered time frame did not host any disciplinary debate on the 2030 Agenda or related agreement.

The second group of issues, certainly not independent from the first set, deals with the links between planning and IGOs as institutions and in the ways in which IGO provisions are shaping the planning discipline, and may lead to a disciplinary renewal.

The content of intergovernmental agreements and the global norms, might not be necessarily so effective and relevant for planning, but these agreements have a quite marked “distinctive urban character” and could be seen as occasion to strengthen the relations between “global norms and planning forms”, therefore to align planning practices to the need of environmental sustainability, poverty eradication expressed and the capacity of IGOs to drive “international socialization” around priority themes (Giovannini, 2008); (Finnemore & Sikkink, 1998). Global agreements in fact can be identified as “global social contract” to put into question some vicious forms of planning and urban development that have generated the urban problems the agreements try to revert (i.e. inadequate living conditions in slums, lack of urban infrastructure and access to basic services for some resident groups, environmental risks and low environmental performance of settlements etc.). Norms in international contexts refer to the ideas, principles and moral values and standards of state behaviour defined as rights and obligations (Krasner, 1983) developed in a context where states aim at maximising their own ability to maximise domestic pressures while minimizing the adverse consequences of foreign development (Axelrod, 1986).

The intergovernmental arena is also challenged by emerging collective expectations of states' behaviour, especially to address the matters where a single state lack of interpretation capacity, legitimation or simply scale capacity. This matter has mostly to do with international institutions and the procedures of international regimes, given the different levels and degrees of normative standard capabilities and agenda setting influence (Simmons & Martin, 2002).

The importance of socialization and agenda setting is also related to the capacity of IGOs to introduce new, or gather efforts and commitment on, topics in the field of common goods management, like the environment and accordingly to sustainability (Ostrom, 1990). Some authors in the field of international relations and political science consider IGOs as drivers of “norm cascades”, referring to the escalation of consensus on some new positions, transforming into “standard behaviour”, as consequence of a growing number of states adopting or supporting agreements at international level, i.e. on climate policy or on human rights (Wendt, 1999), (Finnemore, 1996); (Katzenstein, 1996). This argument plays a relevant role in the field of agenda setting, especially considering the impact of global norms on national contexts.

While the role of local NGOs and CSOs is acknowledged to increase the effectiveness of project design and implementation and to better catalyse development assistance funds made available by development banks, the local deal for meeting the global agreements is made by the public administration sector. This argument is made by two levels (partly related to the first set of issues identified above): first, the authorities need to improve their responsiveness in the administration procedures to operationalize projects, allow practices and initiatives, but also to monitor services delivery by making basic service providers more accountable. This first aspect requires the development of new and stronger local organizations skills for urban management. Second, the groups of poor citizens and their organizations – i.e. the federations of slum dweller, should be fully considered in the decision-making process and actual driver of projects for change. These two, major, changes called by Satterthwaite (2008) would allow to facilitate the evolution of development

assistance to a more close-to-poor level and empower local development assistance organization to implement projects to improve quality of life of urban poor – the main goal of MDGs. This framework, where local authorities can manage and address local transformations and grassroots associations can propose initiatives and implement them, reverts the traditional “foreign” development assistance based, first on state level debt relief mechanisms, development banks and NGOs that are supposed to be less familiar with local contexts and less keen to develop specific place based responses to poverty in disadvantaged urban situations.

These changes would open up to the opportunity to innovate the way in which development assistance is delivered, rather than only in the ways it is conceived in IGOs arenas.

Another important argument is introduced by Neuman (2012); he refers to planning as an applied field of politics and sociology in which planning governance is strongly bound to institutional settings, agendas and political cycles meant to inspire, adopt and set the procedures of the planning process, whereas the institution is defined as the structure able to order social behaviour according to accepted norms and therefore to improve the effectiveness of cooperation on spatial planning aspects in institutional settings.

The lack of effective intergovernmental coordination for spatial planning and growth management is frequently cited (Albrechts, Alden, & ., 2001), (Alexander E. , 1993), especially considering that planning lies between broad social arrangements –i.e. markets and governments, and single organizations – i.e. municipal planning agency, has specific spatial polity – i.e. a city, region or state, and it is configured as a multiorganizational construct spanning several spatial scales (Neuman, 2012). The latter linkages between planning, institutions and sustainability have been further explored by Steele (Steele, 2011). While a broader study on institutional changes in the face of sustainable development has been proposed by Connor and Dovers (2004) and argued about an intensification of institutional changes – quasi incremental, rather than deep institutional reforms; Steele, focuses on the institutional approach to planning. First he argues that planning for sustainability promoted the shift of planning systems and plans to more performative and “strategic flexibility”– rather than conformative, settings. Furthermore the recent institutionalism studies surfaced the role of decision-making patterns, especially with regards to spatial strategy making in complex and evolving governance landscapes. Steele also introduces the emerging “strategy making for sustainability” developed under the influence of the studies of Healey (2007) on spatial strategy making and Connor and Dovers (2004) on institutional changes to address sustainability (reflecting on the institutional accommodation of a sustainability discourse, normative change, legal change, and international law and policy as driver).

A last important element on planning and institutions, by Matthews (2013) (building on Faludi (2000), Forester (1989) and Alexander (2005)), attributes to planning a key function to bridge between territorial transformations and the compliance with, and implementation of, intergovernmental agreements on sustainable development. Planning involves the coordination of development activities and the governance practices for developing and implementing strategies and policies determining the location, timing and form of development; more precisely “planning regimes act to regulate development activities and [...] the social outcomes relate to the institutional governance of spatial and land use development” (Matthews, 2013).

Often times, as noted by Connor and Dovers (2004), institutions are able to incrementally or radically evolve to set the enabling conditions to cope with emerging needs, therefore to facilitate planning procedures and responses. According to this perspective planning assumes a connotation of public tool to be deployed for addressing the priorities of governments and administrations (i.e. those included in development strategies). Given this framework and the attention paid by IGOs to our discipline the responses shall be adequate. The linkages between politics, government priorities and urban development determines much of the capacity and interest to develop public-public partnerships (horizontal and vertical integration and coordination of public authorities, bodies, and financing institutions) and design urban development programmes.

5. Uncertainty and difficulties of planning as of today

Urban planning is a very wide field of theories and practices. The traditional birth of planning dates back to the XIX century, in response to the unhealthy³ and unsafe⁴ human settlements conditions generated by the rapid growth of industrial cities, especially in Europe.

Effectiveness, over time, of statutory systems has been put into question (Healey P. , 2009) for at least two main reasons. First, rigid systems proved to be only partially able to respond and capable to adapt to urban dynamics. Second, the governance of these latter processes became dominant over the traditional responses provided by planning documents.

Urban planning, and its traditional tool, the plan is a specific type of public activity to regulate, address and coordinate the transformations of a given territory (Moroni, 1999).

Traditionally, urban planning practices, especially in some parts of the world, were based on statutory documents (the city plan) to address simultaneously mid-term development provisions, and procedures to manage urban transformations.

Planning systems may considerably vary across countries, being strongly related to the States' organization, levels of power and degree of decentralization.

Urban plans are regulatory instruments and consist of public acts regulating behaviours for the use and transformation of land. Decisions dealing with land-use are intrinsically conflictual (Forester, 1987).

Contemporary city making often requires procedures and instruments that city plans do not manage at their best. The increasing need of flexibility in planning documents and the opening to discretionary planning systems has surfaced a governance and policy dimension of planning. The complexity accompanying the territorial development process has reduced the urban plan to *one among many* tools to be deployed.

In addition, the focus of planning moved towards a territorial development approach, in which the process of governing a territory was conceived as the action-oriented interaction among groups of stakeholders (including social groups, institutions, and economic forces) to address a collective problem (Magnaghi, 1981).

This dimension, reminding that territorial development decisions cannot be reduced to planning acts (the plan), required a much stronger integration, interaction and coordination between the state (and its level of powers), society (involving stakeholders participation in the decision making process) and the public administration (as coordinator of the planning process) (Palermo, 2009). The discipline evolved towards three main streams, the one of urban policy, the governance dimension and the spatial planning paradigm.

³ Lack of urban infrastructures (i.e. sewages)

⁴ Built-up patterns were often prone to fires

6. Planning and IGO today

The evolution of planning practices towards the harmonization and strategic synthesis of territorial strengths into development strategies has built a very strong connection between the discipline and IGOs activities. Several IGOs in fact have specific competences in the development, policy and governance fields. The degree of competences and enforcement capacity is considerably variable. Most of these organizations act under the principles of intergovernmentalism (Garrett & Tsebelis, 2001) and therefore might have limited binding/enforcing powers with respect to sovereignty and authority of national states.

For example most public policies, are part of the world of overlapping powers within the global and regional (such as European) governance in the making: municipalities, metropolitan authorities, regions sometimes, federal states or autonomies, the nation state, the EU and sometimes the OECD urban group, the UN (Habitat Summit) with international rules comprising environmental norms, can all play a role in urban policies (Le Galès P. , 2011).

Le Galès (*ibid.*) reports an endless number of urban and territorial policies being shaped at international level. This reflects the relevance of commitment taken by the international communities on programmatic and long term-strategic agreements. Accordingly, the stake of decisions included in international agreements described earlier, do play a substantial role for the future of urban policy and territorial development trends, as those will set the principles of national policy alignment/*convergence*. This element if endorsed by national planning associations and practitioners, and by national government (as signatories of the global agreements) can drive a major change in the planning discipline, overcoming disciplinary failures to reframe its discourses.

IGOs in synthesis prove to be effective in the broad patterns of interaction states build to overcome the trade-offs between interdependencies and co-operative behaviour and interdependence costs of autonomous action (Ruggie, 1998).

By consequence, the room of intergovernmental co-ordination is rooted in the trans-boundary policy interdependence, and most of all in the externalities produced by national policies and behaviour, for example with regards to environmental impacts.

What is more, the achievement of global targets (i.e. SDG 11: make cities and human settlements inclusive, safe, resilient and sustainable) goes hand in hand with national policy commitments. This nexus is strongly rooted in the subsidiarization of public policies (Kazepov, 2008); the Treaty of the European Union, C 326/15 –principle 4) and in the nature of the level of challenges to be addressed. Individual and un-coordinated actions in the field of climate change would deliver limited and unfair payoffs to individual states. The capacity of sub-national governments to make the right investments and deliver public services for both growth and inclusion remains a core issue in development efforts (OECD, 2009), (2011)). Other than the challenges of policy co-ordination within and among states, a relevant point of concern (Stead & de Jong, 2009)) considers the possibility of policy transfer across countries.

The objective of these efforts can be resumed into two main families: the first, which targets are developing countries, tends to promote the translation of the operational principles (i.e. allocation of competences, policy design principles, etc.) into the institutional and planning reforms. These efforts are intended to set the systemic conditions to develop effective, sound and well functioning territorial development policy and planning. The second target group is represented by the wide set of countries in which planning is already institutionalized and

part of public policy, but where efficiency of the system can be improved by promoting improved co-ordination of levels of power and enhance the institutional capacity of problem setting (Dente, 2014).

In addition, the intergovernmental framework for territorial policy can boost the convergence of national policies to achieve supra-national targets (i.e. territorial cohesion in the EU, or sustainable development in a global context).

Furthermore, next to the capacity to support MSs in policy, institutional challenges, and project implementation, IGOs can host the negotiation of intergovernmental agreements that set programmatic strategies to which MSs align national policies; this is the case of UNFCCC, SDGs, Post-2015 framework for DRR and Habitat Agenda.

The unmanaged urbanization occurred in several developing countries over the last half century has posed serious challenges to social equity prior to the ones related to unsustainable settlement environmental footprints. This fundamental element has given the mandate to the world polity to consider the urban implications of sustainable development. Much of the IGO debate on cities however remains at policy input level and at international development assistance, this latter often put into question for being rather far to real problems on ground and providing some aids in the field of finance (i.e. debt relief) instead to act on local capacity to coordinate and manage the development process itself, as noted in the limitations related to local authorities capacities.

Regional institutions are able to strongly shape the nature, content and impact of global agendas while the local level keeps the lead for implementation.

IGOs have in fact increasingly addressed the matters of –sustainable- urban development with measures targeted at city level or dealing with cities, shifting from policy integration to some degrees of spatial focus. Given this framework cities become the target but also a stakeholder of these processes, while their inclusion in global decision making has reached in the 2030 Agenda (and related thematic agreement) a notable degree.

This is particularly evident when the global politics of sustainability in the urban age is concerned. City diplomacy refers to the “institutions and processes by which cities, or local government in general, engage in relations with actors on an international political stage with the aim of representing themselves and their interests to one another” (Pluijm, 2007). The transformations in the contemporary diplomacy are mostly due to globalization processes and their clearly distinctive urban implications, which have led to the fading of national boundaries and to a redistribution of responsibilities between states and non-state diplomatic actors. Patterns of interaction and actors of the urban intergovernmentalism have consequently changed, however with the difficulty of several IGOs –UN-Habitat and UNDP first and a set of other IGOs given limitations in the IO mandate, to engage and get into cooperative relations with cities. Some forms of cities coordination networks, i.e. UCLG, ICLEI and C40 have supported the consolidation of new forms of decentralization of international relations towards the city level.

Next to this tendency it also emerges a strong emphasis on a comprehensive and integrated approach to spatial planning both supported by organizations' studies on policy coordination and cooperation and by some other reflections within the planning theory. These converging positions match to sectorial forms of coordination, i.e. on sustainable urban development, by setting common goals and intermediate targets and establishing formal forms of partial coordination (where countries commit to cooperate in achieving certain targets but may aim at other targets uncooperatively). Spatial planning therefore emerges as a public tool to put

into coherence sectorial policies with a clear spatial focus, with this tool development agendas are translated into a spatial dimension and into actions at local level. Given this framework planning is strongly concerned in the adaptation and translation of policy goals defined at international level to a more manageable dimension of action, the city.

7. Conclusion

From a disciplinary planning perspective it is important to be aware of the great trust being paid by IGOs on human settlements as key location to win development goals. It is also fundamental to acknowledge the amount of urban related debate, policy making and monitoring that is taking place at intergovernmental level, planning stakeholders, necessarily shall contribute to these efforts.

Indeed planning tools are required to deliver and perform as the challenge is win or lost in cities, where planning instruments are focused. The mobilization of an unprecedented political commitment, societal engagement, funding and partnership around cities and urban development put urban professional at the very core of the 2030 Agenda. On the planning side, however the uncertainties and the series of unsuccessful results of the last century cannot be neglected.

Certainly, much of the implementation capacity stays at the national and local levels, where domestic legislation to manage urban planning practices must be efficient and under the supervision of trained, efficient and accountable professionals. The UN-Habitat Guidelines for Urban and Territorial Planning can support public administrations and national governments to facilitate the reforms and therefore to align to the need of the discipline to effectively catalyze the global momentum, its financing and commitment to start a new season of sustainable urbanization and to deliver adequate living conditions and quality of life for all.

Endnotes

¹ Sustainable development: development that meets the needs of the presents, without compromising the ability of future generations to meet their own needs (Report of the World Commission on Environment and Development, 1987).

¹ The literature review of urban planning journals has first developed from the current ranking of journals as provided by SCImago Journal and Country rank. The selection of the sources based on journals' impact factor (in 2014) intended to point out two set of issues: first, whether and to what extent the most cited journals publish contributions dealing with the activities of IGOs and therefore which is the attention paid by planning debate to IGOs; second, which attention has the planning debate paid over the last ten years on the activities and provisions of IGOs on cities and human settlements, and especially which kind of debate has flourished, if any, in concomitance of milestones of intergovernmental agreements regarding cities. Given their impact factor, the Journal of Urban Economics and the International Journal of Urban Education and Research have been chosen.

A second set has been driven by geographical focus, therefore the journal selection accordingly considered: the Journal of the American Planning association and Planning Theory and Practice. An additional set of three journals intended to explore an eventual attention of more sectorial publishers towards the themes of interest to this study, it was accordingly chosen: the Journal of Planning Education and Research, Environment and Urbanization and Regional Science and Urban Economics. A final set of additional journals has been considered. The complete study is contained at

https://www.politesi.polimi.it/handle/10589/113103?mode=full&submit_simple>Show+full+thesis+record

- **Bibliography**

- A/RES/66/288. (2012). *Resolution adopted by the General Assembly, Annex: The future we want*. Rio .
- Ackermann, F. (2009). *Can We Afford the Future? The Economics of a Warming World*. Zed Books.
- Albrechts, L., Alden, J., & ., & A. (Eds.). (2001). *The changing institutional landscape of planning*. Aldershot, UK: Ashgate.
- Albrechts, L., Kunzmann, & Healey. (2003). Strategic Spatial Planning and Regional Governance in Europe. *Journal of the American Planning Association* , 69 (2), 113-129.
- Alexander, E. (1993). Interorganizational coordination: Theory and practice. *Journal of Planning Literature* , 7 (4), 328–343.
- Alexander, E. R. (2005). Institutional transformation and planning: From institutionalization theory to institutional design. *Plannig Theory* , 4 (3), 2009-223.
- Axelrod, R. (1986). An Evolutionary Approach to Norms. *The American Political Science Review* , 80 (4), 1095-1111.
- Beatley, T. (2012). *Green Cities of Europe: global lessons on green urbanism*. Washingto D.C.: Island Press.
- Beatley, T. (1995). Planning and sustainability: The elements of a new (improved?) paradigm. *Journal of Planning Literature* , 9 (4), 283-295.
- Beckfield, J. (2008). The Dual World Polity: Fragmentation and Integration in the Network of Intergovernmental Organizations . *Social Problems* , 55 (3), 419–442.
- Bell, S., & Morse, S. (2008). *Sustainability Indicators Measuring the Immeasurable?* London: Earthscan.
- Ben-Joseph, E., & Szodt, T. (Eds.). (2005). *Regulating Place*. New York: Routledge.
- Breheney, M. (Ed.). (1992). *Sustainable development and urban form*. London: Pion Limited.
- Camagni, R., & al., e. (1996). *Economia e Pianificazione della Città Sostenibile*. Bologna: Il Mulino.
- Campbell, H. (2012). Planning Ethics and the Rediscovering of the Idea of Planning. *Planning Theory November* , 11, 379-399.
- Campbell, S. (1996). Green Cities, Growing Cities, Just Cities?: Urban Planning and the Contradictions of Sustainable Development. *Journal of the American Planning Association* , 62 (3), 296-312.
- Cohen, M. (2014). The City is Missing in the Millennium Development Goals. *Journal of Human Development and Capabilities* , 15 (2), 261-274.
- Connor, R., & Dovers, S. (2004). *Institutional Change for Sustainable Development*. Cheltenham, UK: Edward Elgar Publishing .
- Cortell, J. D. (2000). Understanding the Domestic Impact of International Norms: A Research Agenda. *International Studies Review* , 2 (1), 65-87.
- Cullingworth, B., & Nadin, V. (2006). *Town and Country Planning in the UK*. Oxon: Routledge.
- d'Albergo, E. (2010). Urban issues in nation-state agendas: a comparison in Western Europe. *Urban Research & Practice* , 3 (2), 138 — 158.
- Davidoff, P. (1965). Advocacy and Pluralism in Planning. *Journal of the American Institute of Planners* , 31 (4), 331-338.
- Dente, B. (2014). *Understanding Policy Decisions*. Dordrecht: Springer.
- Doran, P., & Zimmermann, M. (2009). Examining the Scientific Consensus on Climate Change. *EOS* , 90 (3), 22-23.
- Dunn, W. (1993). Policy Reforms as Arguments. In F. a. Fisher (Ed.), *The Argumentative Turn in Policy Analysis and Planning* (pp. 254-290). London: UCL Press.
- Fainstein, S. "New Directions in Planning Theory" *Urban Affairs Review* (Sage) 35, no. (2000): 451-478.
- Faludi, A. (2000). The performance of spatial planning. *Planning Practice and Research*,. *Planning Theory and Practice* , 15 (4), 299-318.
- Finemore, M. (1996). *National Interests in International Society*. New York: Cornell University).
- Finemore, M., & Sikkin, K. (1998). International Norm Dynamics and Political Change. *International Organization* , 52 (4), 887-917.
- Forester, J. (1987). *Planning in the Face of Conflict* (Vol. Journal of the American Planning Association).
- Forester, J. (1989). *Planning in the face of power*. University of California Press.
- Friedmann, J. (2008). The Use of Planning Theory: a bibliographic essay. *Journal of Planning Education and Research* , 28 (2), 247-257.
- Garrett, G., & Tsebelis, G. (2001). The Institutional Foundations of Intergovernmentalism and Supranationalism in the European Union. *International Organization* , 55 (2), 357-390.
- Giovannini, F. (2008). Towards an Intellectual Leadership: Rediscovering the Role of the United Nations in the 21st Century. In *Planning Theory and Practice, interface*, 9;2 (pp. 254-260).
- Habermas, J. (2001). *On the Pragmatics of Social Interaction*. Boston: MIT Press.
- Harvey, D. (1989). From Managerialism to Entrepreneurialism: The Transformation in Urban Governance in Late Capitalism. *Human Geography* , 71 (1), 3-17.

- Healey, P. (1997). *Collaborative Planning: Shaping places in fragmented societies*. London: McMillan.
- Healey, P. (2009). In Search of the "Strategic" in Spatial Strategy Making. *Planning Theory & Practice*, 10 (4), 439-457.
- Healey, P. (2007). *Urban Complexity and Spatial Strategies: Towards a Relational Planning for our Times*. New York: Routledge.
- James, P. (2014). *Urban sustainability in theory and practice: Circles of sustainability*. New York: Routledge.
- Jenks, M., & Dempsey, N. (2005). *Future Forms and Design for Sustainable Cities*. Oxford: Elsevier Architectural Press.
- Jessop, B. (2004). Multilevel Governance and Multilevel Metagovernance. Changes in the EU as integral moments transformation and reorientation of contemporary statehood. In I. & Bache, *Multi-Level Governance* (pp. 49-74). Oxford: Oxford University Press.
- Katzenstein, P. (. (Ed.). (1996). *The Culture of National Security. Norms and Identity in World Politics*. New York: Columbia University Press.
- Kazepov, Y. (2008). THE SUBSIDIARIZATION OF SOCIAL POLICIES: ACTORS, PROCESSES AND IMPACTS'. *European Societies*, 10 (2), 247 — 273.
- Kim, A. "Unimaginable Change, Future Directions in Planning Practice and Research About Institutional Reform." *Journal of the American Town Planning Association* (Taylor & Francis) 77, no. 4 (2011): 328-337.
- Krasner, S. (1983). *International Regimes*. Ithaca, NY: Cornell University Press.
- Lefebvre, B. "Incorporating cities into the post-2012 climate change agreements." *Environment and Urbanization* (Sage) 24, no. 2 (2012): 575-595.
- Le Galès, P. (1998). *Regulations and governance in European cities* (Vol. The new Blackwell companion to the city). Joint Editors and Blackwell Publishers Ltd .
- Le Galès, P. (2011). *Urban Governance in Europe: What Is Governed* (Vol. The New Blackwell Companion to the City). (G. B. Watson/Wiley-Blackwell, Ed.) Oxford: Wiley-Blackwell.
- Magnaghi, A. (1981). *Il Sistema di Governo delle Aree Metropolitane*. Milano: Francoangeli.
- Matthews, T. (2013). Institutional perspectives on operationalising climate adaptation through planning. *Planning Theory and Practice*, 14 (2), 198-210.
- Mazza, L. (2004). *Prove Parziali di Riforma*. Milano: Angeli.
- Marcuse, P. *The Three Historic Currents of City Planning*. Edited by G. Bridge and S. Watson. Vol. The New Blackwell Companion to the City. Oxford: Wiley-Blackwell, 2011.
- Moroni, S. (1999). *Urbanistica e Regolazione: la dimensione normativa della pianificazione territoriale*. Milano: Francoangeli.
- Neuman, M. (2012). The Image of the Institution, A Cognitive Theory of Institutional Change. *Journal of the American Town Planning Association*, 78 (2), 139-156.
- OECD. (2009). *How Regions Grow: trends and analysis*. Paris: OECD Publishing.
- OECD. (2011). *OECD Regional Outlook 2011: building resilient regions for stronger economies*. Paris: OECD Publishing.
- OECD. (2010). *OECD. 2010. Regional Development Policies in OECD Countries*. OECD. Paris: OECD Publishing.
- Ostrom, E. (1990). *Governing the Commons*. Cambridge University Press.
- Palermo, P. (2009). *I Limiti del Possibile*. Roma: Donzelli.
- Palermo, P. (2004). *Trasformazioni e Governo del Territorio*. Milano: Francoangeli.
- Palermo, P., & Ponzini, D. (2010). *Spatial Planning and Urban Development* (Vol. 10). Dordrecht: Springer.
- Pluijm, R. van der. "City diplomacy: the expanding role of cities in international politics." *Clingendael Diplomacy Papers No.10* (Netherlands Institute of International Relations), 2007.
- Ponzini, D. (2008, December). New Italian Perspectives on Urban Planning: A Policy Tool Approach. *Planum* .
- Rein, M., & Schön, D. (1993). Reframing Policy Discourse. In F. Fisher, & J. Forester (Eds.), *The Argumentative Turn in Policy Analysis and Planning* (pp. 145-166). London: UCL Press.
- (1987). *Report of the World Commission on Environment and Development: Our Common Future*. Annex to document A/42/427 - Development and International Co-operation: Environment, Oxford University Press.
- - Roy, A., F. Giovannini, and B. Chaturvedi D. Satterthwaite. "Global Norms and Planning Forms: The Millennium Development Goals Towards an Intellectual Leadership: Rediscovering the Role of the United Nations in the 21st Century The Central Role of Local Organizations in Meeting the Millennium Development Goals (MDGs) The Story of Chintan." *Planning Theory & Practice* (Routledge) 9, no. 2 (2008): 251-274.
- Ruggie, J. (1998). *Constructing the World Polity: essays on international institutionalization*. Routledge.
- Salet, W. F. (2000). *The Revival of Strategic Spatial Planning*.
- Sartorio, F. (2005). Strategic Spatial Planning A Historical Review of Approaches, its Recent Revival, and an Overview of the State of the Art in Italy. *disP - The Planning Review*, 41 (162), 26-40.

- Satterthwaite, D. (2008). The Central Role of Local Organizations in Meeting the Millennium Development Goals (MDGs). In *Planning Theory and Practice, interface*, 9;2 (pp. 260-267).
- Simmons, B., & Martin, L. (2002). International organizations and institutions. In *Handbook of International Relations* (Vol. Chapter 9). London: Sage.
- Stead, D., & de Jong, M. R. (2009). *West-East Policy Transfer: the case of urban transport policy*.
- Stead, D., & Meijers, E. (2009). Spatial Planning and Policy Integration: Concepts, Facilitators and Inhibitors. *Planning Theory & Practice*, 10 (3), 317-332.
- Steele, W. (2011). Strategy-making for Sustainability: An Institutional Learning Approach to Transformative Planning Practice. *Planning Theory and Practice*, 12 (2), 205-221.
- Susskind, L. &. (1999). *Breaking the Impasse: Consensual approaches to resolving public disputes*. New York: Basic Books.
- UNDESA. (2014). *World Urbanization Prospect 2014*. UNDESA.
- UNECE. (2012). *Climate Neutral Cities: How to make cities less energy and carbon intensive and more resilient to climatic challenges*. Geneva.
- UNECE. (2008). *Spatial Planning - Key Instrument for Development and Effective Governance*. Geneva: UNECE.
- United Nations Human Settlements Programme. (2002). *Sustainable Urbanization: achieving Agenda21*. Dept. for International Development, Nairobi.
- United Nations. (1997). *Report of the United Nations Conference on Human Settlements (Habitat II)* (Vol. Chap. I Resolution I). Istanbul.
- United Nations. (2012). *The Future We Want, Outcome document of the United Nations Conference on Sustainable Development*.
- Wendt, A. (1999). *Social Theory of International Politics*. Cambridge Studies in International Relations.
- Wheeler, S. (2000). Planning for Metropolitan Sustainability. *Journal of Planning Education and Research*, 20, 133-145.
- Wheeler, S., & Beatley, T. (Eds.). (2004). *The Sustainable Urban Development Reader*. London: Routledge.

Growing Small Businesses in South African Townships: How planning tools can facilitate economic growth

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Abstract *This paper explores how planning tools can be used to help grow small businesses located in South African townships. It reflects on a pilot project in Langa where additional land use rights were proactively obtained on behalf of 207 property owners to allow for a range of small business land uses. The pilot project highlights the need to consider unintended financial impacts of formalisation on small businesses operating out of residential homes. These impacts include the degree to which additional rights can increase rates charged and the valuation of the property. It is argued that the financial readiness of small businesses to absorb costs and exploit benefits associated with formalisation should inform when formalisation is pursued. The financial readiness of a small business is related to multiple factors and is difficult to determine for both governments and small businesses themselves. Given these uncertainties, this paper supports a process of incremental formalisation whereby governments grant land use rights collectively through mechanisms such as overlay zones. This allows individuals to pursue further formalisation on an individual and voluntary basis; without governments having to pre-empt the readiness of small businesses to submit building plans to activate the land use rights proactively granted.*

1. Introduction

Income inequality and poverty are matters of great concern in South Africa (van der Berg, 2014). The disparity between rich and poor is also manifested in space (McCann et al, 2015). Urban poverty is concentrated in peripherally located townships that were developed as dormitory towns intended for housing a labour force; a lingering legacy of Apartheid spatial planning that divided society along racial lines. Racial segregation is being replaced by class-based segregation and hypersegregation (Geyer et al, 2016). These phenomena are economic in nature and correlated to factors such as the housing ecology rather than race; however the net result is the continuation of Apartheid-era geographies (Geyer et al, 2016).

The Post-Apartheid planning discourse has promoted spatial visions for cities yielding more equitable urban forms; however the spatial integration of South African cities has proven difficult (Harrison et al, 2008; McCann et al, 2015). The livelihoods of those living in townships often rely on informal systems of tenure and employment (McCann et al, 2015). Varying degrees of informality are evident in townships, ranging from completely informal settlements with no formal security of tenure (where informal structures are built without access to formal services) to township areas where some form of formal housing and security of tenure exist, but with an active informal economy.

The role of the informal economy and Small Medium and Micro Enterprises (SMMEs) specifically has been recognised in the South African policy environment (COCT, 2012). South

Africa suffers from high unemployment and the National Development Plan's aspiration to create 11 million additional jobs by 2030 will be partially reliant on the creation of new - and the upscaling of existing small businesses (Fatoki, 2014; Republic of South Africa, 2012).

Micro and small businesses are classified according to inter alia, annual turnover, total gross asset value and period of existence. Micro enterprises (defined as employing less than five people) are the most pervasive entrepreneurial activity in South Africa and are expected to be an important vehicle to address challenges around job creation, sustainable economic growth and equitable distribution of income (Fatoki, 2014). Many policy makers in South Africa continue to conflate poverty and income inequality and whilst more jobs will reduce poverty, it will not solve income inequality (van der Berg, 2014). Whether micro enterprises will be the panacea for all South Africa's economic development challenges remains to be seen; however supporting small and micro enterprises in township locations is argued to be both justifiable and logical from a policy agenda seeking to create more spatially just cities. In this context, this paper aims to explore how the urban planning profession can contribute to creating preconditions for the growth and development of small and micro enterprises operating informally in township locations. It does so by reflecting on a case study in Langa, Cape Town.

2. Problem Statement

SMMEs have a high failure rate in South Africa (Fatoki, 2014) and operate in uncertain environments. Ligthelm (2010) reflects on various studies and concludes that whilst Governments and NGOs wish to intervene by assisting informal businesses to graduate into the formal realm, policies are ineffective when the objective of the entrepreneur is not growth but survival. Ligthelm's own research undertaken in a South African township find that entrepreneurial endowment and motivation of the individual entrepreneur largely dictates the survival and growth potential of the business. Despite this, the degree to which the wider regulatory environment is supportive of start-ups or informal enterprises seeking to formalise is considered important.

As part of this wider environment, municipal regulation plays a role that may either exacerbate or improve existing conditions that result from factors beyond the control of SMMEs (DPRU, 2006). Within this realm, non-financial municipal regulation such as zoning and business licensing has been identified as one of the areas likely to impact on start-ups or informal enterprises seeking to formalise. Appropriate zoning is in many cases a pre-condition to other approvals (such as a business license). The impacts of addressing land use regulatory matters are particularly important at the pre-establishment or start up phases of businesses when resources are often severely constrained (DPRU, 2006). Whilst many enterprises will continue to operate informally in township areas without being closed down due to non-compliance, it is argued that obtaining appropriate land use rights are important to the businesses seeking to grow and formalise.

One of the planning legacies in South African cities has been poor local preconditions for business development. In some cases, issues are rooted in problematic spatial structure characterised by internalised neighbourhoods and poorly located and performing business centers, which cannot take advantage of passing trade. Townships often reflect zoning that

mirrors their historic planned “dormitory” role. Despite residential properties being permitted certain micro-enterprise uses, these rights are not extensive. Many township areas reflect active and vibrant informal economies with a range of businesses operating in apparent contraction to what might be expected from viewing zoning maps of these areas. In this context, is there a role for planning to play?

The practice of urban planning in a developmental context is often partial on a territorial level and tends to abandon areas that are poorly regulated by law (Bolay, 2015). Watson et al (2013) identified informality as a contributing factor to the contrast between planners’ official intentions and the reality on the ground. Consideration of the informal sector, and particularly the trading and employment generation aspect thereof, has yet to be incorporated into mainstream planning in South Africa (Du Plessis, 2014). Where the informal sector is mentioned in spatial development frameworks (SDFs) aimed as guiding land use decision making, is not clear in how these statements might be translated into action. For instance, the Cape Town SDF offers vague statements of support for informality and SMMEs (CCT, 2012). Whilst local spatial plans might indicate progressive land uses in predominantly residentially zoned townships; such spatial plans do not confer land use rights and is therefore unable to meaningfully address regulatory barriers facing SMME operators in townships. Property owners are still required to submit individual land use applications to change their land use rights to obtain business licenses.

The impetus for business owners to obtain land use rights does not necessarily work in favour of enabling the progression and growth of these businesses. Firstly, there are costs associated with doing so and along with the time necessary to deal with the issue, the business owner may be inclined to continue to operate informally in terms of the planning regulatory environment. Secondly, land use processes may present a complex and challenging (and seemingly unnecessary) concept for business owners to deal with. Coupled with the fact that enforcement of land use regulation is generally complaints driven and this has traditionally been less prevalent in poorer areas of cities, operators will either choose not to regularise or remain ignorant of their “illegal” status from a land use perspective.

3. Case Study: Langa

With a growing focus on the potential of appropriate zoning as a possible lever to create an enabling environment for the growth of informal enterprises, the City of Cape Town (hereafter referred to as the City) decided to consider a direct intervention around individual land use rights in a township area where business uses were likely to be desirable. The potential was recognised to consider “regularizing” desirable existing informal businesses that may be in operation.

Langa Township was chosen as a pilot site. A land use survey confirmed that there were a number of existing shebeens (a South African term for taverns), restaurants and guest houses operating in an area consisting of 207 properties called the Langa Quarter. The Langa Quarter also happened to be the lead project of iKhaya le Langa; a non-profit organisation whose aims are to address particular social needs in a community through providing socially enterprising solutions. Their vision for the Langa Quarter was to transform the area into a vibrant

'responsible' tourist destination. Whilst this vision had community buy-in; many of the existing illegal businesses could not be legalized due to their residential zoning and did not have the funds to undertake individual land use applications.

3.1 Intent

The objectives of the pilot project in Langa was to test a new planning approach by initiating a process to proactively obtain land use rights on behalf of property owners in an area where the likelihood and potential for individual owners to do so was low, but where the opportunity for business growth was high. These rights were the first step in regularizing existing illegal businesses and in creating a platform for starting new legal businesses. In this context, a range of consent uses was applied for on behalf of property owners to permit restaurants, offices, boarding houses (guest houses) and service trade. It was also recognised that some businesses might need to physically expand in future or had already expanded and could benefit from an increase in the permissible floor factor from 1 to 1.5.

3.2 Challenges and process design

Several challenges emerged as part of this project. Firstly there was a concern that changing the land use rights of a property may have financial implications for property owners- both in terms of the rates they are charged and the valuation of their property (and by implication, the potential resale value of their property). In response, the City undertook investigation into this aspect with a view to understanding under what conditions these impacts would be felt and to what extent they could either be avoided or delayed.

Secondly and on a more practical level, one of the requirements of this land use application was the need for power of attorneys from the property owners to act on their behalf. This highlighted an issue around ownership that afflicts many township areas and led to challenges in terms of tracking down the legal owner of the properties. Title deeds in townships often do not reflect the correct property owner. Many residents in townships received government-sponsored houses that legally cannot be sold for the first 7 years. Informal transfers are common, resulting in a category of property owners that do not have formal title. Even in cases where government-sponsored houses have not been sold on, complications arise where multiple family members inherit a property. Title deeds therefore do not keep up with property transactions and many current property owners do not have title deeds reflecting their ownership.

It was recognized that it would be unlikely to obtain the 207 power of attorneys due to title deeds not being up to date and that the process was potentially one that required greater shared understanding. The City, with the help of iKhaya le Langa, organized preconsultation sessions with the property owners of the Langa Quarter. These sessions aimed to explain what the City intended to do (which was to give legal effect to the vision of iKhaya le Langa) and to confirm whether the City had a mandate from the community to submit an application on their behalf.

Additional public engagement sessions with the community were held to introduce abstract planning concepts and jargon related to land use rights. This was to ensure that participant could engage with the formal correspondence they would receive from the City as part of the

legal participation process of the land use application. The official formal correspondence was supplemented with “information packs” in a question and answer format, based on questions raised during the public meetings. Property owners in the Langa Quarter were presented with three options. The default option was that property owners who took no action would be included in the land use application for additional rights (which would not result in financial impacts). They could then submit building plans at a later stage to give effect to their newly obtained rights but would be under no obligation to do so.

Property owners who had existing businesses and who wanted both land use rights and an increase in floor factor (to extend their built structure beyond what was allowed in the single residential zoning) had to sign a letter of consent to acknowledge that their new rights might result in financial implication, regardless of whether they use the rights or not. Property owners who decided that they did not want any rights could write to the City to request to be excluded.

The process had to cater for different levels of participation as well as for different land use demands. Whilst the business identified in the land use survey might have been an indication of demand for a specific land use, it remained impossible to forecast the market saturation point and what the degree of take up of such land uses would be. Given uncertainties around demand, a “basket of rights” approach was followed, which included applying for five different land uses namely guest house, restaurant, office, boarding house and service trade.

The degree of uncertainty in terms of the take up of rights included in the basket of rights was problematic for the line departments who had to comment on the impact of the application from a services capacity perspective. A pre-submission meeting was held with potential commenting line departments, who were given a matrix indicating different scenarios in terms of the take up of rights. It was requested that the comment should relate to the “highest impact scenario” from their departmental perspective.

3.3 Outcome

The application was submitted in March 2014 and was approved one year later. During the public participation process, no requests for exclusion were received from the community. This outcome was greatly assisted by the partnership with iKhaya le Langa, who had a long-standing working relationship with the community and was able to provide social and physical infrastructure for the resource-intensive public participation and education sessions that were held.

Status	Land use rights for the Langa Quarter : Pre-approval	Land use rights for the Langa Quarter: Post approval
Zoning	Single Residential 2	Single Residential 2
Uses	Dwelling House Second Dwelling Utility Service Urban Agriculture Shelter House Shop Home Occupation Bed and Breakfast Home Child Care Informal Trading Any educational, religious, occupational or business purposes; with dominant residential use.	All uses permitted in SR2 plus the following consent uses: Restaurant Office Boarding House (Guest House) Service Trade
Floor factor (FF)	1	1.5 for property owners who requested additional FF and signed the letter of consent.

Table 1: Comparison of land use rights before and after the pilot project was completed

3.4 Further roll out and Small Micro Enterprise Overlay Zone

Cape Town’s new Planning Bylaw makes provision for overlay zones that can allocate rights to pre-determined spatial locations. It was proposed to introduce a Small Micro Enterprise overlay zone based on the basket of rights used in the Langa pilot project. The Small Micro Enterprise (SME) Overlay zone was approved in June 2016 and can be applied along activity routes as identified in spatial plans. The overlay zone therefore gives effect to ideas articulated in local spatial development frameworks (supporting economic development along certain roads) and in policy (supporting SMMEs). The SME overlay represents an example of how different planning tools (policy, SDFs and zoning schemes) can work together to bring about spatial change.

4. Findings related to the formalisation of Small and Micro Enterprises

4.1 Formalisation could have negative and positive financial impacts on the individual

The Langa project highlighted the need to consider unintended financial impacts of formalisation. In Cape Town, an Indigent grant ensures that property owners do not pay rates and taxes for the first R200 000 value of their property. This means that properties with a valuation below R200 000 do not pay any rates. The properties in Langa were valued at just below R200 000 and a slight increase in valuation (as a result of additional rights) could result in residents needing to pay rates. Many of these increases would be considered miniscule for the average land use applicant, but may have detrimental impacts on survivalist business’s cash flow. More importantly, whereas an increase in one’s property valuation would generally be

assumed as something positive, this is not always the case in a context where property owners have no intention of selling their property and where low property values allow property owners to qualify for the Indigent grant.

Formalisation could also have positive impacts in terms of access to credit. Having the correct land use rights is a pre-requisite for applying for business licenses, which in turn is a prerequisite for many business loans from commercial banks. Non-compliance with legislation and having something that occurs “illegally” therefore excludes business operators from accessing formal sources of finance. Further investigation into the financial impacts of this type of intervention is likely to be a useful area of enquiry.

4.2 Security of land use should be pursued incrementally

Security of land use refers to having a degree of comfort that a certain type of land use will be supported in a specific location. In the context of Langa, it refers specifically to business owners knowing that land use rights allowing their operation are supported in their current location. Whilst security of tenure impacts on the investment patterns of individuals (who are more likely to invest in properties if they do not fear eviction), it is not clear whether security of land use provides an incentive for individuals to invest in the properties out of which they operate their businesses (in most cases, their residential home). However, if there was a disincentive to invest in illegal businesses out of fear of closure, security of land use will (at the very least) neutralize such a disincentive.

There are many parallels between security of tenure and security of land use rights in terms of actual and perceived benefits of formalisation. In the case of title, De Soto’s hypothesis is that formalisation is necessary to achieve economic growth in developing countries and to access credit (Geyer et al, 2014). Critics argue that there is a lack of economic progress amongst those who have formalized and that formalisation does not necessarily guarantee access to credit (Geyer et al, 2014).

It is too soon to determine whether the security of land use rights in Langa has achieved economic growth or resulted in access to credit. Whilst the value of abstract and intangible assets such as land use rights to the individual in a township context is still uncertain, there is anecdotal evidence that the broader Langa Quarter received more corporate social investment (CSI) as a result of the pilot project. This does not directly benefit individuals; however it could result in indirect benefits for businesses operating in the Langa Quarter. Ensuring that business can comply legally by proactive changing land use rights (and therefore, providing security of land use) significantly lower the way corporations assess the risk of potential beneficiaries of CSI.

Geyer et al (2014) suggests an incremental approach to the formalisation of property titling whereby security of tenure is first achieved collectively before the individualization of ownership. This incremental approach can also be applied to the formalisation of land use rights, whereby security of land use is first pursued collectively. Both the Langa pilot project and overlay zones pursue collective land use rights. These initiatives give assurance to all small businesses, illegal and legal, that their land use is in principle supported in their current location and that if they

operate within reasonable parameters, they will not be served with closure notice. This allows government to proactively clear the first regulatory hurdle facing small businesses without having to pre-empt which businesses are survivalist and which have potential to grow and be formalised further by virtue of submitting building plans.

4.3 Formalisation should happen at the discretion of the owner and in conjunction with financial education

An important question arising from the Langa case study is how one determines when a small business is ready to absorb costs and access the benefits related to formalisation. Fatoki (2014) interviewed 33 micro enterprise operators and found that most owners do not engage in formal financial planning and only keep some books of accounts. Whilst this study had a relatively small sample size, it indicates low levels of financial literacy amongst owners of new micro enterprises. This suggests that even if a local authority could accurately calculate the exact increase in cost as a result of formalising (such as the increase in rates caused by additional land use rights, once an owner submits a building plan), not many owners would be able to assess their financial situation and determine whether they are ready. Fatoki (2014) also found that whilst respondents understand commercial banks as a source of finance, they did not understand the sources of equity finance and the requirements to obtain a loan.

Any conversation around formalisation of small businesses and the associated land use rights requirement needs to highlight the benefits of access to formal financing and promote the aspiration towards greater citizenry (paying rates and moving your property out of the Indigent valuation threshold). This presents a balanced and realistic narrative of formalisation- the owner will be responsibilities for more costs, but will have access to more opportunities to grow.

According to Ligthelm (2010), the likelihood of successful formalisation is largely based on the human factor such as the individual business owner's positively motivated business intentions and actions. This was also evident in the Langa pilot, which included businesses that were survivalist in nature as well as businesses that had won awards and had navigated complex bureaucratic processes without assistance in the same precinct. It would therefore be futile for governments to attempt to pre-empt when businesses are ready to formalise and the focus of government intervention should be limited to creating preconditions for voluntary formalisation. Governments can play a role in proactively clearing the initial regulatory hurdle on behalf of businesses and empowering owners to make an informed choice about when they are ready to undertake further formalisation (by means of submitting a building plan) based on individual circumstances.

4.4 Acceptance of informality should not be the only policy response to informal businesses

Acceptance of informality ensures that vulnerable survivalist businesses are not burdened with administrative processes and financial costs that can result in their undoing; however merely accepting informality is not helpful to other informal businesses. The absence of any attempt to create the preconditions for formalisation of informal businesses guarantees limited growth by virtue of exclusion from formal sources of finance. In this context, what is envisioned is not a process of forced formalisation (whereby operators are threatened with being closed if they do

not formalise) but creating opportunities for voluntary formalisation. Whereas Cape Town's planning policies and plans currently offer statements of support for SMMEs, this position can now be supplemented by outlining support for growing SMMEs through a process of incremental and voluntary formalisation linked to the implementation of SME overlay zones in suitable township areas.

Amin (2013) cautions against viewing poor areas exclusively through a "human potential" optic-devoid of audit by numbers and distracted by place-based biographies and ethnographies. Whilst this paper reflects on a place-based narrative around experiences in Langa, the true measure of success will be whether the basket of rights applied for in Langa can be replicated elsewhere in Cape Town by making use of the SME overlay zone. It is hoped that this paper illustrates the need to attempt to quantify the impacts of intervening in the informal economy. The Langa pilot project dealt with uncertainties relating to land use demands, land use take-up and financial readiness of businesses by allocating uncertainties to different scenarios and attempting to quantify likely scenarios. Despite the fact that quantification of such scenarios provides limited guidance (such as having no financial impact, having a potential financial impact or having a significant financial impact on the property owner), it can alert those who intervene in the informal economy of potential unintended financial impacts.

5. Conclusion

This paper investigates the role that the profession of planning can play to help clear regulatory hurdles encountered by small and micro businesses operating in townships in South Africa. A pilot project in Langa is presented as an example of how the government can proactively apply for additional land use rights on behalf of property owners. The pilot project highlights the need to consider financial impacts of formalisation- both positive and negative. Given these financial impacts and the different financial situation businesses find themselves in, it is proposed that formalisation should be pursued in an incremental manner. Suggestions include pursuing security of land use collectively- either via a project (such as the 207 property owners in the Langa Quarter) or via the new SME overlay zone (that applies to sections of streets). This allows property owners in these areas to pursue further formalisation by means of submitting a building plan as and when they are financially ready. This two-step process accommodates uncertainty around the financial readiness of businesses to formalise and uncertainty around the likely demand and take-up of specific land use rights in local areas.

References

- Amin, A. (2013) "Telescopic Urbanism and the Poor", *City*, Vol. 17, No. 4, 476-492.
- Bolay, J.C. (2015) "Urban Planning In Africa: Which Alternative For Poor Cities? The Case Of Koudougou In Burkina Faso", *Current Urban Studies*, Vol. 3, 413-431.
- City Of Cape Town (2012) "Cape Town Spatial Development Framework", Cape Town, City Of Cape Town.
- Development Policy Research Unit (2006) "Impact of Municipal Regulations on SMMEs", DPRU Working Paper 06/107.
- Du Plessis, D. (2014) "A Critical Reflection on Urban Spatial Planning Practices and Outcomes in Post-Apartheid South Africa", *Urban Forum*, Vol. 25, 69-88.
- Fatoki, O. (2014) "The Financial Literacy of Micro Entrepreneurs in South Africa", *Journal of Social Science*, Vol 40, No.2, 151-158.
- Geyer H.S. Jr, Faizel Mohammed (2016) "Hypersegregation and Class-Based Segregation Processes in Cape Town 2001–2011", *Urban Forum*, Vol. 27, No.1, 35-58.
- Geyer, H.S. And Geyer, H.S. Jr (2014) "Residential Transformation In South Africa- Reopening the Dead Capital Debate", *Urban Forum*, Vol. 25, No.1.
- Harrison, P., Todes, A. and Watson, V. (2008), "Planning and Transformation", *Lessons from the South African Experience*, London, Routledge.
- Ligthelm A. A. (2010) "Entrepreneurship and small business sustainability", *South African Business review*, Vol. 14, No. 3.
- McCann, A. And Odendaal, N. (2015), "Spatial Planning in the Global South: Reflections on the Cape Town Spatial Development Framework", Unpublished research, University of Cape Town.
- Van Der Berg, S. (2014) "Inequality, poverty and prospects for redistribution" *Development Southern Africa*, Vol. 31, No. 2, 197–218.
- Watson, V. and Odendaal, N. (2013), 'Changing Planning Education in Africa: The Role of the Association of African Planning Schools', *Journal of Planning Education and Research*, Vol. 33, 96 – 107.

Opportunities and Challenges for Urban Planning under Kenya's New Constitutional Dispensation

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Abstract

The Kenya Constitution 2010 presents a new negotiated charter for carrying out business between the state and the citizens. Urban planning as a public service and instrument for policy implementation Klosterman, 18 has received new impetus in the new dispensation having been contextualized within urban development and land use planning. Under the new constitution, urban planning is a concurrent function plan preparation, approval, implementation and review is devolved to the county governments while monitoring and oversight of land use planning is the function of the National Land Commission. This clarity in vertical separation of mandate is a major departure from the previous centralized framework of planning that resulted in glaring failure in realizing the benefits of planning. The essential questions are: how can the inherent strengths of the envisaged urban planning framework be harnessed What are the apparent challenges and how can they be resolved And what are the lessons learnt in the transition to the new framework Lessons learnt from the Kenyan example will provide useful reference to inform countries at similar levels of development.

1.0 Introduction

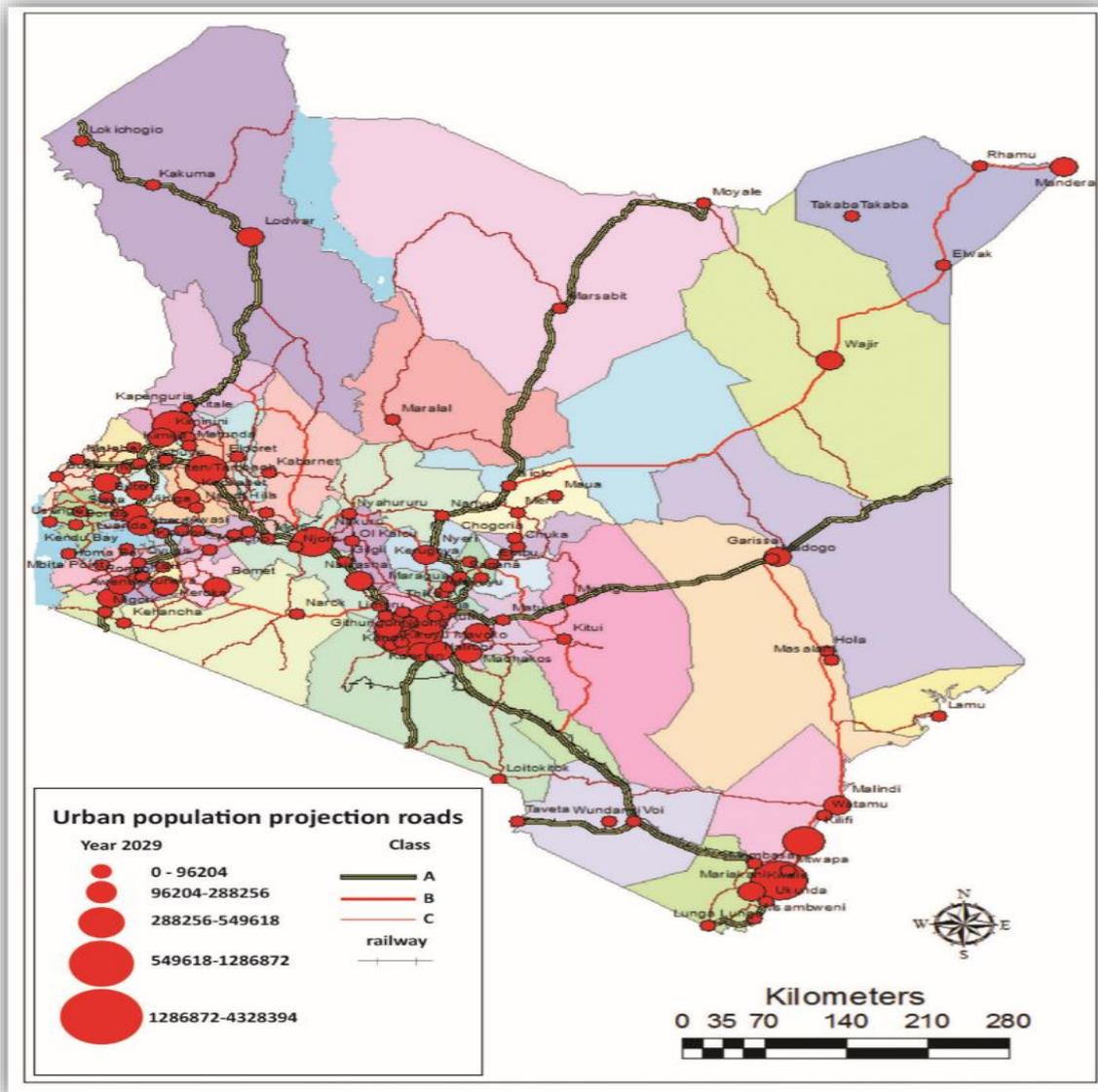
Cities and Urban Areas play a crucial role as engines of the economy as places of connectivity, creativity and innovation, and as centers of services for the surrounding areas (UN-Habitat 2011). Kenya has experienced unprecedented urban growth, at independence the urban population was about 8% while it was estimated to be about 40% in 2015. It is projected that by year 2030 at least half of the Kenyan population will be urbanized. Additionally, urban areas play a critical role in national development and contribute about 70% of the Gross Domestic Product (World Bank 2016).

To sustain and enhance this fundamental role in national development, the cities and urban areas need to be properly planned. This calls for a requisite system of planning anchored in the constitution, policy, legislation and supported by regulations and practice guidelines.

Changes in urban planning and policy need to be analyzed in relation to wider political, economic, social and environmental transformations which have been taking place in recent years (Houghton and Courcell, 2004). In Kenya significant shifts in the context of urban planning have occurred in terms of a new constitutional dispensation that has triggered changes in policy, legal,

and institutional structures. As well, the swing to the Vision 2030 national development framework has redefined the approach to and focus of urban planning.

This paper describes and appraises the previous urban planning context in Kenya, evaluates the current urban planning framework with the objective to identify the emergent opportunities and challenges. Lessons are then drawn to inform further policy and practice improvement for countries at similar level of development. The paper is based on a review of the constitution, policy and legislation against the practice of urban planning at the county level. It is also informed by focused group discussions with the County level policy makers and implementers.



2.0 Reference Frame

The discussion takes cognizant of the fact that:

“Constitutional arrangements determine, to a large extent, the respective power that different tiers of government have with regard to spatial Planning. On unitary states it is a general principle that the national government makes the law concerning spatial planning and this is then applied throughout the country. However, there is variation in the extent of delegation to lower levels” (Davoudi, et al, p.12, 2004).

There are significant variations between countries and over time in the pattern of distribution of responsibilities (Cullingworth, 1993). At one extreme, the national level merely provides enabling legislation or adjudication, allowing municipal or regional governments to develop their own approaches (USA and Australian model). At the other extreme, a national government could keep tight control over the development of the system and its practices (English model). In the British model, the scope of local authorities is defined by central government and if they act beyond their given powers, they are confronted by the principle of *ultra vires*. This contrasts with the model of the other European countries where the *doctrine of general competence* applies. Here the local authorities are assumed a general power over the affairs of communities and only when they are unable to do so higher level of government will become involved.

Bennet (1993) describes the administrative system in Britain as dual system in which central government sets legal and functional constraints for local authorities and then plays a supervisory role. Stoker (1991) describes the relationship between local and central governments in Britain as an agency model where local authorities act as agents of central government carrying out its policies within a system of regulation, laws and centrally controlled taxation and financial allocations. The separation between the spheres of local and central government has led to dual polity (Bartley, 1991) with little movement of politicians and professionals between the two tiers of government.

The Kenyan planning system was patterned on the British model as a colonial legacy. The national government articulated its policies and demanded that local planning authorities follow them in development plans and regulatory practice. Thus national government held the balance of power in defining the parameters of the regulatory system. It also held the balance of power with respect to resources for local government, enforcing progressive budget reductions and the channeling of funds through special programmes for which authorities make bids. The local planning authorities were surrounded by constraints which allowed the national government to exert a powerful influence in shaping the detail of planning practices. Central to this influence was a circular system of checks and balances.

3.0 Pre- Kenya Constitution 2030 urban Planning Framework

The Ministry of Local Government was responsible for the guidance, inspection, monitoring and coordination of Local Authorities to ensure compliance with the provisions of the law and any other regulations that may be issued to help improve the performance of Local Authorities. The oversight role of the Ministry was designed to ensure that Local Authority resources are managed properly in a transparent and accountable manner for improved service delivery. The Ministry had the responsibility to ensure strict financial discipline, through proper budgeting, proper

maintenance of books of account, timely and accurate financial reporting and effective involvement of citizens in the decision-making process – and to demand for accountability from both the civic leaders and the public servants in their Local Authority (JICA, 2007; Republic of Kenya, 2008).

3.1 The Distribution of Responsibilities in the Planning System

The planning framework in Kenya had three operational levels for distribution of spatial planning responsibilities:

- a) The national level (macro) - where the policies, laws and regulations that govern spatial and economic planning were determined (National Development Plans, Vision 2030, Human Settlement Strategy, Local Government Act, Physical Planning Act, Regional Development Authorities Acts and policy); Urban Plan Preparation and Approval;
- b) The Regional/sub-national level (meso) – at this level the policies and regulations were articulated/operationalized through the preparation of the Regional Development Plans, District Development Plans and Regional Development Programmes and Projects and the Local Authorities Service Delivery Action Plans (LASDAP). The main public players at this level were; the Regional Development Authorities;
- c) District and Urban Level (Micro) – the Local Authorities (County Councils, Municipal Councils and town Councils) and the Central Government Ministries and Departments (i.e. the District Physical Planning Office and the District Development Office) (Figure 2).

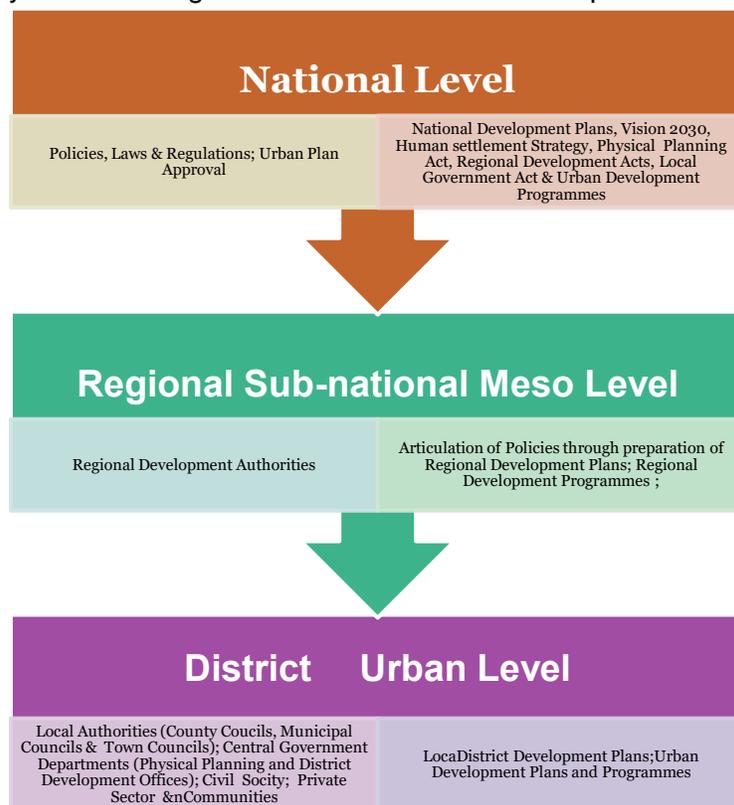


Figure 2: Pre-Kenya Constitution 2010, Planning Framework. Source: Based on analysis of policy documents

3.2 Outcome of the Previous Planning Framework

The previous urban planning framework was therefore characterized by:

Delink between plan preparation, approval and review (undertaken by the Ministry of Lands at the national level) and plan implementation (undertaken by the Local Authorities). This resulted in; delayed plan preparation; poor plan implementation; tokenism in citizen participation leading to very low levels of compliance with the plans and development of parallel urban and land management systems.

This has been largely due to the glaring functional disconnect between the plan preparatory authorities and implementing agencies, lack of appropriate technical and institutional capacity of local authorities, inadequate human resource establishment in the ministry responsible for urban planning, absence of broad based consultation and the lack of an effective coordinating framework for preparation and implementation of the planning proposals and regulations. Lack of a national land use framework has made the situation even much direr. These malfunctions manifest themselves in terms of unmitigated urban sprawl, land use conflicts, environmental degradation, and spread of slum developments and low levels of land utilization among others.

4.0 Urban Planning Framework under the Kenya Constitution 2010

4.1 Constitutional Context

The Kenya Constitution presents new opportunities for urban planning including:

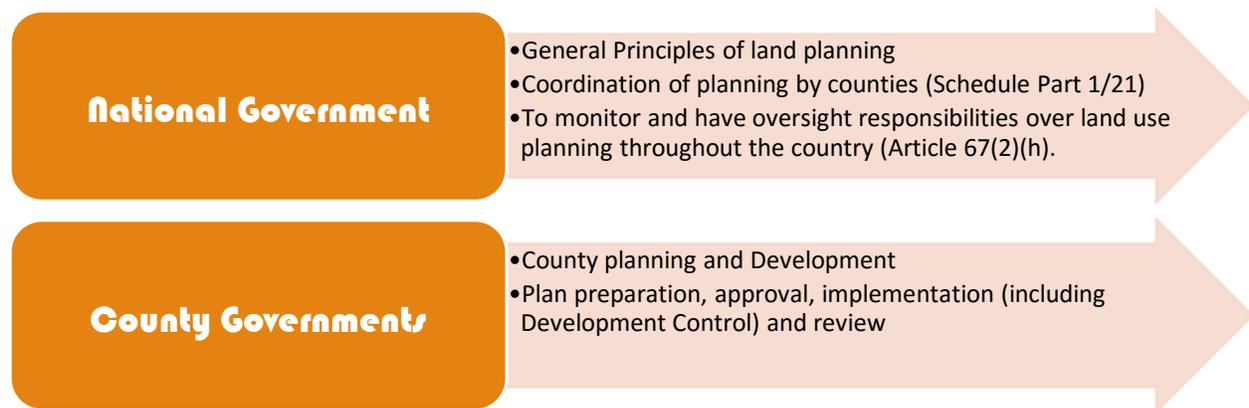


Figure 3: Two Levels of Government and Distribution of Planning Functions under Kenya Constitution 2010. Derived from appraisal of the Constitution

There is a clear separation of the planning functions between the County Governments and the National Government. The county Governments are responsible for county planning and development including: plan preparation, approval, implementation and review. Whereas the national Government is responsible for coordination of planning by the Counties. As well at the national level, the National Land Commission is assigned the role of monitoring and oversight over land use planning throughout the country. This specific function was in response to the

previous state of affairs where plan preparation and implementation was discretionary with the consequences of very poor level of urban plan preparation and implementation. This arrangement of devolution of the urban planning function has the advantage that:

Development happens on sites in places. Any policy system aimed at promoting and regulating development needs to have a strong local focus. Local responsibility is a feature of most planning systems. The distribution of formal responsibilities within planning systems has an important structuring effect on planning practices, specifying in legal terms who has the power to use the different tools, to change the tools and to oversee others in their use. The patterns of responsibilities usually involve more than one level of government and sometimes other public and private agencies (igar, Healey, Hull and Davoudi, p.21, 2000)

The Kenya Constitution 2010 also provides for devolution of resources to follow devolution of functions. It has also given County Governments power to: develop localized legislation and regulations; to prepare, approve, implement and review urban plans; establish urban management structures and systems.

4.2 Policy Agenda

4.2.1 Land Policy

The Sessional Paper Number 3 on the National Land Policy sets a clear agenda for land reforms and identifies land use planning as basis for facilitating delivery of land for urban development and investments. It contextualizes land use planning relative to land survey, land administration and land development (Figure 4). It defines land in three dimensional perspective to include: the surface of the earth and sub surface rock; any body of water on or under the surface; marine waters in the territorial sea and exclusive economic zone; natural resources completely contained on or under the surface; and the air space above the surface. This perspective therefore invites the urban planners to land use planning which presages an integrated approach to planning.



Figure 4: Contextualizing Urban Planning in the National Land Policy Framework

4.2.2 Kenya Vision 2030

The Kenya Vision 2030 is the country's long-term development blueprint which aims to create a globally competitive and prosperous country providing a high quality of life for all its citizens.

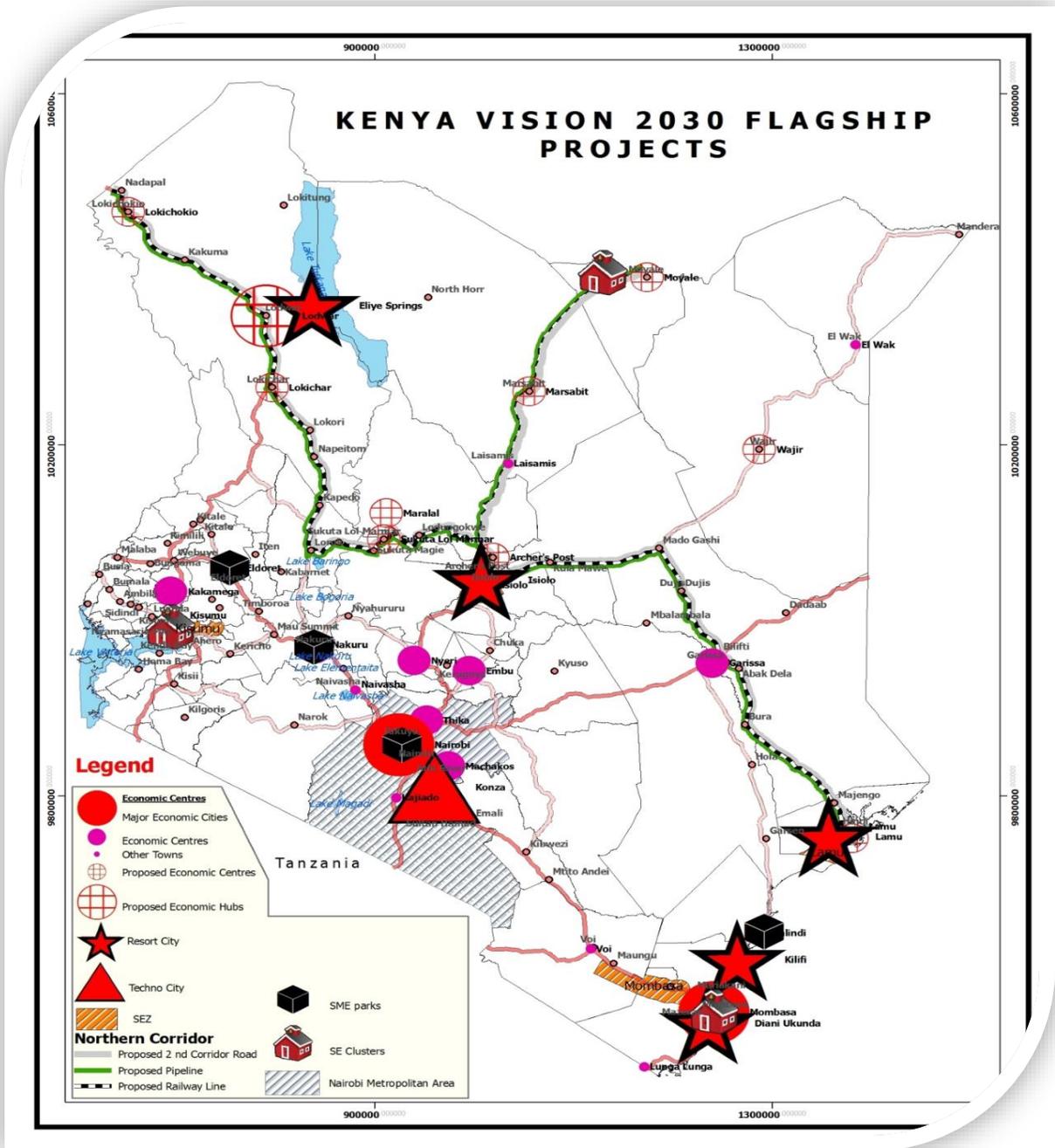


Figure 6: Vision 2030 Flagship Projects that demand more Innovative Urban Planning Approaches. Source: Developed from Vision 2030 documents and Kenya Atlas

It aspires to transform Kenya into a newly industrializing, middle income country by 2030.

In the realm of planning and management the aim is to achieve Integrated Regional and Urban Planning and Management through (i) Strategic Development, Physical, and Investment Plans, (ii) Enhancing urban and regional planning capacity, (iii) Decentralization or devolution and improved financial management of local authorities, and (iii) Institutionalization of participatory planning and development.

The flagship projects for 2012 include the following: The Metropolitan and Investment Plans Initiative: This will require preparation of metropolitan investment plans for eleven (11) regions (Nairobi and its environs), Mombasa, Kisumu, Kakamega; Nakuru, Eldoret, Wajir, Garissa, Mandera, Kitui, Mwingi and Meru). Strategic development and investment plans for special and border towns and for all other municipal councils will also be undertaken.

Additionally the Kenya Vision 2030 introduces contemporary urban development concepts, namely: Techno-cities; Resort Cities and Special Economic Zones. These concepts raise the expectations in urban planning beyond the Physical Planning framework that formed the reference frame during the pre-Kenya Constitutional dispensation (figure 6).

4.3 Legal Context Environment

The legislative framework subsequent to the Kenya constitution and Land Policy, namely the County Government Act 2012 and the Urban Areas and Cities Act 2011 in resonance make profound and fundamental provisions that expands the gains for urban planning:

4.3.1 County Government Act 2012

Section 104. (1) Requires that a county government shall plan for the county and no public funds shall be appropriated outside a planning framework developed by the county executive committee and approved by the county assembly; (2) Stipulates that the county planning framework shall integrate economic, physical, social, environmental and spatial planning. While section 106 (1) calls for Cooperation in planning shall be undertaken in the context of the law governing inter-governmental relations; (2) provides that County plans shall be based on the functions of the county governments as specified in the Fourth Schedule to the Constitution and on relevant national policies; (3) necessitates that County plans shall take due cognizance of the financial viability of development programmes; and Section 106 (4) demand that County planning shall provide for citizen participation.

4.3.2 Urban Areas and Cities Act 2011

Section 36 (1) Every city and municipality established under this Act shall operate within the framework of integrated development planning which shall:(a) contribute to the protection and promotion of the fundamental rights and freedoms contained in Chapter Four of the Constitution and the progressive realization of the socio-economic rights; (b) be the basis for; the preparation of environmental management plans; the preparation of valuation rolls for property taxation; provision of physical and social infrastructure and transportation; preparation of annual strategic plans for a city or municipality; be the basis for development control; overall delivery of service

including provision of water, electricity, health, telecommunications and solid waste management; and the preparation of a geographic information system for a city or municipality.

4.3.3 Response from the Urban Planning Practice

The response from the practice of urban planning has been to adopt an integrated urban planning approach which: takes into consideration the physical, economic and social dimensions of development; provides for horizontal integration, among the various sectors of public action; considers policies, projects and proposals in relation to one another; is multi-sectoral and multi-disciplinary (land use planners, land surveyors, economists, agriculturalists, geologists among others); is Strategic - developing a long term perspective to urban development; addressing the critical aspects of development as opposed to the comprehensive approach to issues and development proposals; is evidence-based – systematic research and surveys, rigorous data analysis and interpretation; is result- orientation –aimed at achieve specific objectives, resolving issues and harnessing emerging potential/opportunities; and is participatory - deepened citizen engagement.

5.0 Challenges in Harnessing the Opportunities for Urban Planning

A rapid appraisal of the extent to which the opportunities discussed above were being harnessed at the county level revealed a number of fundamental challenges that are constraining the realization of the benefits of the new urban planning framework presented under the Kenya Constitution 2010:

.1 Inadequate Capacities to prepare and implement Urban Development Plans

Of the 31 counties surveyed, only 32% had set up Land Use Planning Departments responsible for preparing, implementing and reviewing of Urban Development Plans; of these 32% only 10% had more than three planners for the entire county. None of the counties had set up a planning unit as required by the County Government Act 2012 section 105 (county planning units are responsible for coordinating integrated development planning within the county ensuring linkages between county plans and the national planning framework). Only 20% of the counties surveyed had supportive infrastructure to facilitate planning activities. The reasons cited by the County Executive Committee Members for this situation included: inadequate funds allocated to hire qualified staff and equip the offices; none availability of qualified planners within the counties.

.2 Low levels of prioritization of urban planning

This was reflected in the budgetary allocations for plan preparation. Only 20% of the surveyed counties had set aside more than 2% of the county budgets for plan preparation purposes. This was attributed to the low priority placed on urban planning by the Members of the County Assemblies who approve the budgets presented by the county executive. The politicians do not see the immediate benefits for plans which communicate long range benefits. The Members of the County Assembly are more interested in funding projects and programmes that are easily seen by their constituents to ensure their re-election; they are short-range thinkers. Whereas the planners communicate longer-range goals and performance spans.

.3 Institutional Rigidities and inadequate support to county Governments

National level institutions established during the pre-Kenya Constitution 2010 have not wholly adjusted to the current framework. Although urban planning is a devolved function supported by the County Governments Act 2012 and the Urban Areas and Cities Act 2011, the National Ministry of Lands still operates under the Physical Planning Act Of 1996 which centralized plan preparation and approval. This is sending mixed signals and causing confusion at the county levels, thus constraining the delivery of the urban planning service. Further, as much as the Constitution assigns the role of formulating general principles of land planning and the coordination, there has not been any framework developed to execute this mandate nor any instruments provided as reference frame for urban planning.

6.0 Conclusion and Lessons Learnt

Urban Planning in transitional and changing environments needs to be managed by developing strategies that mitigate emerging challenges and harnesses the opportunities presented. Possible strategies include:

Undertake needs assessment and projection of the human resource requirements in terms of quality and quantities. As well the requisite support infrastructure to the devolved units. This will provide a level of preparedness that will cushion against the transition hiccups that could arise due to resistance to change and pedestrian handling of urban planning by devolved government.

Policy makers and implementers need to be inducted into changing environments and frameworks through a deliberate and structured way. An analysis of the actors and their specific roles assigned by legislation will enable a more targeted and effective sensitization.

Balancing short term political interests and strategic long term planning perspectives

Urban planners need to recognize the reality of politics as critical in the planning arena and develop abilities to interpret local attitudes and viewpoints and relate them to larger planning contexts. That is urban planners must strike a balance between politics and the planning goals:

“Planners must deal more adequately with the realities of politics and its inevitable need for compromise, consensus and coalition. On the other hand, politicians need to recognize that there is much in planning that can be used to improve the public good and make for better politics. In other words, planners should be like politicians and politicians should be more like planners”
Catanese 1 84, p.23 .

Urban planning policy making should of necessity forestall possibility of institutional resistance to change and develop measures to lubricate smooth transition.

References

- Broadbent, T, (2007) *Planning and Profit in the Urban Economy*, London: Routledge
- Catanese, Antony (1984) *The Politics of Planning and Development*, Beverly Hills London New Delhi: SAGE Publications, Inc.
- Cullingworth, J. B. (1993) *The Political culture of Planning*, London: Routledge
- Davoudi S, Healey P. and Hull A. (1997) Rhetoric and reality in British structure planning in Lancashire, 1993–1995. In: Healey, P., Khakee, A., Motte, A. and Needham, B. (Eds.), *Making Strategic Plans: Innovation in Europe*. London: UCL Press. pp. 153–171.
- Davoudi, S. and Strange, I. (eds.) (2009) *Conceptions of space and place in strategic spatial planning*. New York: Routledge
- Houghton, G. and Councell, D. (2004), *Regions, Spatial Strategies and Sustainable Development*. London and New York: Routledge, Taylor and Francis Group.
- JICA (2007), *Local level Service Delivery, Decentralization and Governance: A Comparative Study of Uganda, Kenya and Tanzania Education, Health and Agriculture Sectors KENYA CASE REPORT*, Tokyo: Research Group, Institute of International Cooperation
- Kenya, Republic, (2010), *Constitution of Kenya 2010*. Nairobi: Government Printers.
- Kenya, Republic, (2011), *Urban Areas and Cities Act 2011*. Nairobi: Government Printers.
- Kenya, Republic, (2012), *County Governments Act 2012*. Nairobi: Government Printers.
- Kenya, Republic, (2010), *2009 Kenya Population and Housing Census*. Nairobi: Government Printers.
- Kenya, Republic of (2008), *Kenya vision 2030*. Nairobi: Government Printers.
- Kenya, Republic of, (1978), *Human Settlements in Kenya: A Strategy for Urban and Rural Development*. Nairobi: Government Printers.
- Kenya, Republic of (1969), *Local Government Act Cap 265 of the Laws of Kenya*. Nairobi: Government Printers.
- Kenya, Republic of (1985), *Lake Basin Development Authority Act Cap 442 of the Laws of Kenya*. Nairobi: Government Printers.

Kenya, Republic of (1991), Kerio Valley Development Authority Act Cap 441 of the Laws of Kenya. Nairobi: Government Printers.

Kenya, Republic of (1994), Sessional paper No. 1 of 1994 on Recovery and Sustainable Development to the year 2010. Nairobi: Government Printers.

Kenya, Republic of (2008), First Medium Term Plan (2008- 2012). Nairobi: Government Printers.

Kenya, Republic of (2007), Regional Development Authorities Policy. Nairobi Government Printers.

Klosterman, Richard E. 1985. Arguments for and against planning. *Town Planning Review*, 56(1), pp. 5-20

Legates, Richard and Stout, Frederic (eds.) (2011), *The City Reader* (Fifth Edition), London and New York: Routledge Taylor and Francis Group

Stoker, G. and Young, S. (1993) *Cities in the 1990s*. London: Longman.

Stoker, G. and Mossberger, K. (1994) Urban regime theory in comparative perspective. *Environment and Planning C. Government and Policy*, 12(2): 195–212.

UN-HABITAT (2011) *Economic Role of Cities*, Nairobi: United Nations Human Settlement Programme

Vigar, G. Healey, P. Hull, A. and Davoudi, S. (2000), *Planning, Governance and Spatial Strategy in Britain: An Institutional Analysis*. New York: St. MARYINS PRESS, INC 175 Fifth Avenue.

Wassner, Robert (200) *Readings in Public Economics, Issues and Public Policy*, 350 Main Street, MA 02148-5020, USA, 9600 Garsington Road, Oxford ox42DQ, UK: Blackwell Publishing

World Bank (2016) *Republic of Kenya: Kenya Urbanization Review*, Washington DC, USA: The World Bank

AN INVESTIGATION INTO THE APPLICATION OF IMPROVED BUILDING TECHNOLOGY IN OFFICE BLOCKS TO MITIGATE THE IMPACT OF TERRORIST ATTACKS IN NAIROBI

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INTRODUCTION

The issue of terrorism has become an international problem on which the international community has spent so much in a bid to come up with a solution to mitigate its impact on the human population. In events where terror attacks have taken place in buildings, massive destruction of property, deaths and life-threatening injuries have been witnessed.

Terrorism has proved to be a global menace affecting both the developed and the third world countries. As a matter of fact, the impact has been more severe in the developed countries. On September 11th, 2001, the most devastating attack in the history of humanity took place on the American soil. The implementation of the attack was successful despite the technological prowess possessed by America. Fourteen years later, France was attacked leading to loss of 123 lives and injuring scores of the French nationals.

Kenya has also had a fair share of terror attacks starting from the attack on the Norfolk hotel in 1980 to the latest and deadliest being the attack on Garissa University College where 150 people were killed and several others wounded some with life-threatening injuries.

Terrorism still remains a major global threat and continues to claim lives all world over. The incorporation of the different strength and design considerations for a construction deliverable to withstand terror activities is a responsibility of the whole project team. This includes but not limited to the client, the relevant professionals engaged, the contractor et cetera. This makes it an important aspect of construction project management and therefore cannot be overlooked without risking serious profit or saving threatening consequences (Barnet, 2003).

Problem Statement

All too often terrorism and associated activities continue to inflict pain and suffering on people all over the world. Hardly a week goes by without an act of terrorism taking place somewhere in the world, indiscriminately affecting innocent people, who just happened to be in the wrong place at the wrong time. The worst effects of terror attacks have been felt where the attacks have taken place in buildings.

In the event of terror attacks, physical destruction of buildings takes place owing to the large blast forces. This leads to the significant monetary loss by the developers and occupants of the buildings. The risk posed by the terror attacks discourages investment in the real estate sector. The loss of lives and life-threatening physical injuries are undesirable effects of terror attacks in buildings. This occurs due to the crumbling of buildings and breaking of glass. Nearby buildings are also adversely affected by terror attacks. In most cases, secondary buildings are usually more affected than the target buildings.

According to wall street (1983), it is practically impossible to have a perfect defence, not against the bullet, not against the tank and not against nuclear weapons. As a solution, complication of an attacker's calculations can blunt his force and save millions of lives. From the foregoing, it is reasonable to state that the professionals in the building industry have a great role in ensuring that in the event of an attack lives are saved and minimal destruction experienced. The materials used in the construction of buildings are of great importance in the minimization of loss of lives. With many deaths having occurred due to the collapse of buildings, choice of alternative materials come in handy to save lives in the event of attack.

This paper analyses and brings to light the various building technology measures available in the market for use in the Kenyan construction industry. It also examines the extent of application of the improved building technology and the impact of terrorism on urban and regional planning. The materials ought be robust and resilient to enable buildings to not only survive terror attacks but also prevent the loss of lives and minimization of the significant financial losses.

LITERATURE REVIEW

Buildings are very important to the society as they act as places of governance, economic hubs, education centres and residential areas. Some buildings are of importance to the society as a whole due to the nature of work carried in them and the symbolic nature of the structures; for example, the National museum. Destruction of buildings will have a negative impact on the society as a whole.

History of Terrorism in Kenya

Kenya, however, had experienced various attacks before this. According to the national counter terrorism centre of Kenya, Kenya has experienced over 100 terrorist attacks to the present with the earliest occurring in 1975. The 1998 American embassy attack in Nairobi made both the U.S. and Kenya more aware of the threats posed by foreign terrorists. This incident, which killed over 200 people [including 12 Americans] and injured thousands, prompted Kenya to begin – albeit slowly – a more concerted counter-terrorism strategy (Krause & Otenyo, 2005).



*Fig 2.1 Collapsed Westgate mall in Westlands, Nairobi
(The telegraph, 2014)*

Theoretical background of explosions

Designing against, and planning for a terrorist attack requires knowing about the types of damage that will be caused. Bombs and the explosions are a common tool used by terrorists. An explosion is a rapid release of a colossal amount of energy, causing a massive increase in temperature and pressure, creating hot compressed gases which can expand in a shock wave (Pape et al. 2010a).

Explosions are generalized into four categories on the circumstances that bring about their existence: physical, chemical, electrical, and nuclear depending on their source. Terrorists mainly use physical and chemical explosions as nuclear and electrical explosions are quite difficult to execute.

When an explosion occurs, there are different types of effects that can occur and cause damage to nearby structures. Some major causes of damage are overpressure, thermal affects, energized projectiles, cratering and ground shock.

Lessons Learnt from Past Experiences

1. Bombings compromise the structural integrity of the affected buildings, often resulting in collapse. Collapse accounts for most of the fatalities where it happens, as the overwhelming weight of fallen parts of the building will either crush those underneath or crush them. The partial collapse of the Alfred P. Murrah Federal Building in the 1995 Oklahoma City bombing resulted in approximately 90% collapse.
2. Blast pressure shatters glass panes and other elements of nearby buildings. Depending on the proximity of the building to the point of explosion and the magnitude of the explosion, the damage caused by the blast waves will vary. The nearer the building to the point of explosion, the more forcefully items caught in the wave of pressure will be shattered, and the larger the objects the wave can carry. These shattered, airborne materials can lacerate occupants' bodies, or cause harm by impact alone if the object thrown is big enough.
3. Damage detailed above as brought about by blast pressure can cause significant loss without being accompanied by total structural failure. The structural frame of a building may remain intact, with non-structural component failure accounting for damage resulting from an attack.
4. Bomb blasts affect not only the targeted building but also those near enough to be caught in the blast's pressure. The 1998 US Embassy attack in Nairobi resulted in the collapse of the nearby Ufundi Building while the embassy building itself remained standing, though significantly damaged.

Strategies for Countering Terrorism

Site Planning and Architectural Design Standards for Counter-Terrorism.

Aibara et al., (2010) and Dalton et al., (2013) have formulated site planning and architectural design standards for countering terrorism. The standards create a passive design where counterterrorism measures are instituted during the design stages. This leads to low construction and maintenance cost of building in response to terrorism. The standards are applicable for both new and existing buildings.

Site Planning.

Various parameters are considered when site planning. They include the location of parking, perimeter fencing, entry control points/ access, control facilities, vantage points and location of high-value assets among others aspects (Opiyo et al., 2015).

Architectural Design Parameters.

The architectural design parameters considered for counter-terrorism and enhancing building occupancy safety and security are internal circulation, visitor control, asset location, room layout, external hallway, and building configuration and function groupings (Aibara et al., 2010; Dalton et al., 2013). Apart from these parameters others reviewed are on emergencies in the buildings and include: escape routes, the number of an escape route for building with more than one storey height, exit doors and width of escape routes for particular occupancy, signage, and emergencies evacuation plans (Government of Kenya, 2015). These are the important design elements that minimize fatalities in case of an emergency such as terrorism.

Effect of the design for terrorism on public realm

One of the counter-terrorism strategies is the increase of the standoff distance between the building and the street. This has impacted the way the streets are designed by the creation of some distance between the building and the adjacent street. Counter terrorism aims at protecting public places through construction and the arrangement of public spaces to create a fortress. This should however be balanced with the openness of public spaces so as to maintain the vibrancy of urban life. The design of public spaces is an element of planning and will therefore impact the way people interact with public spaces. Care should therefore be taken to ensure that the design for terrorism does not negatively impact street aesthetics.

Protection of buildings from blast loading

With the increased terror threat, researchers have come up with better materials which have more resilience and can stand explosions from terror attacks. Different methods of fixing the materials have also been devised all in a bid to curb and minimize deaths brought about by terror attacks.

Better materials to stand explosions

When a bomb explodes, you can't outmanoeuvre it; you probably can't even take cover quickly enough to protect yourself. Instead, you have to hope that there's something—anything—already in the way that can shield you from the blast. Various materials have been developed to save lives in the event of a terrorist attack.

Blast resistant glazing

Designing glazing that does not break has proven to be uneconomical. The alternative solution is to design glazing that retains the glass fragments after the glass cracks. For new construction, this can best be provided by using a PVB laminated glass inner leaf in the glazing system, adequately anchored to the frame. PVB glass comprises a protective interlayer, usually polyvinyl butyral, bonded between two panels of glass as shown below;

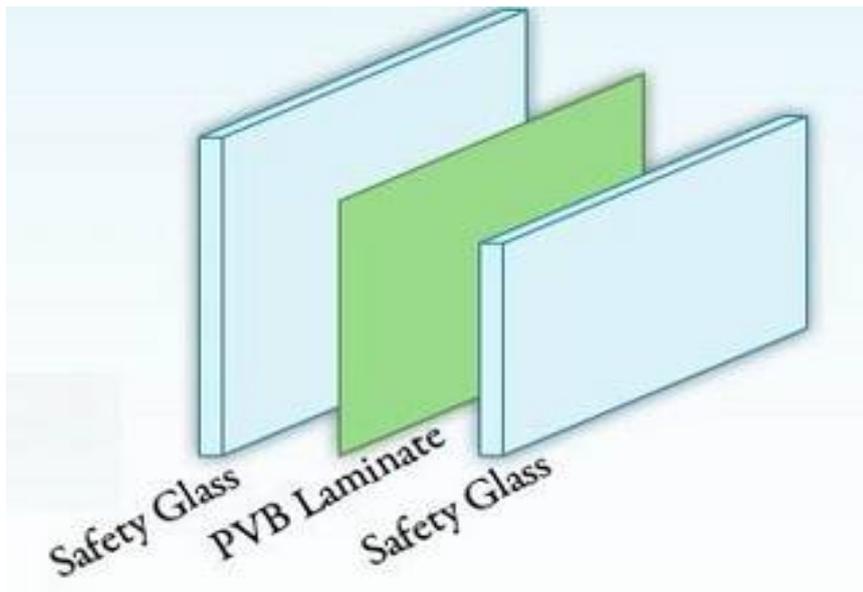


Fig 2.2 Blast resistant glazing

Source: (Michael C. Janus, 2005)

Blast resistant walling

Insulated concrete sandwich wall panels have been used successfully in standard building construction for many years. These systems consist of an exterior façade an insulating foam layer and an interior structural concrete layer. These systems provide an effective means of protection against the blast pressures generated from an explosion. The high mass of the concrete wall coupled with the sandwich configuration of the panels provides an elevated resistance to the dynamic effects of blast demands.

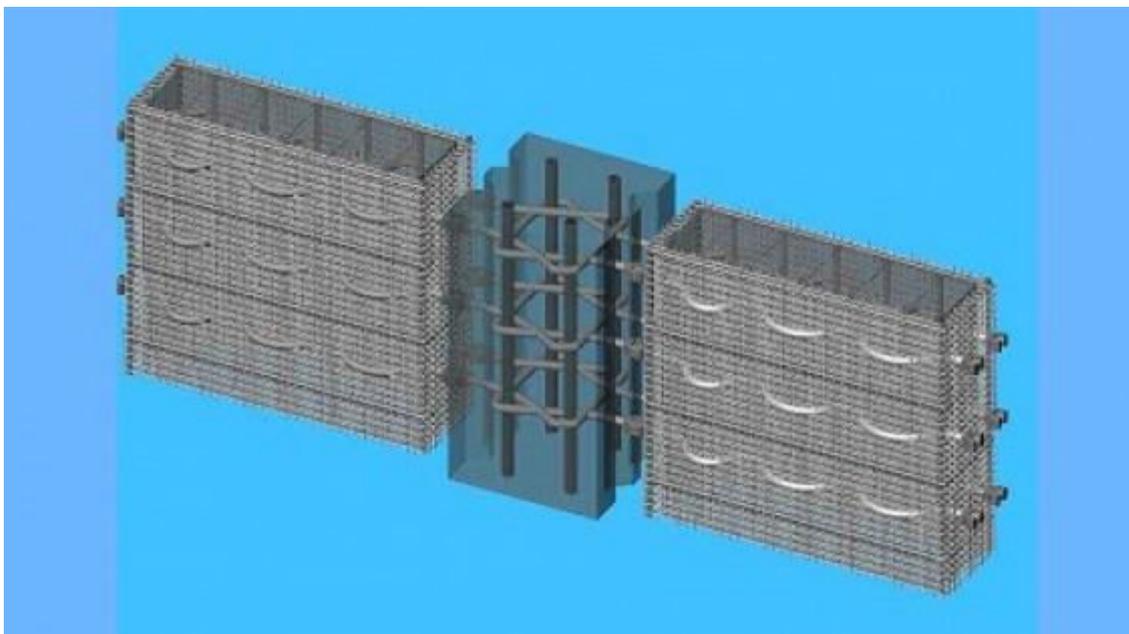


Figure 2-3 Blast resistant walling

Source: (Warn et al. 2003)

Blast Resistant Concrete

While it is impossible to have a bomb-proof building, concrete has been improved to stand better the explosion effects. The University of Liverpool has developed a new bomb-proof concrete that uses a higher cement content and less water than usual, along with only the very finest silica sand as its aggregate. To strengthen it further, a series of short, narrow steel fibres reinforce the material, giving it a tensile strength ten times higher than that of standard steel-reinforced concrete.

RESEARCH METHODOLOGY

The population

In statistics, a population has been defined as the complete set of individual causes or objects with some objectives common characteristics (King'oriah, 2004). The population parameters are summary descriptors (incidence, proportion, mean and variance) of the variables of interest in the population. A sample of the population is used in the estimation of these parameters. It is on this sample that inferences are made about the population. A sample of the population is used in the estimation of these parameters. (Kothari, 2004)

For this study, the population comprises the built environment professionals who have undertaken projects in Nairobi County. This includes structural engineers, architects and quantity surveyors who form the main part of the design team.

Sampling technique

Since it is logically impossible to sample all the users of the construction professionals who have undertaken office blocks projects in Nairobi area, the following sample technique is employed to obtain a manageable sample from the population. (Chava & Nachmias, 2007)

$$n = \frac{Z^2 \cdot P \cdot Q \cdot N}{e^2(N-1) + Z^2 \cdot P \cdot Q}$$

Where:

n = sample size

N = population size

P = sample population estimated to have characteristics being measured. Assume a 95% confidence level of the target population.

Q = 1-P

e = acceptance error (e = 0.05 since estimated value should be 5% of the true value)

Z = standard nominal deviate at the required confidence level = 1.96

A total number of 131 was still vast and further sampling using the systematic random sampling method (Mugenda & Mugenda) where every Kth case in the population frame is selected for inclusion in the sample. Thus, from the randomized list of the architectural firms, quantity surveying firms and structural engineering firms, the 3rd case of each was selected resulting in a sample size where;

- Architectural firms – 15
- Quantity Surveying firms – 10
- Structural engineering firms - 18

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

This covers the analysis and presentation of data collected in May 2016 from quantity surveyors, architects and construction engineers. The data relates to the investigation of the adoption of improved building technology in office blocks within Nairobi to mitigate the impact of terrorist attacks and the need for such measures to save lives.

Profession of the Respondents

The respondents composed of either the employees or directors of the firms. Based on the analysis of the findings, majority (25%) of the respondents were registered structural engineers followed by 21% who were registered architects. It was also established that 15% of the respondents were registered quantity surveyors and assistant quantity surveyors respectively while 12% of the respondents were assistant architects and assistant structural engineers as shown in figure 4.1.

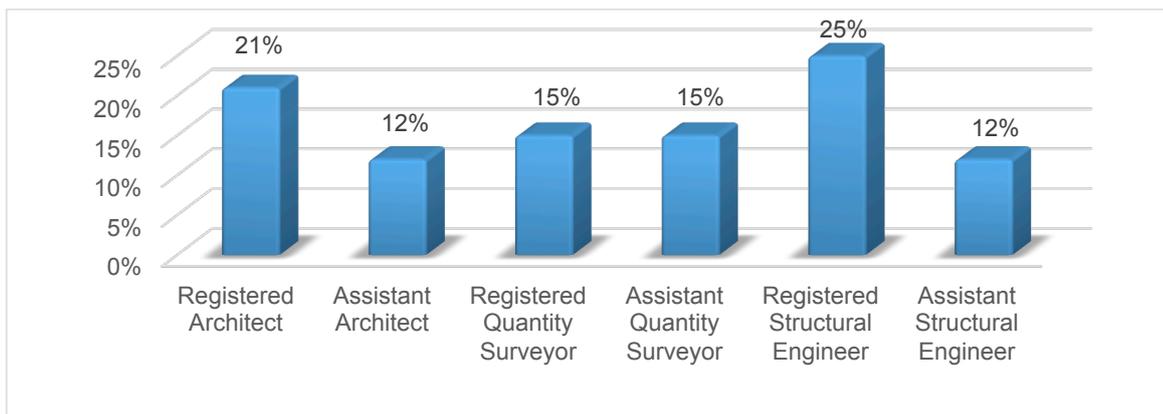


Figure 4-1 Professions of respondents

Source: Field Survey

Client's information on the available anti-terror building technology

The clients' information on the availability of the anti-terrorism building technology was examined and rated from good to poor. This was to establish whether the client, as the employer in the project, had sufficient knowledge on the available building technology.

23% of the respondents showed that the client had poor information of this building technology. This could be due to the fact that some clients may not be fully conversant with the various inventions and discoveries in the building industry as they may be involved in different careers.

32% of the respondents said that clients had fair information on the technology. 31% had good information and 14% are very informed. This 14% could represent the various building professionals who decide to undertake building projects for investment purposes.

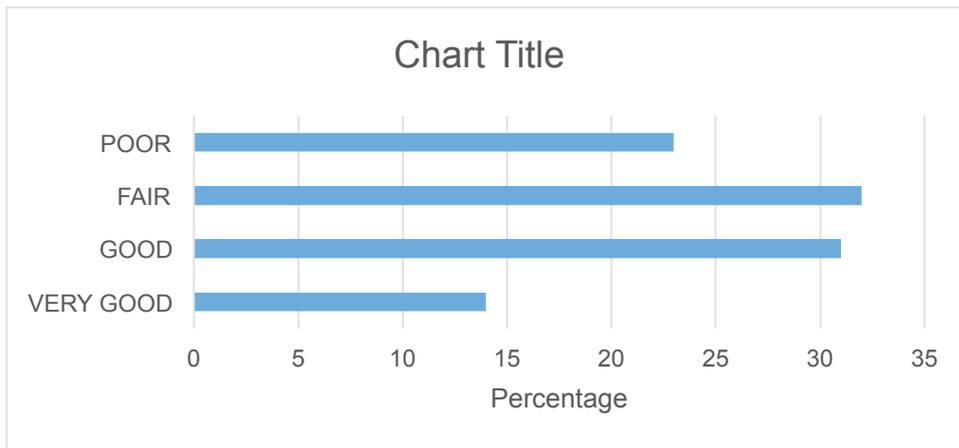


Fig 4.2 Client information on availability of anti-terror technology

Source: Field Survey

Application of anti-terror building technology

None of the professionals was of the view that the application of the anti-terror building technology is very good. 32% were of the view that the application is good. 48% settled on fair while 20% settled on poor. This could be due to the various considerations that are made before the adoption of this technology. This may be due to the fact that this is a new concept and may take time before it is fully accepted and implemented in the Kenyan building sector.

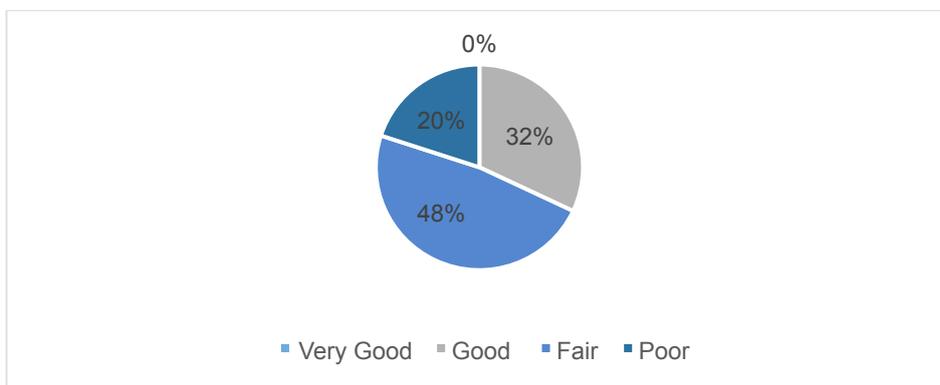


Figure 4-3 Application of anti-terror technology

Source: Field Survey

Rating on the anti-terror building technology

The various characteristics that affect the application of anti-terror building technologies were considered and each given a rating on a scale of one to five. The suitability of this technology and the ease of maintenance came first with 4 out of 5. This shows that the improved building technology is better than the conventional technology as it is strengthened to withstand extra forces making it more durable.

Cost and ease of adoption came second with 3 out of 5. This may be due to the fact that the improved building technology is more expensive compared to the conventional technology. Availability came last with 2 out of 5. This may be due to the fact that the low demand of this

technology has led to low supply of the same and this has led to decreased availability.

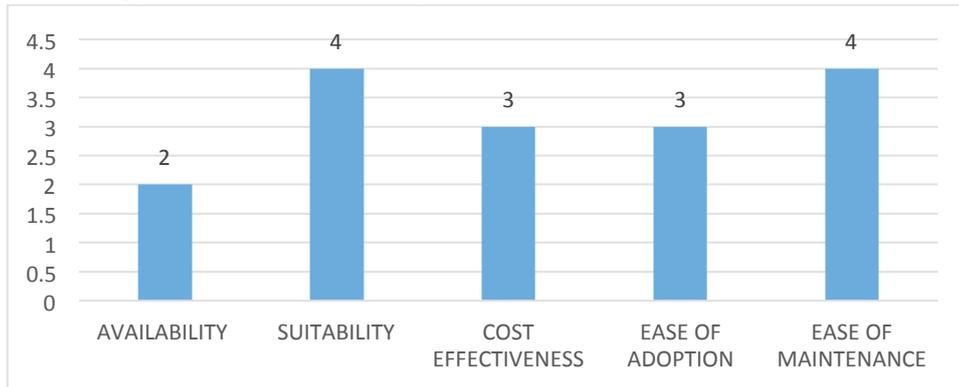


Figure 4-4 Rating of anti- terror technology

Source: Field Survey

Factors considered before adoption of anti-terror building technology

This aimed to investigate the various considerations made before the adoption of the improved building technology in projects. Cost led with 50%. This may be due to the fact that the client operates on a specific budget and cost considerations have to be made before the adoption or addition of any new material or method of building. Overall safety came second with 27%. This shows that the safety of buildings is also considered greatly before adoption of this technology. Safety would ensure that lives are saved in the event of an attack and that the building does not collapse resulting to losses. Availability came third with 23%. This shows that availability is also considered before the adoption of the technology. Clients and consultant would be interested in applying technology that is readily available.

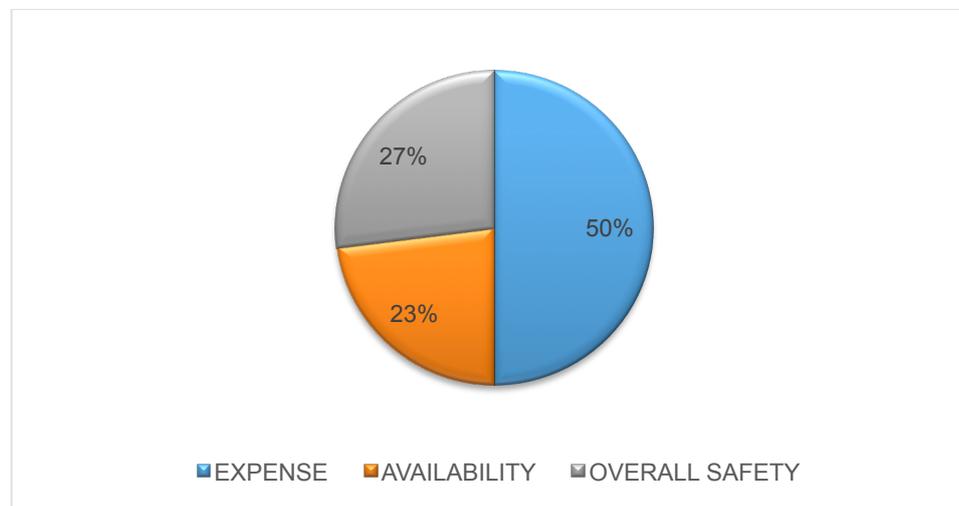


Figure 4-5 Considerations before adoption of anti-terror building technology

Source: Field Survey

FINDINGS, CONCLUSION AND RECOMMENDATIONS

As earlier mentioned, the purpose of this study was to examine the extent of application of improved building technology in office blocks to mitigate terror attacks in Nairobi. The study proposed the implementation and application of improved building technology which has been applied in other regions of the world to mitigate the impact of terrorist attacks. The findings were grouped according to the objectives which they were based on.

FINDINGS

Objective One

The first objective of the study was to find out the extent of application of building technology measures in buildings to mitigate terror attacks. As discussed, for this objective to be realized, the study had to assess the extent to which the building technology has been applied. This was done by considering various factors. First was the client's information on the availability of the anti-terrorism building technology. This is because the client is the employer and will be a main determinant of what materials or method of fixing will be used in the construction project. The suitability of the building codes was also considered. This is because the building codes govern and direct on the type of materials that will be used in construction. Third the various factors which are considered before the application of anti-terrorism building technology were examined. These are the factors that will determine whether the technology will be applied or not.

According to the study, a low adoption of anti-terror building technology was observed with only 32% applying the said technology. This shows that despite the availability of the same, there is slow adoption and low levels of application.

The question of building codes also arose. This is because the various materials to be used in the construction industry are stated in the building codes and associated legislation. The professionals in the construction industry gauged the suitability of the codes from very good to very poor. The average lied on good. This however shows that something should be done on the building codes to improve them and make them more suitable and accommodative of upcoming technology.

Objective Two

The second objective was to find out the available building technology measures that should be applied to mitigate the impact of terror attacks. As stated earlier, various factors on the anti-terror building technology were examined. The various anti- terror building materials that are available in the market are discussed extensively so as to bring into light the best and the most suitable.

The methods of fixing are also discussed. The professionals in the construction industry were asked on the availability and application of this technology and all were aware of the existence. Various factors were considered to gauge the suitability of this technology and on a scale of one to five the factors were rated. Suitability and the ease of maintenance of this technology came top of the list based on the research data with 4. Ease of adoption and cost effectiveness came second with 3. However, availability came last with 2. This shows that despite the global availability of this building technology, locally the various types of technology are not available

Objective Three

The third objective was to find out the various factors considered before the application of the improved building measures to building. The various factors that determined the adoption shed some light on what could have led to the slow adoption of the anti-terror building technology. The expense of the technology was the main factor that was considered having a percentage of 50%. This show that the developers consider the cost that will be incurred in the project. The anti-terror building technology is more expensive compared to the conventional technology and this could

hinder its adoption. The degree of safety followed with 27%. This shows that the developers care about the safety of the tenants and also wouldn't want the collapse of the building as a result of terrorism activities. This is because collapse would bring about the loss of colossal amounts of money.

CONCLUSION

The assessment of the current situation proved that despite the knowledge of the availability of improved building technology against terrorism, the technology was not sufficiently applied so as to mitigate the impact of any attacks. This building technologies should be sufficiently applied as the professionals on the questionnaires said that the design for terrorism was very important.

The building codes are also seen to be insufficient when it comes to the issue on terrorism. This is because the codes do not give any preventive measures of construction or prescriptive use of materials which would in turn prevent or mitigate terror attacks.

RECOMMENDATIONS

Improved building technology against terrorism should be considered for adoption in the construction industry. This follows the fact that their adoption in developed countries has been seen fruitful and has saved numerous lives. The application would also prevent the collapse of buildings and prevent financial losses to the clients.

The professionals in the construction industry ought to advise the clients on the best prevention methods and apply them in their projects so as to save lives and prevent a collapse in the event of an attack. Being part of the design team, the quantity surveyor, the architect and the structural engineer should apply due diligence to ensure that the right preventive measures are applied so as to mitigate terrorism attacks.

The current building codes should be improved on to accommodate new technology and also to address the issue of terrorism in the design and use of materials. This will go a long way in the adoption of the anti-terrorism building technology.

REFERENCES AND BIBLIOGRAPHY

(DHS), U.S. Department of Homeland Security. (2009b; p.11, September). <http://www.dhs.gov/>.

Board of Registration of Architects & Quantity Surveyors of Kenya. (2014, October 28). *Board of*

Registration of Architects & Quantity Surveyors of Kenya - Architectural Firms . Retrieved

January 6, 2015, from Board of Registration of Architects and Quantity Surveyors

website: http://www.boraqs.or.ke/members/arch_firms

Erin miller. (2013). *National Consortium for the Study of Terrorism and Responses to Terrorism*.

Maryland: Department of Homeland Security.

FEMA 427. (2003). *FEMA 427 ;Primer for Design of Commercial Buildings to Mitigate Terrorist*

Attack. Washington DC: Federal Emergency Management Agency.

Frankfort, N. C., & Nachmias, D. (1996). *Research Methods in the Social Sciences* (5th ed.).

London: Arnold Publishers.

Housing, M. o. (2009). *Planning and Building Regulations*. Nairobi: Ministry of Housing.

Njue Peter Improved building technology in office blocks, '52nd ISOCARP conference, 2016'
Munge Joshua

How do Building Codes work in Kenya? - Anza

<http://www.anza.co.ke/advice/how-do-building-codes-work-in-kenya>

J.B.K, K. (2005). Rehabilitation of old commercial buildings to enhance safety of the occupants: A case study of Nairobi Central Business District. Unpublished Research Project.

K.J.Kelley. (2009). Kenya Seeks 30 billion from U.S., The Daily Nation Newspaper. (Thursday, June 26, 2003). In K. Otiso, *Kenya in The Crosshairs of Global Terrorism: Fighting Terrorism at the Periphery, Vol 1.* (pp. 117-119). Nairobi: Kenya Studies Review.

Kennet, M., Letvin, E., Chipley, M., & Ryan, T. (2011). *FEMA-452-Manual to Mitigate Potential Terrorist Attacks Against Buildings*. Department of Homeland Security, Science and Technology Directorate, Infrastructure Protection and Disaster Management Division.

Kenya, R. o. (2007). The Occupational Safety and Health Act;OSHA. *The Laws of Kenya* .

King'oria, G. K. (2004). *Fundamentals of Applied Statistics*. Nairobi: Jomo Kenyatta Foundtion.

Kosnick, S. (2005). *Terrorism and its Impact on the Construction Industry*. College Park: University of Maryland.

KRAUSE, V., & OTENYO, E. E. (2005). Terrorism and the Kenyan public. *Studies in Conflict and Terrorism*. 282, 99-112.

Kumar, R. (2005). *Research Methodology; A step by step guide for beginners; 2 Edition*. London: Sage Publications.

Leedy, . D., & Ormrod, J. E. (2001). *Practical Research: Planning and Design; 7th Edition*. New Jersey, USA: Merrill Prentice Hall.

Longinow, A., & Mniszewski, K. R. (1996). *Protecting Buildings against Vehicle Bomb Attacks*. Northbrook: 330 Pfingsten Rd.

Michael C. Janus (2005), *Building Security and Safety*, a Handbook for Architects and Planners.

MILLER, E. M., REIS, S., & KAPLAN, S. N. (2013). *Thinking like a master teacher with Sandra N. Kaplan*.

Mugenda, M. (1999). *Research Methods*. Nairobi: Nairobi Acts Press, Jomo Kenyatta Memorial Library, University of Nairobi.

Strategic planning for uncertain times

Joanna PRIGARA, University of Aalborg, Denmark

Abstract

Urban planning, as a complex set of different design principles, is a phenomenon influenced by the dynamic changes in the surrounding world. As a result, cities have to face various challenges that are a reflection of the current situation they experience.

This paper describes strategic tools that can be used to enhance the existing planning system in reference to Polish planning system. A method of creating alternative scenarios of development was used to predict the possible paths of redevelopment a postindustrial site in Gdynia. This is a project that the author has described in her undergraduate thesis. A complex analysis of the preferred visions of the site was done based on the available documents from the city and port authorities. Distinct expectations of two influential authorities, changes in the economic situation and the public opinion are the main reasons that lead to creating alternative solutions that shall be evaluated further. As an outcome of the process, the area is provided with alternative projects as different paths of development. Depending on the time and possible uncertainties, the chosen design shall provide with a positive solution of the problem.

Another planning policy that is being widely used is a revitalization plan for the degraded areas within a city. Such document is a result of a deep and complex analysis of the current state and becomes a bullet list of goals that shall be achieved. It focuses not only on the economic factors but also the social ones, as the inhabitants play a crucial role in the whole process. Within this subject, students of Spatial Development at Gdańsk University of Technology created a guide for the revitalization process of city Słupsk. The analysis of multiple factors and workshops led to creation of a booklet with recommendations for the urban renewal of a degraded area that was processed.

The issue which rises in this subject shall address the problem of the extent, in which urban policies shall be indicative and flexible. Cities have zoning plans that are executing their planning principles, however, these are not flexible enough within times of uncertainty. The conclusion brings up the importance of strategic planning. It shall contain guidelines not only for the authorities but also for the inhabitants that take an active part in creating planning policies.

Introduction

In times of uncertainty in planning, when the situation of a city is unstable on different levels (economic, environmental, social or cultural) planners shall stay cautious in their decisions. It is important to have a solid knowledge about the current situation in order to create a conscious solution. City planning requires long lasting projects and it always has to reach into the future, which might be complicated and uneasy to predict. Such situations create a demand for specific tools that enable to make assumptions yet are based on present circumstances. These features can be fulfilled by using a strategy of development or a revitalization strategy for a specific area in the city. In general, strategic planning allows creating a scenario of possibilities that shall lead to a desired planning solution. A scenario is a general document that describes a desired pathway of actions. Hence, it includes specifications and guidelines for a more detailed level of planning. Strategic planning clarifies two fundamental issues. It defines the role of a city in the present situation as well as its desired shape. It is not possible to predict the unexpected, however, by developing alternative solutions it is possible to foresee what might happen and react accordingly.

Polish planning policy

- A brief description

Polish planning policy consists of different levels regarding accuracy and execution of the designed policy. A region usually has two types of documents that regulate its planning situation. First type refers to a general master plan. The second is a more specific zoning plan that executes precise regulations for defined areas. A general master plan is a highly important document because it determines general principles and recommendations for the region. This document consists of informational parts which include a complex analysis of the current situation of a region on different levels (environmental, cultural and historical, social, economic, technological, communication). The general master plan contains parts that describe the desired future of the region with different goals that it has to fulfil. Each goal is described and motivated. As a whole it is a reference for partial zoning plans that are being created, because the master plan describes a general idea for the future of a region. However, being very general and representing the optimistic development scenario, it rarely takes into consideration the inevitable real life changes and fluctuations of the markets that affect planning situations.

Except for the previously described planning documents, regions (in Polish this term refers to municipalities) might also create their own strategies of development. Such strategy has a purpose of defining the most desired vision for the future and a mission that describes how to reach it. As a strategic document, it can be described as a long-term action plan with a list of necessary strategic goals. Depending on the municipality and its needs, specific strategies are formed for a period of 5 years. General strategies concentrating on the future are created for 10 or 20 years. It is not mandatory for a region to have a current strategy of development, as it is a separate and an independent document to a master plan. However, there are many benefits that result from this planning document. The process of strategic planning allows to clarify what is most important for the future of a region. Because it is a long lasting plan it involves different parties to join the planning process: the city, local and regional investors as well as the inhabitants or any subject interested in the process. This allows to increase the interest in planning participation. Having a vision and a mission enables the inhabitants to identify themselves with the region and engage in planning the future of their

surroundings. Moreover, having a valid strategic plan increases the opportunities of a region to access external sources of funding for development and infrastructure projects

Cities usually have areas within their borders that demand a different, more individual, planning treatment. There are many reasons that determine the sensitivity of the examined area. Market fluctuations, difficult social situation of its inhabitants, ecological factors, deindustrialization and economic restructuring reasons of the city or suspicious neighbourhood are some of factors that affect urban policy making. The master plan gives a general idea for the direction of development in each district. It does not describe the means of implementation of the vision in the specific context of the area in transformation. A strategy of development becomes complementary in this case, as it provides with methods for achieving the desired future. It is a powerful tool that is underused in local planning. The strategy document is based on an analysis of the current state of the area in the city recognizing complex planning aspects (ecological, social, economic). Hence, possible scenarios can be created which shall lead to a wanted vision for an area. If an area is recognised as vulnerable with an uncertain future, a planner can create alternative solutions in form of scenarios of development. A scenario presents steps that shall be taken in order to solve a difficult situation. It is a chain of events and their possible results, causes and effects, hence there might be more than one that answer the demand for a solution. What has to be done is a prediction of likely events that can take place depending on the planning situation that will occur. A scenario provides an insight in the future because it is a plan of actions. Each has a reason and has a result that might be more or less desired depending on the circumstances. Thanks to this feature there is a higher dose of flexibility involved when using a scenario of development for city planning.

Except for regular planning documents described before, it became common among municipalities to develop a revitalization plan. It is a general document describing the boundaries of a fragile and degraded area together with the necessary actions the city has to undertake. In the recent years creation of such planning documents was highly favourable as the subject of revitalization became vibrant for the local communities and the inhabitants in need of deep changes.

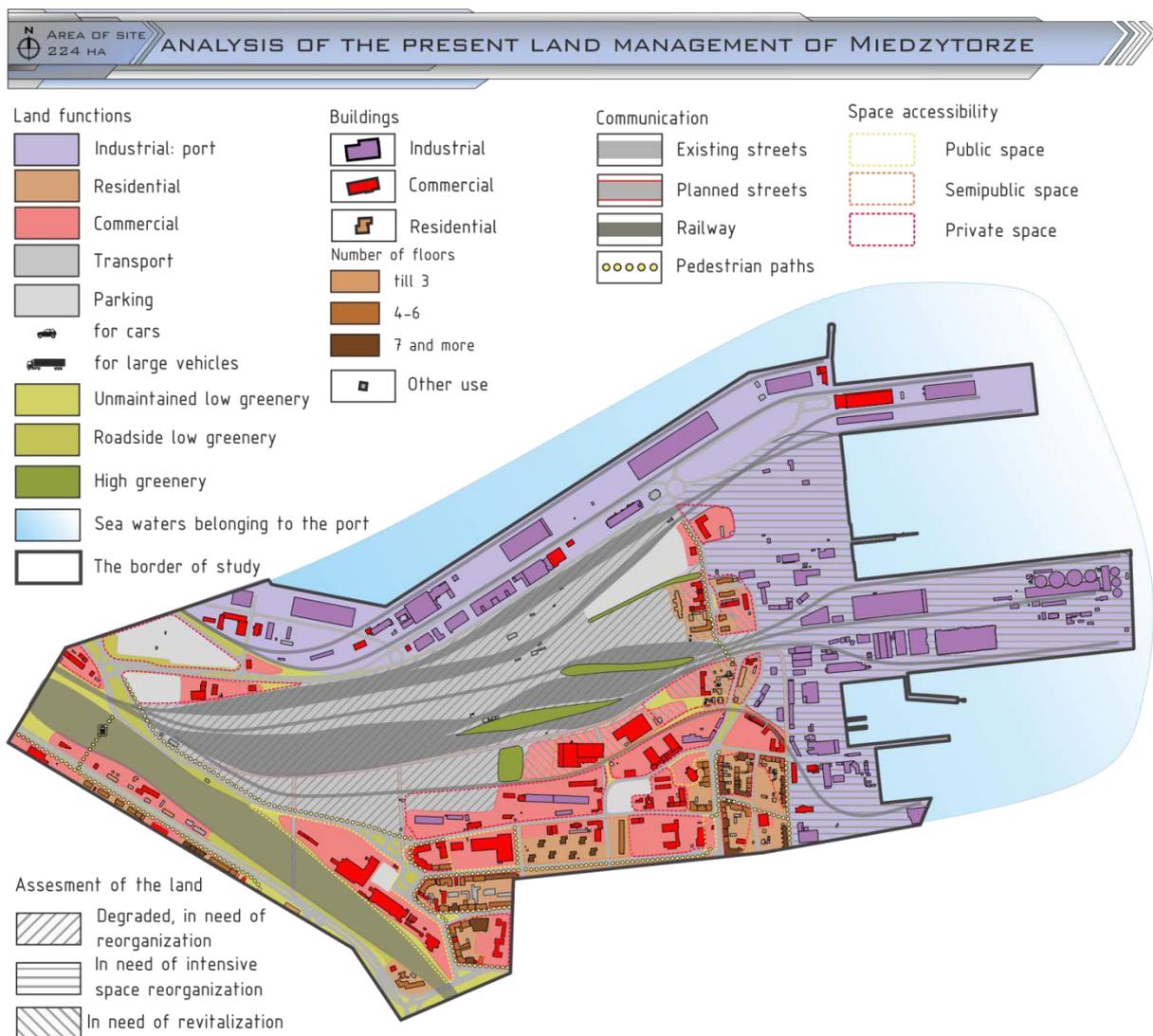
Scenarios of development of "Międzytorze" area in Gdynia

- foreseeing the possible development concepts based on alternative solutions

The work "The development concept of "Międzytorze" area based on alternative scenarios of growth of the port and the city of Gdynia", written by Joanna Prigara, is an individual undergraduate thesis project. It shows how scenarios can be used in planning a fragile area of a city. The author has analysed the current physical, social and economic situation, however, what was the most important in this particular case, are the two authorities that influence the area - the city and the port. A profound analysis of the "Port Strategy of Gdynia till the year 2027" and the "Master Plan of conditions and directions of development of the city of Gdynia" led to creation of two possible paths of development.

Międzytorze is a special area that lies between the centre of Gdynia and the sea, covering nearly 200 ha of land. The history of this area goes back to the interwar period when the Polish authorities have decided to create a Polish independent port. This decision was a major step for Gdynia. The port investment was a reason for a big migration of workers that also became involved in transforming Gdynia from a fishing village into a city. Young

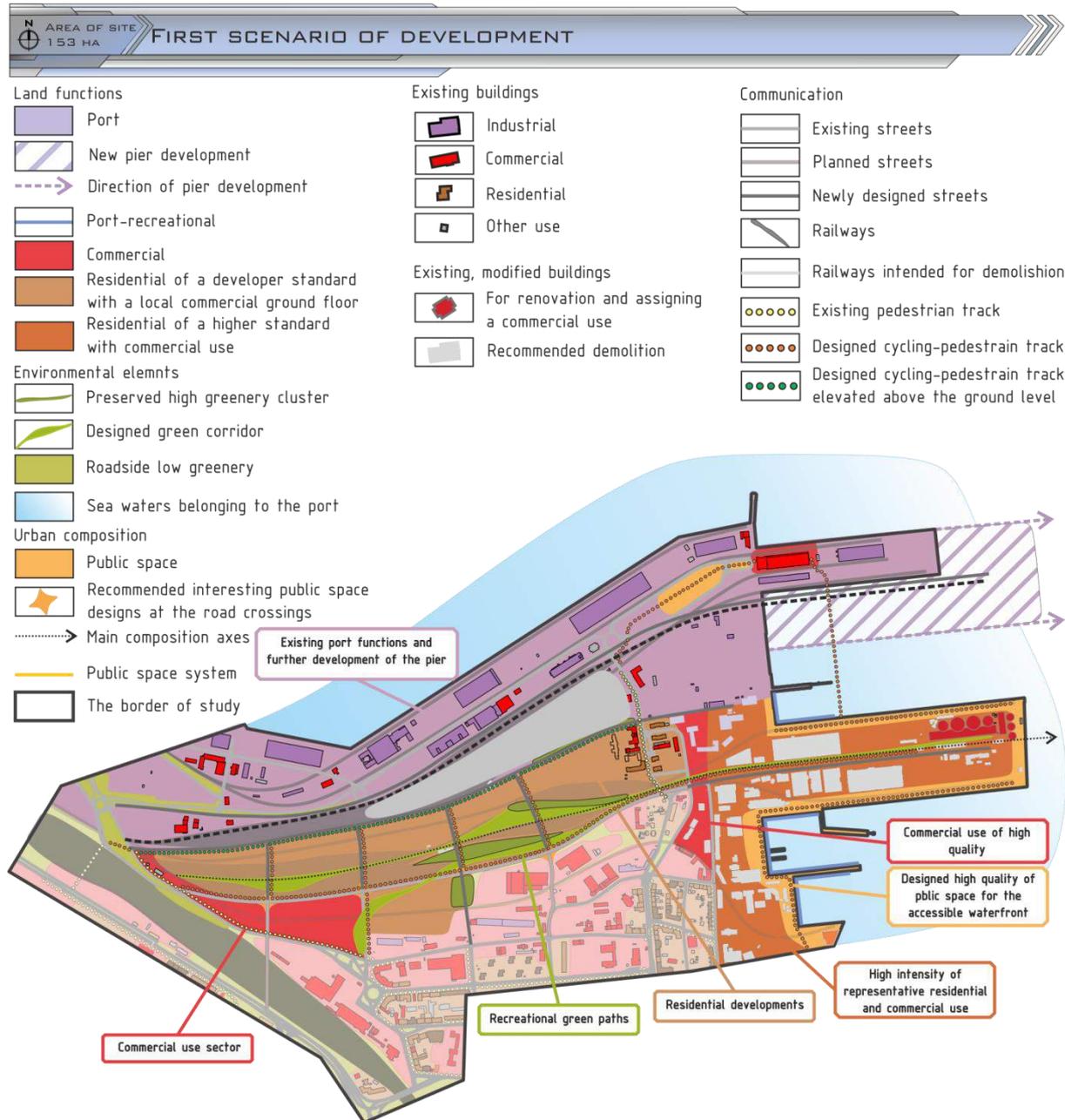
architects have decided to follow the rules of modernism and as a result the city gained a simple form with a modern character that refers to its marine heritage. In the present times Międzytorze is a degraded and underused area under the jurisdiction of the port authorities that wish to hold it for strategic reasons (logistics and probable future development). The central part of the site is taken by the railway tracks that were heavily used when the port was the biggest exporter of coal in the Baltic Sea region. However, as the marine industry began facing problems, the existing rail infrastructure became degraded. The situation of Międzytorze is uncertain because of the port situation. The way this organisation proceeds will define the possible development. The city has developed densely up till the borders of the industrial part. Favourable location by the sea as well as in the central part of the city results in a high demand for this site. Investments in the city structure can be already seen below Międzytorze, where residential development is implemented on postindustrial pier (which was owned by a shipyard), which is clearly affecting the waterfront of Gdynia.



Graphic by the author, source: the undergraduate thesis of the author

The author's work proposes two scenarios that respond to the analysed documents and the possible, but uncertain, paths. The first assumes a balanced growth of the city with a shrinkage of the industrial activity in the analysed area. The port shall remain active in the

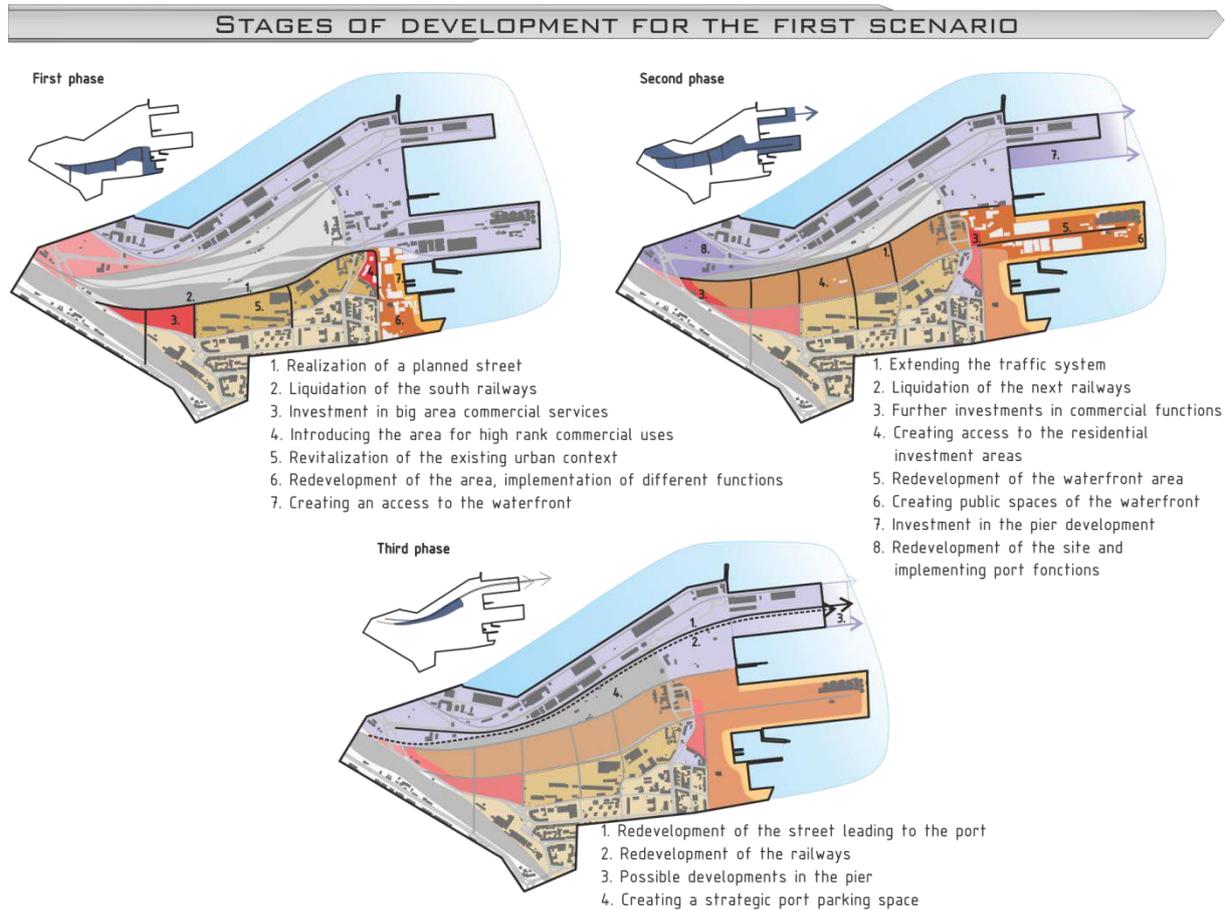
north part of the area and develop into the sea with investment in the north pier. The remaining area in the south is designed for residential purposes with an addition of commercial uses. The author designed a new urban grid on the site as a continuation of the existing pattern of composition of the city centre. The modernistic part of the main part in Gdynia has specific rules of composition with general assumptions about the axes of sight fixed on the sea or locating service points and small public spaces at the cross-roads.



Graphic by the author, source: the undergraduate thesis of the author

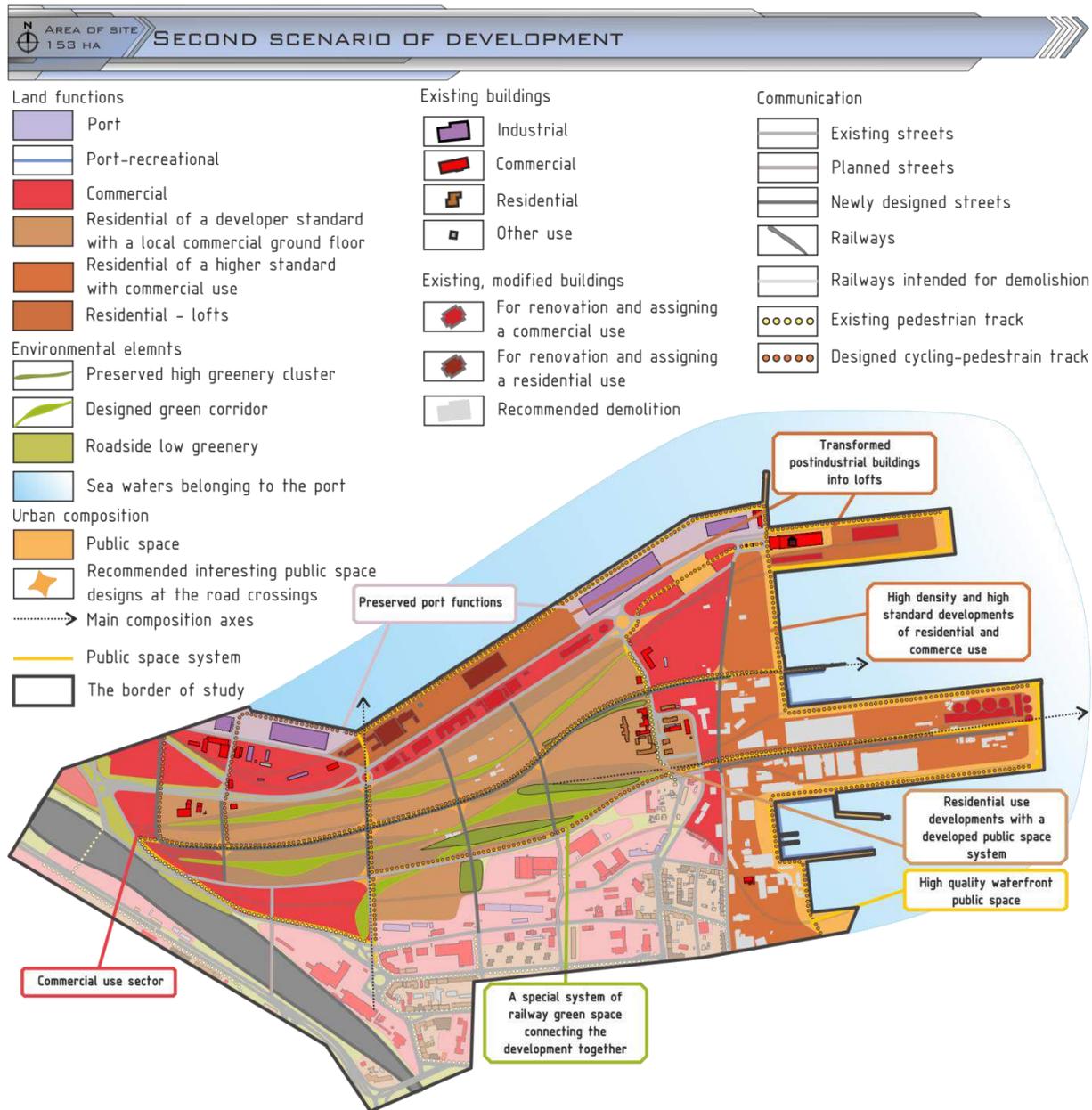
In this scenario the author has invented a three step action plan that shall be followed to reach the final state. It is important to spread the activity across the and not concentrate investments in one zone. The whole development needs changes in the traffic system. The pier development involves reorganization of the connection between the port and the city. A parking lot for trucks and a logistic area is placed between the main port street and the

new proposed residential areas. This would serve as a buffer making a between the industrial part and the residential city part.



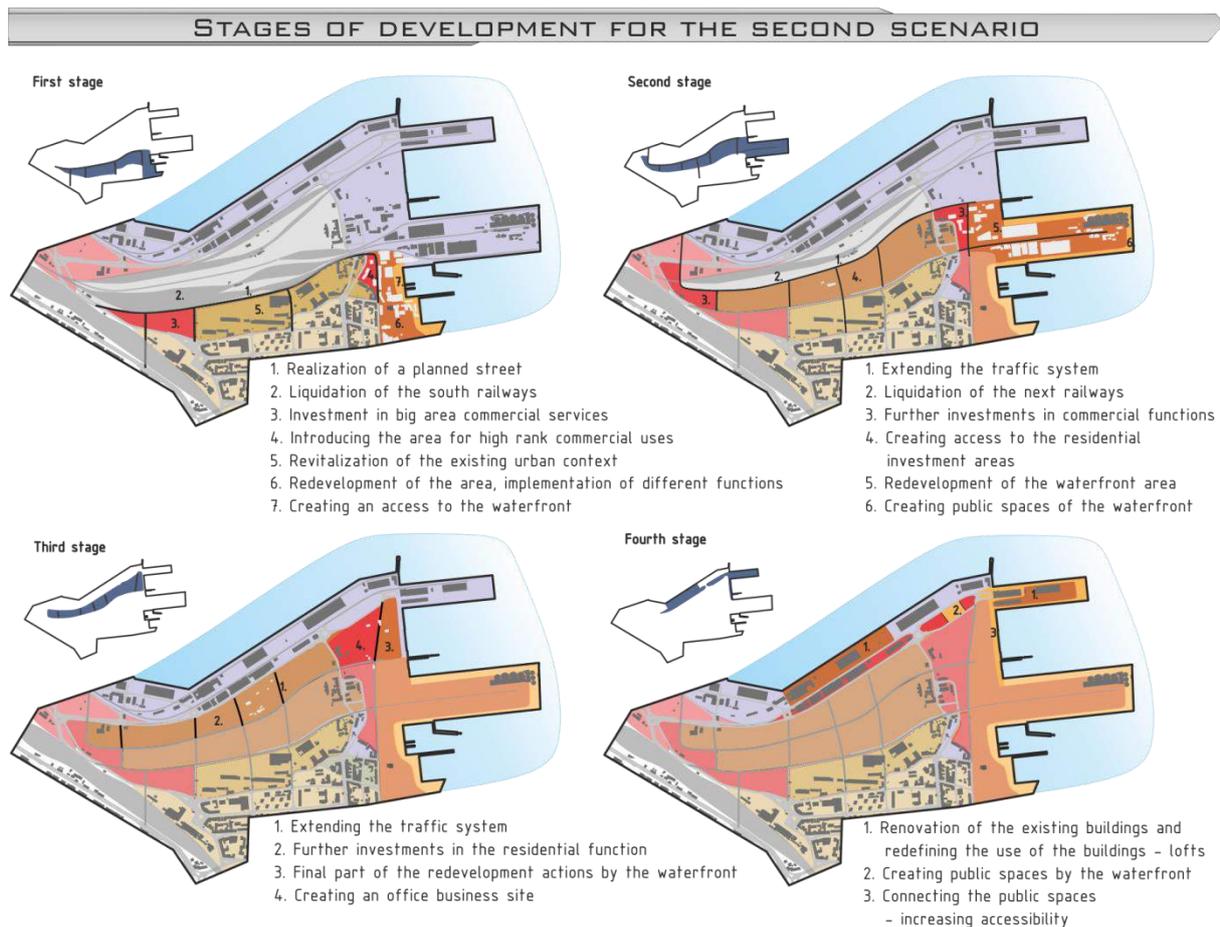
Graphic by the author, source: the undergraduate thesis of the author

The second scenario gives an idea of an intensive city growth with small port functions remaining. This scenario is oriented towards transforming the postindustrial area into a vibrant district. The new use of land is mainly residential, office and commercial. All of them shall stay connected thanks to the new system of public spaces and green areas for leisure and recreation. Because this part is concentrated on the new inhabitants in the city, it is also important to provide a high quality of public space by the waterfront that has been blocked while the area is still used for port functions.



Graphic by the author, source: the undergraduate thesis of the author

The action plan provided consists of four steps because it involves a higher number of developers to join the investment process. Also, the city shall cautiously administer the land according to the economic situation and the demand for the land to invest. This is why the author provides the described four phases, starting from the areas that are closest to the city and then move upwards. In this scenario the development of each part is connected to the traffic development.



Graphic by the author, source: the undergraduate thesis of the author

In both of the scenarios described above, the core part is the residential development in the southern part of the site. A big highlight is the proposed system of public spaces inspired by the New York's High Lane. Gdynia also has a railway that can be transformed into a system of public spaces joining different areas together. Using the existing transportation corridor and changing it into a lively path would be a factor linking the new investments in both scenarios. Such solution would prevent from exclusion between smaller projects and would be a factor that creates a historical identity that would distinguish this site from others.

This undergraduate thesis project results in the scenarios described above. Having such alternative solutions for the site is useful especially when the future of the area is uncertain. This way the city might have an insight of how planning this area could proceed. Each step needs further discussion according to the present possibilities. As the future of Międzytorze has been uncertain and dependant on different factors, planning alternative solutions brought light on the possibilities that can be created by moving in each direction. Strategy is about foreseeing and creating a preferred option. In this case the two options presented were planned out and hold a desirable way of forming this area. A strategy is a good way to put the future of the city for discussion as it attempts to predict what might occur in the upcoming years or decades. Creating scenarios of development are the first step for more informed and less risky decision-making when the planning conditions becomes more stable (for example the market becomes balanced). Strategies can also be used to reach out to the inhabitants of the fragile area during the participation meetings.

The revitalization plan for the Old Town of Słupsk

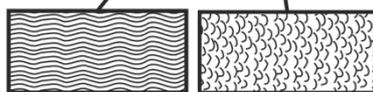
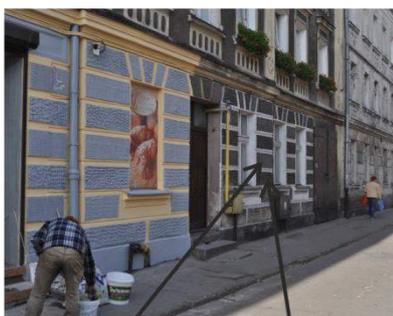
- the document created by the students of Spatial Development at Gdańsk University of Technology

A revitalization plan is a planning document on the complex matters involved in redefining a fragile area. Since it has to answer multiple problems it is also a general document that contains a strategy leading to reinventing the area.

In the 2015/2016 academic year students of Spatial Development Undergraduate Course at the Gdańsk University of Technology took an active role in creating a revitalization plan document supporting the authorities of the City of Słupsk. The focus of this collaborative student project of the whole semester was to create a joint publication with suggestions and recommendations to the process. The city has chosen an area of around 9 ha of the Old Town that is degraded and in need of intervention. During the fieldwork students have realized that the biggest problems in this case was the lack of municipal infrastructure (central heating, sewerage systems) as well as social issues involving high unemployment rate.

Among other tasks, students had analysed the present state of the area and identified the social, economic and spatial problems and limitations. All regulations in the "Master Plan of conditions and directions of development of the city of Słupsk" were brought up and a SWOT analysis was elaborated. A simple spatial analysis was made and the group of students identified the overall vision and the main objectives for the revitalization plan. These have been divided into 4 categories. The first was devoted to improving the visual attractiveness of the city. The second focused on improving the quality of public spaces. The third was aimed at improving the accessibility of the area both for pedestrians and vehicle users. The final focus was on empowering the inhabitants to take part in the revitalization process. Smaller groups of students have been investigating the possibilities within these objectives and developed specific ideas that were unified and summed up in the document that was a final outcome of works from the semester.

Renovation of a facade in a ground floor store



Recommendation: keep the style of the details present on the existing facade

The present effect: colour disharmony



Recommendation: keep the facade united and preserve the existing colour



Source: *The booklet of revitalization advice for the city of Słupsk by the students of the undergraduate course of Spatial Development course at the Gdańsk University of Technology*

In the first point the group had to define the guidelines that would help in improving the visual attractiveness of the examined area. It was recommended that an ultimate goal should be to maintain the traditional schema of colours that were defined basing on the preserved historical buildings. This point was unified with the proposal of restoring the traditional decorations and proportions of the facades. It is not intended to promote a historical style in a present form. What is important for the new developments is to keep similar heights of the buildings and the proportions, rhythm and divisions of the facades. What is also important to mention is that the majority of Polish cities face a problem of their city centres being littered with advertisements. It is especially seen in the facades of buildings that include a commercial use on their ground level. Furthermore, owners willing to renovate their businesses often spoil the harmony of a façade and by renovating only the part they own. The proposal is to impose regulations that would preserve the scale and aesthetic value of buildings in the city centre.



Photograph by the author, taken at the site on 09.10.2015

In regards to public space, the recommendation was to develop a design guideline which would indicate a certain style of outdoor furniture that would be uniform for the entire area. This could be another way to develop a feeling of identity with the revitalised area for the inhabitants.

In the second category of objectives, the students attempted to develop a system of public spaces. The idea is to unify the inhabitants within the area as well as serve as a link connecting the revitalized area with the rest of the city. Developing a proper public space shall be consulted with the inhabitants in a series of workshops. To unify the inhabitants community gardens shall be introduced. They have a positive impact in the mentioned social aspect as well as the environmental, promoting ecological gardening in the city, together with improving the quality and attractiveness of public space of the site.

In regards to the objective of improving the accessibility point, one of the groups came up with an interesting idea of developing a phone application that would provide the necessary information about the city and its communication systems, as accessibility is not only about the physical access but also virtual. Since conscious planning of the transportation system is crucial at this point, that is why the group has also examined the existing traffic pattern and reworked it.

The final, fourth objective on community participation is basing on the assumption that the process of revitalization is not only about the physical change of the surroundings. It is also important to keep the local community engaged in all the stages, beginning in the identification of main challenges and ending with the implementation, monitoring and evaluation. It is significant that the inhabitants need to feel that they are a part of the movement. This results in the desire to change and that is a crucial role in the whole process. Since planning is for people, and not the other way around, the whole strategy will not work out without their engagement. This is why a series of workshops shall be conducted. Making people involved in creation of their surroundings results in creating attraction to the space and a sense of ownership, which will likely result in increased use and better maintenance. Students have given ideas of a charrette design for workshops that could activate people. It is recommended that the city launches initiatives to attract more investors to the revitalized area by creating special economic status for the district. Lowering the taxes for a certain period of time or giving a lower lease price are some examples of actions that could start an economic activity in the area. Favourable economic conditions would attract small business holders who would start their activity in ground levels of the buildings. Hence the pedestrian activity would begin in the streets and a visible change would be made that the inhabitants could appreciate.

As a result of these projects a booklet of revitalization advice has been created and sent to the authorities of Słupsk. The works on the revitalization planning document are in progress. The booklet is rich in ideas that shall be included in the official plan. It gives clear proposals that are possible to execute by the municipality, they only need to be adopted in the official revitalization document.

Conclusion

Cities and regions are constantly facing diverse challenges that are an integral parts of planning. The planning regulations need to respond to the present needs, as well as answer the predictable and unpredictable challenges of tomorrow. A development scenario is a tool that allows creating simulations of the possible paths of development. These are based on the diagnosis of the current state, followed by the assumed goals in a series of steps. Unpredicted events can alternate them what results in development of alternative solutions. This is why a scenario is more flexible than a strict zoning plan. A zoning plan is crucial as it contains the essential roles for planning, however, it does not leave a space for unpredicted changes in the environment, politics or economy.

Międzytorze project was done to provide a different point of view for a solution for the degraded area. Usually, Polish planning focuses on designing singular solution when a developer pressure occurs. Author's scenarios mean to visualise two possibilities of development, because they include the role of the port which is integrated with the city and cannot be simply omitted while deciding about the future of its terrains. Such approach is theoretical, however thanks to the design process, it allows to get a conscious insight in the designing possibilities that lie ahead.

The Słupsk project was an interesting collaboration between the city and the students. What was learnt is that the interest in the aesthetics, public spaces and accessibility needs a strong involvement from the inhabitants to make the recommendations work. The strategy

created by students requires a formal support not only from the authorities but also from the local community to make anything happen.

Determining a vision clarifies the objectives of planning. A scenario of development shall be treated as a complementary document to the master plan for sensitive areas within a region. Because it is a result of a deep analysis of the current state and it is based on the predictions for the future, it is a base for any emergency planning situation. A plan that has already been thought through can always be consciously alternated if a rapid change in the surroundings occurs. This is a better solution than creating a new plan from the start. Revitalization plan focuses on the redevelopment of an area with an emphasis on social factors. As a planning document, it is also flexible and can be alternated in uncertain times. It shall be treated as a support to the existing planning documents as it refers to degraded areas.

Sources:

Prigara J., *The development concept of "Międzytorze" area based on alternative scenarios of growth of the port and the city of Gdynia*, 2016

Collaborative work of students of the undergraduate course of Spatial Development at the Gdańsk University of Technology, *Program rewitalizacji kwartału wewnątrz ulic: Deotymy, Jaracza, Sygetyńskiego, Ogrodowej*, 2016

Sołtys J., *Pojęcie strategii, planu i planowania strategicznego – ich miejsce w planowaniu i zarządzaniu*, lecture within the subject Strategies of Municipality Development, academic year 2015/2016

Sołtysik, Maria. *Gdynia, miasto dwudziestolecia międzywojennego: urbanistyka i architektura*. Wydawnictwo Naukowe PWN, 1993

Sołtysik, Maria. *Modernizm gdyński – modernizm europejski, inspiracje i analogie*. [online]. Ostatnia aktualizacja 2014. [accessed: 02.06.16]. Access through World Wide Web: http://www.gdynia.pl/g2/2014_04/82236_fileot.pdf

Studium uwarunkowań i kierunków zagospodarowania przestrzennego Gdyni, załącznik nr 1 uchwały nr Xi/190/15 Rady Miasta Gdyni z dnia 26 sierpnia 2015

The transformation and reorganization of cities in Southeastern Turkey: An examination from the safety perspective

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Abstract 21st century is a period when the globalization penetrates the life. There are some positive developments such as equity in information accessibility via internet and efforts for creating/designing inclusive public spaces. On the other hand, vibrant and crowded public spaces have become targets as a result of globalization of terrorist attacks. Violence and conflicts have been moved to urban areas, and refugee flows which accelerated due to the armed conflict/civil war in some countries, such as Syria, Iraq, Yemen etc., have turned into a crisis that affected all of Middle East and European cities. These happenings necessitate reconsidering the safety paradigm.

Turkey, because of its geographical location, is one of the most affected countries by both terrorist attacks and refugee flows. Meanwhile, conflicts between security forces and terrorist groups in Eastern and South Eastern parts of the country that have been transferred from rural areas to city centers bring the matter of re-organization and transformation of these areas into question. On February of 2016, the President of Turkey announced that some part of south eastern cities such as Sur, Cizre and Silopi, which have demolished due to the conflict, will be reconstructed in detail. Thus, Turkey is on the verge of transforming the cities according to safety paradigms, and it is a necessity to reconsider urban planning and design of urban open spaces in the context of terror and violence.

The aim of this study is to examine the transformation and re-organization of cities, especially the southeastern cities of Turkey which are going to be planned and designed after demolitions during the conflict in terms of the safety perspective. Within this scope, we will firstly investigate the changing paradigms on the safety issue as a result of the globalization. Secondly we will compare latest examples of passive safety measures and replanning/redesigning approaches in the world with the planning and designing approach of the reconstruction of eastern cities of Turkey from safety perspective. Thirdly, we will discuss what should be new tools of urban planning and design for preventing violence and terrorist attacks in cities.

1. Introduction

Safety and security issues, namely defending the city against internal or external threats have remained on the top of the city planning agenda throughout the history.

In the Cold War era, governments placed emphasis on national and global security rather than the concerns of ordinary people. In the post-Cold-War world, because of increasing intra-urban conflicts, human security, which pays attention to the concerns of ordinary citizens, has come into prominence (Beall and Fox, 2009, p.174). Human security has continuously renewed threats like migration flows, terrorist attacks, armed conflicts...etc.

The roots of safety issues in urban design and planning date back to Jane Jacobs (1961) that she developed considering American cities more than 50 years ago. Jacobs' suggestions about the safety problem that she discussed on the center of 'streets and sidewalks' based on ordinary crimes pioneered in development of planning and design principals which prevent crime and minimize fear of crime in cities. This point of view was

extended by Ray Jeffrey (1971), Oscar Newman (1972), Wilson&Kelling (1982) as putting the safety issues on the planning agenda.

The theme of security has also an increasing importance in contemporary redevelopment and regeneration programs. Raco (2007) stresses three interrelated trends about the security issue. Firstly, it has become a key factor that affects a place's competitiveness and attractiveness. Secondly, rising of social problems, marginalized groups and urban terrorism has made the cities dangerous places to visit. Thirdly, increasing security concerns has brought different policy approaches and design solutions related with emerging technologies in security industry such as CCTV systems and GIS technologies.

In addition, safety is seen as a criterion for a sustainable community. Raco (2007) lists 'sense of community identity and belonging; tolerance, respect and engagement between people of diverse backgrounds; low levels of crime and anti-social behavior' under the criteria of 'identity, belonging and safety' as one of the central features of a sustainable community.

2. Changing paradigms in safety and security issues

2.1 From 'anomic crime' to 'organized crime'

Beall and Fox (2009) define the most dangerous forms of insecurity for urban living: Crime and violence. This definition consists of both anomic and organized forms of crime and violence from petty thefts to criminal gangs, from gender-based violence to terrorist attacks. They also classify the urban crime and violence as anomic crime, organized crime, endemic community violence and open armed conflict.

Parallel to the rapid urbanization, organized violence like wars, conflicts and terrorist attacks have been moved from rural areas to urban centers. Now, "cities are increasingly the primary battle field for 'new wars'", incubation and target areas for terrorist activities, and 'spaces of refuge for displaced populations' (Beall and Fox, 2009, p.177).

2.2 From 'fear of crime' to 'culture of fear'

The perception of individuals about a place is more important than the actual level of danger. This perception can generate fear of crime and damage the fabric of cities likewise (Beall and Fox, 2009, p.178). Not only crime rates but also 'fear of crime' is accepted as a key performance indicator for sustainable development (Davey et al., 2009:140). There are a lot of cases that fear of crime negatively affected daily life by reducing the use of public spaces especially by vulnerable groups like women and children. As a result of this, quality of life in cities decreases while economic costs of living increases (UN, 2007: 73).

'Fear of crime' can turned into 'culture of fear' as a result of increasing urban crime and endemic violence by means of media, and this can lead to 'segregation, social fragmentations and the creation of fortified spaces' in cities. (Beall and Fox, 2009, p.178). These fortified spaces, namely gated communities, which can be seen both in developed and developing world, isolate people from the streets and city life, so 'a geography of fear' starts to appear based on two different perceptions of space: inside and outside. Eventually, there is no 'eyes on the street' in deserted public spaces.

'Do walls in the city provide security- or do they create fear?' (Marcuse 1997: 101).

Fear of crime is substantially related with 'a lack of trust'. According to Jacobs, 'the absence of this trust is a disaster to a city street', and there is no way to create it institutionally (Jacobs, 1961: 76). Jabareen and Carmon (2010:448) list five factors that together create communities of trust: shared beliefs, shared perceptions of risk, shared interests, shared daily life practices, and shared spaces.

2.3 *Urbicide: killing the urban*

"The future of warfare lies in the streets, sewers, high-rise buildings, industrial parks, and the sprawl of houses, shacks, and shelters that form the broken cities of our world" said Ralph Peters in 1996 (cited by Graham, 2011: 32). Urban sites have become the battlefields of the new war. Urban violence based on wars and conflicts that cause the demolition of urban infrastructure and destruction of buildings and places can be called as 'urbicide'. Urbicide briefly means 'killing the urban' (Jabareen, 2006). Graham (2008) uses the term of 'asymmetric urbicide', when both sides are attacking 'everyday urban life' of each other 'in an intensely urbanised context'.

There can be different actors and tools in the process of urbicide. Sometimes it can be by means of urban policy and planning for political purposes. Beall and Fox give three examples for 'urbicide': The first one is Operation Murambatsvina in Zimbabwe, which intended to eradicate illegal activities in the city of Harare, but finally resulted in that 700000 urban residents lost their homes. The second one is Israeli occupation in Palestine to prevent the consolidation of Palestinian urban centers. This is not only an attack against buildings and places, but also a disruption of urban society. The third one is the war in Bosnia, which destroyed both symbols of Bosnian culture and urban fabric. However, in the contemporary world, urban space and civilians living there is used by combatants for tactical advantage as a 'new war' feature (Beall and Fox, 2009, p.187-190).

Jabareen (2006) evaluates the Israel state politics in Nazareth as 'urbicide' because of 'its destructive outcomes in the locale'. The city of Nazareth became 'a victim of an extreme external intervention' (Jabareen, 2006: 312).

3. **Urban planning in the cities of conflict**

After the urbicide, when this 'new war' finishes, reconstruction of cities will be matter. This consists of not only repairing the physical fabric of the city (basic infrastructure, historical areas..etc.), but also reordering daily life. According to Beall and Fo (2009:195), this 'reconstruction is not merely a question of bricks and mortar; it requires identifying and confronting the social and psychological inheritances of a conflict'.

'Cities can be important sites for cultivating peace and building a concrete image of o society's future aspirations' (Beall and Fox, 2009, p.172). This peace building process should make the city, which is 'full of strangers', provide a feeling of safety and security for a person 'on the street among all these strangers' (Jacobs, 1961: 38).

Providing public security is necessary to mitigate crime and violence. On the other hand, a question arises how will we provide public security and create safer cities. Will new strategies and planning tools be 'designed to control, survey and defend urban space' (Beall and Fox, 2009, p.198), or is it possible to find more smooth and democratic solutions?

Jacobs' approach was that 'public peace is kept by an intricate, almost unconscious, network of standards among the people themselves, and enforced by people themselves' (Jacobs, 1961: 40). She also suggested three principles for a safe city street: Clear demarcation between public and private space, natural surveillance (eyes upon the street), and consistent using of sidewalks (Jacobs, 1961: 44-45). These principles are followed by new urbanists, and they advocated designing vibrant, permeable and crowded public spaces to be able to secure them (Davey et al., 2009: 141). On the other hand, CPTED (crime prevention through environmental design) principals are also developed under the influence of Jacobs, and the 'defensible space', which offered the division of public and private space, was introduced (Newman, 1973; Davey et al., 2009: 143). The main difference between these two approaches was that the former one offered 'open solution' while the latter one offered '

closed solution' to prevent crime and reduce 'fear of crime' (Hillier and Sahbaz, 2009: 164). However, they only focused on preventing the negative effects of 'anomic crime' rather than 'organized' forms of crime and violence.

Bollens (2006) asserts that promoting or discouraging healthy interrelations in the city can be possible by urban design and planning tools. According to him, the city's physical order, social integration, cultural diversity can be empowered or weakened via urban planning. He also lists some planning and design criteria to ensure peace building in the cities of conflicts. Firstly, urban form should be designed as flexible that allows porosity and mixing of population for healthier urban processes and avoids physical segregation like walls, buffers..etc. Secondly, each group in the city should be engaged equally in planning process in terms of participation, design solutions, access to services..etc. to be able to increase communication different urban groups. Thirdly, urban planning should be sensitive in location and land use decisions that is related with different ethnic and cultural groups. Fourthly, the public sphere should be designed physically and institutionally in such a way that covers all competing identity groups in the city. Finally, peace building knowledge should be allowed to diffuse vertically and horizontally via well-designed institutional linkages.

Raco (2007) recommends some enhancements in the security planning within 'progressive sustainability' approach to be able to secure communities. According to him, the socio-economic causes of insecurity, marginalization and exclusion should be reconceived within a wider perspective, the process of governance should be managed in this direction, and finally, the uses and rights to public spaces should be rethought to increase 'social order and minimize conflict' (Raco, 2007: 318-319).

Jabareen (2006:321) advocates 'collaborative planning' approach to avoid the possible conflicts between different ethnic, cultural and religious groups in the city. This approach consists of 'understanding the micro structure of the city in terms of identity and people's perceptions of places and spaces', estimating potential risks that plans involve before implementation by meeting citizens, and reducing contradictions between planned space and experienced space.

UN Global Report suggests six main groups of policy responses at the local level to deal with urban crime and violence: "Effective urban planning, design and governance; community-based approaches to enhancing urban safety and security; strengthening formal criminal justice systems and policing; reducing risk factors; non-violent resolution of conflicts; and strengthening social capital" (UN, 2007: 47).

4. Reconstruction of Urban Areas After Conflict

Big conflicts have been taken place in both Europe and Middle East since the mid 1970s. This process started with Lebanon Civil War (1975-1990), continue with Bosnian war (1992-1995), Kosovo War (1998-1999), Afghanistan war (2001-2014), Iraq War (2003-2011), Syrian Civil War (2011-present). Cities that have important cultural and natural values such as Beirut, Jerusalem, Sarajevo, Mostar, Kabul, Damascus and Baghdad were demolished because of the armed conflict. In the post-conflict period, some activities have been realized in order to reconstruct demolished urban areas and protect cities against war. In this part, urban reactions after the conflicts in Beirut and Palestine are examined.

4.1 Reconstruction of Beirut Historical City Center, SOLIDERE

Beirut remained a small provincial Ottoman town until the mid-19th century. After the Ottoman Empire developed trade with West, the harbor of the city was transformed and Beirut-Damascus road was constructed.. The French occupation after the First World War, took over Beirut as a capital city of Lebanon. In 1943, Lebanon gained its independence and Beirut gained importance in terms of economical and political values in country. In 1950s, people who escaped from socialist and nationalist revolution, which took place in neighboring countries, upper income Palestinians and oil which comes from Arabic-Persian Gulf flowed to Beirut, all of whom wealth into Lebanon's banking system and these incomes were invested in its real estate sector (Nasr and Verdeil, 2008). Beirut was named as "Paris of the East" because of the cultural and economical values until the mid of 1970s. However, these developments were interrupted due to the civil war and the important part of the city was destructed (Figure 1) (Komut, 2002).



Figure 1: The destruction of Lebanon Civil War, Beirut. Source: Url-1.

After the Taif Agreement (1990), reconstruction activities started for Beirut. "Participatory planning" approach has been adopted in this process. In this context, architects, planners and universities provided consultancy service to local governments. Moreover, Prince of Wales' Urban Design Task Force in Lebanon worked actively in planning phase (Saliba, 2006). The reconstruction of Beirut consists of three main plans:

- 1) Beirut North Sea Coastline Rehabilitation Project, LINORD
- 2) Reconstruction and Planning Project of the North Region of Beirut, ELISAR
- 3) Reconstruction of Beirut Historical City Center, SOLIDERE

Although the re-planning of Beirut consists of three different project, LINORD project is still infant and ELISAR project was bombed by Israel in 2006 and important part of constructed area was destructed (Tadmori, 2006).

SOLIDERE took on the task of reconstruction historical city center of Beirut and it developed a successful financing model. This project is located on 1,8 million m², one third of this area was gained from land reclamation, and involves infrastructure and public area development. Moreover, project involves constructing road, pedestrian road and car park, developing communication, water, sewage, and electricity network, generating new open public areas. 563,440 m² of this area was developed for special development projects. Hotels district, 31 floor housing tower, Saifi Village which include low rise housing units, 41 international Bank buildings, fairground, congress and culture center, embassy district, archaeological site, etc. are located on this area (Figure 2) (Komut, 2002).



Figure 2: Beirut City Center Project. Source: Url-2.

Beirut City Center project is assessed positively because of the some factors such as rehabilitation of unplanned urbanization, restoration of uncared historical buildings. 5000 years old archaeological remains were found from the project area because of the excavations (Tadmori, 2006). On the other hand, many buildings of the project don't suit their context in terms of material and architectural styles; residents have to migrate other areas because of the enhancement of the housing prices and new functions of the project. Moreover, there are no security statement except for "24 Hour Security Coverage with CCTV". This may cause a big problem because war and conflicts might continue as lived in ELISAR. ELISAR project, which was planned as similar manner with SOLIDERE, was bombed by Israel forces and this construction was destroyed dramatically.

4.2 Activities through protecting cities against war in Palestine

Palestine had been the part of the Ottoman Empire nearly 400 years until First World War. After this time, Palestine entered the domination of England and this country retreated from Palestine in 1948. State of Israel was established on this region in the same year. Arab-Israel War was taken place because of establishment of new country on Palestine land and Israel won the war and occupied a considerable part of this region (Cleveland, 2008). Many conflicts have been realized between Palestinians and Israel State until now, Palestinians' lands have been occupied by using planning tools.

Israel started to construct West Bank Wall by asserting security reasons in 2002. According to plan, the length of this wall will be 725 kilometers and when this construction will finish, %9,5 of West Bank, which include East Jerusalem, will be isolated, nearly 385.000 settlers will be located between Wall and Green Line, 128.000 Palestinians will be sieged by wall from three side and 26.000 Palestinians who can access other side of the region via tunnels and highway will be sieged by wall from four side (Figure 3) (Url-3).



Figure 3: Separation Barrier. Source: Jadallah, 2015.

In 2014, Gaza war emerged and many civilians died because of the conflicts. United Nation Schools, which are temporary shelter in war times, sea sides and civil settlements were bombed and many people lose their life. On September of 2014, formal investigation was opened against military officials who are responsible for these attacks (Url-4). Israel State has attacked to Palestinian lands for many years. However, any official unit hasn't done anything against to this occupation. Thus, there is a need of another way to release this occupation and to find a solution for this destructions. In this context, some organizations such as APJP (Architect and Planners for Justice in Palestine) got into the act and carried out some projects for preventing war destruction and helping to aggrieved people. APJP was established in 2007 and this organization aims to seek support on international platforms for Palestine (Şentek, 2015). APJP objects to the illegal settlements, control points and some projects such as Separation Wall (West Bank Wall).

In this context, APJP organizes a campaign against occupation practice, which was carried out via architectural and planning tools. In 2009, organization started petition against Israel's E-1 Plan. APJP focused on the important role of architect and planners on these occupation projects and it called for their colleagues to struggle against occupation projects of Israel Architecture Assembly and Israel Government. In this regard, APJP carried out campaigns to prevent construction of Ma'ale Adumim settlements which was planned to divide North and South part of the West Bank, to prevent transformation project of destroyed Lifta settlements by sending Palestinians. Moreover, APJP was successful on frozen of the plan about pulling down 88 housing units in Silwan town by molding public opinion (Figure 3) (Url-5).



Figure 3: Al-Bustan Area In Silwan Scheduled For Demolition. Source: Url-6.

Forensic Architecture (FA) is one of the agency, which aims to product and present architectural evidence from war areas by making structural analysis. Although this Project is not limited to Palestinian region, there are important studies have been carried out for Palestine. FA undertakes advanced architectural and media research on behalf of international prosecutor, human rights organisations such as Amnesty International (AI), Human Rights Watch, B'teselem and Al Mezan in Palestine as well as political and environmental justice groups. FA is analysing violations, modelling unfold events in space and time and creating 3D models of environments where conflict continue. Besides, FA creates filmic animations and interactive cartographies on the urban and architectural scale about these issues (Url-7). According to Weizmann (2014:16):

“For forensic architecture, buildings are thus not just passive elements, receptive sensors on which events are registered. Nor are they just the scenes of a crime, the locations in which violence takes place. Rather, built environments are composite assemblies of structures, spaces, infrastructure, services, and technologies with the capacity to act and interact with their surroundings and shape events around them. They structure and condition rather than simply frame human action, they actively—sometimes violently—shape incidents and events.”

One of the investigations in Palestine, which is carried out by FA, is “The wall in Battir”. The Palestinian Village of Battir is located at the south of Jerusalem in which the Israeli army was planning to build a new part of separation wall (Figure 4). This village has important elements such as terraces and irrigation channels, which date back to the Roman Period. Forensic Architecture members provide digital model and animation, which represent the effect of the wall on the environment, and show that even the most “architecturally sustainable” and “less invasive” methods proposed by the army would cause irreparable visual and environmental harm. Because of these efforts, Israel’s High Court froze the state plan to build the wall in Battir. (Url-8).



Figure 4: Separation Wall in Battir Village. Source: Url-8.

5. The Transformation and Reorganization of Cities in Southeastern Turkey

Many terrorist attacks were realized between 1984-2013 in cities of Southeastern Turkey. In this period, nearly 40.000 people died because of the terrorist attacks. These attacks generally took place in the eastern and southeastern part of the Turkey. On 25 April 2013, PKK (Kurdistan Workers' Party), which is the most harmful terrorist group, announced that they sent their mailed fist from Turkey to the North Iraq. However, peace process ended with the terrorist attacks in 2015. From this time to nowadays, there are dense conflicts between security forces and terrorist groups realized in some regions such as Nusaybin, Sur, Cizre.

Whereas PKK attacked mainly from the mountains before 2013, these conflicts have taken place in cities. PKK digged ditches and made barricades on different points of the region. Thus, government declared a curfew some neighbourhoods where conflicts took place in order to prevent civilian casualties. Built environment were damaged due to the conflicts. For example, the top view of Sur have changed dramatically in six month (Figure 5). In addition to this, %22 of Cizre, Sur, Silopi and Nusaybin population migrated and over 10.000 shopkeepers affected negatively from this process (Tümer, 2016).



Figure 5: Urban pattern change of Sur in six month. Source: Google Earth.

After the conflicts had finished, Prime Minister of Turkey announced that areas, which were affected from the conflicts, would be rebuilt and all citizens who had to migrate from their living areas will be given rent allowance (Url-9). In this regard, first action was realized for Sur where conflicts finish on March 9, 2016. According to council of ministers' decision, many parcels will be expropriated by Ministry of Environment and Urbanization (Url-10). Moreover,

Prime Minister announced in Sur that Diyarbakır Fortress and Hevsel Gardens Cultural Landscape, which are located on Sur and are on the UNESCO World Heritage List, will be protected, new buildings will be built in harmony with local values in terms of material and typology, historical and public buildings will be restored as their original specialties. He also showed some visuals from the project on his speech (Figure 6) (El, 2016).



Figure 6: Visuals from the project. Source: Url-11

The strategies about reconstruction of Sur are listed below:

- *“Firstly the government will evaluate the extend of the damage, pull down weak buildings*
- *Citizens, which have been affected from demolition, will be resettled with a financial aid for house rental prices. They also will be given low interest rate loan so that they can buy house.*
- *Urban transformation studies will take place on 1,870,000 m²*
- *There will be “Less housing, more trade”,*
- *1000 historical buildings will be put under protection*
- *8000 buildings will be restored as their original typologies*
- *Buildings won’t pass over historical fortress and maximum building height will be 4 stories,*
- *Market values of buildings will be paid to citizens in exchange for expropriation” (Baysal, 2016).*

In the process of Sur reconstruction, security measures have tightened. In this context, armored police station, which has three stories and 8 meters height, were constructed on different parts of the Sur (Figure 7) (Url-12).



Figure 7: New police station in Sur. Source: Url-12.

6. Conclusion

Despite the fact that there are some common situations in the cities of conflict, it is not realistic to apply same urban planning and design principles to each different case because of its unique physical and social characteristics.

The biggest challenges for reorganization process in southeastern part of Turkey, in particular, in Sur/Diyarbakır can be listed as follows:

- Providing public security with minimum effects on daily life in terms of freedom of mobility and access to services,
- Arranging physical order in a way that prevent terrorist attacks without disrupting traditional urban pattern and increasing feel of insecurity,
- Constituting institutional linkages between central government and local authorities that are different sides of conflict.

After the peace process has broken down, the need to public security has been understood more clearly, especially with 6-7 October events, which resulted in hundreds of casualties and many damages in urban areas (Url-13). However, it is almost impossible to increase security measures without affecting daily life negatively. In addition, each measure to increase security will also increase the feel of insecurity among citizens and visitors. Moreover, the traditional urban pattern of some cities in Southeastern Turkey such as narrow streets and cul-de-sacs, has made it harder to ensure public security. On the other hand, most of tangible and intangible cultural heritages of cities are located in these old parts of the cities. The other problem is that central government and local authorities are in different side of the conflict; therefore it is very difficult to act in unison in the transformation and reorganization process.

The main motive in reorganization process has been the attitude of residents in these cities. Although most of them supported Kurdish Party (HDP) politically in last elections, they have been also for peaceful process rather than armed conflict. It has made easier to sweep terrorist groups away the cities in spite of restrictions in daily life within a couple of months. It has demonstrated that attitude of locals has the great potential to designate the processes both in conflict and reconstruction periods. In this context, 'collaborative planning' approach can be helpful for reducing conflict on urban areas. Structural analyse methods which are used by Forensic Architecture may be helpful for reconstruct demolished areas. Moreover, some applications, which provide data transfer between citizen and security forces, should be developed and used conflict times in the future.

7. References

- Baysal, Ercan (2016). İşte Sur'u ihya stratejisi, <http://www.star.com.tr/mobil/mobildetay.asp?Newsid=1080123>, accessed date: 06.06.2016.
- Beall, Jo, Sean Fox, and Tom Goodfellow. Cities and development. Routledge, 2009.
- Bollens, Scott A. "Urban planning and peace building." *Progress in Planning* 66.2 (2006): 67-139.
- Cleveland, William L., & Harmancı, Mehmet (2008). *Modern Ortadoğu Tarihi*. Agora Kitaplığı.
- Davey, Caroline, Lesley Mackay, and A. B. Wootton. "Designing safe residential areas." *Designing Sustainable Cities* (2009): 139.
- El, Kıvanç (2016). Onlar yıkarsa biz yapacağız, <http://m.milliyet.com.tr/onlar-yikarsa-biz-yapacagiz/siyaset/detay/2219856/default.htm>, accessed date: 06.06.2016.
- Graham, Stephen. *Cities under siege: The new military urbanism*. Verso Books, 2011.
- Graham, Stephen, ed. *Cities, war, and terrorism: towards an urban geopolitics*. John Wiley & Sons, 2008.
- Hillier, Bill, and Ozlem Sahbaz. "Crime and urban design: An evidence-based approach." *Designing sustainable cities* (2009): 163.
- Jabareen, Yosef. "Space of risk: The contribution of planning policies to conflicts in cities, lessons from Nazareth." *Planning Theory & Practice* 7.3 (2006): 305-323.
- Jabareen, Yosef, and Naomi Carmon. "Community of trust: A socio-cultural approach for community planning and the case of Gaza." *Habitat International* 34.4 (2010): 446-453.
- Jacobs, Jane. "The Death and Life of Great American Cities. 1961." *New York: Modern Library* (1993).
- Jadallah, Sami Jamil (2015). Disband the PLO Now, <http://www.veteranstoday.com/2015/09/09/disband-the-plo-now/>, accessed date: 15.06.2016.
- Jeffery, Clarence Ray. *Crime prevention through environmental design*. Beverly Hills, CA: Sage Publications, 1971.
- Komut, Emine (2002). Savaş ve Afet Sonrasında Üç Kentin Yeniden Düzenlenmesi: Beyrut, Saraybosna, Erzincan, *Mimarlık*, 306, pg. 8-9, (July-August).
- Marcuse, Peter (1997), Walls of fear and walls of support, in: N. Ellin (Edit) *Architecture of Fear*. New York, Princeton Architectural Press.
- Nasr, Joe and Verdeil, Eric (2008). The reconstructions of Beirut. Salma K. Jayyusi, Renata Holod, Attilio Petruccioli and Andr'e Raymond. *The City in the Islamic World*, Brill, pp.1116-1141, *Handbook of Oriental Studies*.
- Newman, Oscar. *Defensible space*. New York: Macmillan, 1972.
- Raco, Mike. "Securing sustainable communities citizenship, safety and sustainability in the new urban planning." *European Urban and Regional Studies* 14.4 (2007): 305-320.
- Saliba, Robert (2006). Kent Plancılığında Yeni Eğilimler: Savaş Sonrası Dönemde Beyrut Deneyimi, *TMMOB Mimarlar Odası Ankara Şubesi Bülteni*, 43, pg. 38-45.
- Şentek, Arif (2015). *İsrail'de Mimarlığın Etik Sorunları ve APJP*, *Mimarlık*, 381, pg. 22-26, (January-February).
- U.N. Habitat. "Global report on human settlements 2007: Enhancing urban safety and security." Earthscan, London (2007).
- Url-1: http://www.palestineinarabic.com/photo_refugee_destruction_1.html, accessed date: 05.06.2016.

- Url-2: <http://www.solidere.com/sites/default/files/attached/cr-brochure.pdf>, accessed date: 05.06.2016.
- Url-3: *The Humanitarian Impact of the Barrier* (2008), pg.6, http://www.ochaopt.org/documents/barrier_report_july_2008.pdf, accessed date: 08.05.2015.
- Url-4: *İsrail'den Gazze Savaşına Soruşturma*, http://www.bbc.com/turkce/haberler/2014/09/140911_israil_sorusturma, accessed date: 06.05.2015.
- Url-5: *Petition Against The E1 Plan*, <http://apjp.org/the-e1-lifta-silwan-petition/>, accessed date: 05.06.2016.
- Url-6: <http://apjp.org/maps-and-photos/maps/675878>, accessed date: 23.06.2016.
- Url-7: <http://www.forensic-architecture.org/project/>, accessed date: 25.05.2016.
- Url-8: <http://www.forensic-architecture.org/case/wall-battir/>, accessed date: 25.05.2016.
- Url-9: <http://www.iha.com.tr/haber-davutoglu-sur-cizre-ve-silopiye-yeniden-insa-edecegiz-532477/>, accessed date: 05.06.2016.
- Url-10: <http://www.resmigazete.gov.tr/eskiler/2016/03/20160325-15.pdf>, accessed date: 06.06.2016.
- Url-11: <http://www.gunes.com//Video/suru-hya-projesi-676315>, accessed date: 12.06.2016.
- Url-12: <http://www.yenisafak.com/gundem/diyarbakira-3-katli-zirhli-kuleler-kuruldu-2486426>, accessed date: 24.06.2016
- Url-13: https://en.wikipedia.org/wiki/2014_Kurdish_riots_in_Turkey accessed date: 20.6.2016
- Tadmori Khaled (2006). Beyrut'ta İç Savaş Sonrası Yeniden İmar ve Planlama Dönemi: 1990'dan Günümüze, *Mimarlık*, 332, (November-December).
- Tümer, Didem (2016). Hendeğin Bilançosu: Nüfusun %22'si göç etti, <http://www.aljazeera.com.tr/al-jazeera-ozel/hendeğin-bilancosu-nufusun-22si-goc-etti>, accessed date: 05.06.2016.
- Weizman, Eyal (2014). Introduction: Forensis. *Forensis. The Architecture of Public Truth*, 9-32.

Spatial Resilience, Adapting To Water Sensitive Planning In South Africa

Re-evaluating the intimate relationship between spatial planning and water

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1. Abstract

When people were few, and water was plentiful, the issue of water-intensive socio-economic development was generally overlooked by decision makers (spatial planners). Today, South Africa faces a different situation where water demand exceeds the current and future water availability. Every land-use decision and practice have a water resource footprint, a change in land use can either decrease or increase quality and quantity of groundwater and surface water resources. There is a general lack of understanding as to what negative and often disastrous effects spatial planning decisions have on water resources within the planning profession. To date, spatial planning policies and practices lack the ability to effectively manage, protect and enhance water resources. With five out of nine provinces declared as drought disaster areas, municipal decision makers must re-evaluate its relationship with water. The recently published Water Sensitive Urban Design for South Africa: Framework and Guidelines provide strategic guidance to urban water management decision-makers (primarily city managers and other local authority officials) on the use of Water Sensitive Urban Design in a South African context. The framework highlights the fact that Water Sensitive Urban Planning is considered to be one of the major components of a Water Sensitive Settlement. Unfortunately, many good frameworks and guidelines achieve nothing due to a lack of some driver ensuring that it gets used. There is a need for policy makers and individuals to leverage their positions to make sure that the concept of water sensitivity is incorporated into relevant policy document. The Spatial Planning and Land Use Management Act no. 16 of 2013 (SPLUMA) stipulates that municipalities must develop a wall-to-wall Land Use Scheme, which provides land use and development rights for the entire municipality. Keeping in mind the already established inter-relationship between land and water, section 26(2)(a) of the Act states that land may only be used only for the purpose permitted by the land use scheme. Evidently, the municipal land use scheme (within the context of SPLUMA) will affect the management of water resources. The article will explore new technologies and information which planners and relevant stakeholders can use to develop informed “fit-for-purpose” land use schemes which will result in water-conscious land–use planning.

2. Introduction

Land is an essential natural resource, both for the survival and prosperity of humanity and for the maintenance of all terrestrial ecosystems (FAO/UNEP, 1999). The conversion of land from its natural state to an artificial state (man-made or urban) is one of the most irreversible human impacts on the global biosphere (Seto et al., 2011). Intellectual debates about the population-land use-environment relationship are nothing new. More or less, two hundred years ago, Malthus (1803) and Lloyd (1833) argued that population growth would eventually outstrip the productive capacity of lands. It is estimated that humans have altered between 39–50% of the Earth's land surface (Turner et al., 1990; CIESIN, 2005) reducing the overall ability of the biosphere to sustain life (Vitousek et al., 1997; Steffen et al., 2004). The change in land-use has made water problems increasingly more severe and complex (UNESCO-IHP, 2015). Water is arguably one of the most significant resources on this planet (Madden, 2015)

and the demand are increasing dramatically due to the population growth, rapid urbanization, land-use changes, degradation of water quality and growing impact of climate change (UNESCO-IHP, 2015.p3). According to Goga & Pegram (2014) water, food and energy security forms the basis of a self-sufficient economy. But as a water scarce country with limited irrigable land and water intensive (coal-fired) electricity- generation, the WWF believes that South Africa is testing the limits of its resource constraints.

3. Development trends in South Africa

The challenge of succeeding in water-conscious land-use planning is three-fold. First, municipalities are faced with planned (urban settlements) and large unplanned (rural settlements) areas. Spatial data and information as to what specific land use is exercised in municipalities are limited to urban areas. Secondly, South Africa focused on hard infrastructure for service delivery, in most cases, disconnected from soft infrastructure resulting in loss of biodiversity. Lastly, South Africa has very little legislation that protects ecological infrastructure necessary to deliver valuable services to people such as fresh water, climate regulation, soil formation and disaster risk reduction. The impact of these challenges in an already water-scare country will be worse with the effects of climate change, and a predicted water supply – demand gap of 30% will be faced by 2030 if business as usual continues (2030 Water Resource Group, 2009).

3.1 *Planned and unplanned structure of settlements in South Africa*

South Africa's planning history has seen a considerable array of legislation. Much of the legislation responsible for managing land uses in a municipality pre-dates 1994, and limited land use planning to urban boundaries. Today, South Africa is faced with an unusual and unplanned spatial nature which presents many developmental challenges. As such, settlements embody some of society's most pressing challenges, as diverse as high percentages of people living in slums; expansion and dominance of the informal sector; inadequate basic services; social and political conflict over land resources; climate change; and environmental degradation (The World Bank Institute, 2014). It is necessary to understand the spatial structure of settlements in South Africa, as they present different challenges for land-use, water, and environmental management.

Urban settlements in South Africa refers to planned, densely settled, spatial compact central business districts and surrounding suburbs. Though densely settled of city density of South African cities are low compared to most European cities or cities in the global south (cities in the developing world). As many would know, apartheid spatial planning dominated the spatial form of South African cities, the result of which is multiple settlements often disconnected from the functional structures of the core city and its primary nodes. Over the past 20 years, urban centres experienced rapid urban expansion. In 1994, the newly elected Government identified the need to develop large-scale low-income housing settlements for the poor on the urban periphery with the objective to eradicate backlog. Reasons for the choice of location include: the nature of the low-income housing subsidy that requires a single detached dwelling on its own stand of defined size; the availability of large tracts of inexpensive land at the periphery; and administrative preference for larger developments (Bosshoff, 2014). As South Africa embarked on an ambitious program to eradicate backlogs as envisioned by the Reconstruction and Development Programme (RDP) little consideration was given to the fact single-use, low-density patterns tends to consume significant amounts of land per capita and generates larger per capita infrastructure installation and maintenance costs (United Nations Habitat, 2013). Literature points to a fact that during the transition period from apartheid to democracy, and in the restructuring of local government, limited integrated development planning took place (Dewar, 1998; Asmal, 2000; Donaldson, 2002). During this transition period, according to Dewar (1998, p. 369), policies were formulated "within discrete national

line function departments, with little reference to the activities in other departments.” He claims that this approach contributed to a fragmented and distorted urban planning and development phase.

Today, peri-urban settlements has evolved into various features such as (a) affluent residential areas (high-end residential development that often consumes resources unsustainably - planned), (b) low cost and social housing estates (RDP housing on degraded land with a low market value and often referred to as poorly planned settlement), and (c) informal settlements (located on vacant and unsuitable land for human settlements due to local topological features such as unsuitable soils, wetlands and flood risks – unplanned and in many cases illegal) (DEA, 2014). Rural settlements on the other hand typically refer to relatively sparsely, unplanned populated rural areas containing small settlement nodes and denser, spatially distributed rural settlements. Much of rural South Africa, particularly outside of large-scale industrial agriculture, functions with formal or informal commonage, frequently suffering inadequate municipal support due to low budgets and capacity constraints (DEA, 2014). Last but not least, some settlements are classified as mixed settlements which are located within former homelands. These areas are under the authority of traditional councils as of 2010 and has combined features of urban and rural settlements (DEA, 2014). Land use decisions are made on behalf of the Tribal Chief and often uninformed due to a lack of land use management system.

3.2 *Infrastructure and land use*

The way in which land is used affects the cover and composition of landscapes as well as the on- and off-site functionality of ecosystem goods and services (Hoffman, 2014; Maitima et al., 2009). According to (Armitage, et al., 2013.p1) “development normally reduces the natural permeability characteristics of land by replacing free draining surfaces with impermeable surfaces such as roofs, roads and paved areas that are typically drained by ‘hard’ infrastructure”. Hard Infrastructure for e.g. pipes and lined channels are predominantly focus on collecting runoff and channelling it to the nearest watercourse as fast as possible. This perspective of dealing with water services prioritises quantity (flow) management with little or no emphasis on the preservation of the environment (Armitage, et al., 2013). The result has been a significant impact on the environment through the resulting erosion, siltation and pollution (Wilson, et al., 2004; Haskins, 2012) leading to a significant loss of biodiversity and ecosystem services. Hence the above, and the fact that the majority of settlement types are unplanned and disperse, South Africa’s government still succeeded in the roll-out of bulk or hard infrastructure. According to the Department of Water and Sanitation and Statistics South Africa, in 2011 almost 97 percent of households had access to water, and 75 percent had access to sanitation (DWS, 2013)(StatsSA, 2012). While major investment in water resources infrastructure has enabled the provision of water supplies to large urban areas, and in large parts of the rural areas, to commercial water users and the various economic sectors, significant problems remain concerning the sustainable delivery of service, the financial sustainability of service providers and the lack of attention to maintenance, populations poor usage habits, physical and commercial losses and ecological degradation (DWS, 2013).

3.3 *Future water demands and Climate Change*

The 2030 Water Resource Group compiled a study in 2008 which was aimed at determining the water supply and demand gap for South Africa by 2030. The study determined a 17% demand gap for 2030 under the current efficiency levels. It is reckoned that population growth coupled with economic growth will lead to a growing middle class which has a larger consumption rate overall, accounts for 34 percent of the total demand (2030 Water

Resource Group, 2009). The gap excludes losses due to acid mine drainage, additional irrigation requirements, and climate change. Adding an “average” expectation of climate change for South Africa by 2030 shows a slight decrease in supply and a (more pronounced) increase in crop demand, growing the 2030 supply-demand gap by 30 percent. It should be noted that the increased demand should be seen as a plausible scenario—not a prediction (2030 Water Resource Group, 2009). According to the Long-Term adaptation scenarios Phase 1 (2013), South Africa could experience changes in temperature of $>3^{\circ}\text{C}$. However, this is only a national average scenario, the intensity of change varies dramatically over hydrological zones. The interior of the country is projected to rise dramatically between $5\text{--}8^{\circ}\text{C}$ (SANBI, 2013). The Climate Change Adaptation Report on Human Settlements (DEA, 2014) highlights how human settlements has changed the availability of water resources, “The proliferation of non-permeable surfaces that accompanies human settlements, along with the destruction of wetlands, greatly increase runoff, increasing flood risk and altering catchment behaviour. Agriculture (both irrigated and non-irrigated) also changes water runoff and catchment behaviour, and this includes the irrigated “lawn crops” that are so prevalent in suburban areas. Furthermore the very existence of many human settlements in such a water scarce country is dependent on one of the most extensive water transfers networks in the world: South Africa has 28 inter-basin transfers schemes with a total water transfer over 7 million m^3/year .” Climate change impacts on water in South Africa could exacerbate existing water-related challenges and create new ones related to climate variability, extreme weather events and changing rainfall seasonality (DEA, 2014). Ecosystem-based adaptation and mitigation will become increasingly important in climate change responses in South Africa (SANBI, 2014:6).

Most of these challenges can and should be addressed through integrated water resource management (IWRM) which is defined as “the process which promotes the coordination development and management of water, land, and related resources, to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems” (GWP, 2000, p. 22). The definition of IWRM explicitly refers to the integrated management of land and water. The Global Water Partnership Report (2000, p. 24) describes this relationship as follow “Land use developments and vegetation cover influence the physical distribution and quality of water and must be considered in the overall planning and management of the water resources. Another aspect is the fact that water is a key determinant of the character and health of all ecosystems (terrestrial as well as aquatic), and their water quantity and quality requirements, therefore, have to be taken into account in the overall allocation of available water resources.” Unfortunately planning for land and planning for water still lack critical integration in South Africa. As stated by Woltjer & Als (2007) “the majority of decisions around water management are made without reference to spatial planning issues related to urbanization and population growth, and conversely development and land-use decisions are made with little consideration of their effects on water systems.” According to Thomson-Smeddle & Roux (2016), this is primarily due to the continued predominance of old approaches to township planning, infrastructure and housing design and a lack of cross-sector integration and collaboration.

Traditional approaches to managing water resources are struggling to deal with the increasing complexity of water demand and supply and are unlikely to close the predicted gap. The previous sections made due reference to the effects of land use change or the lack of land use management specifically in rural settlements and the effects thereof on water resources. The following section will explain how land use management in South Africa can contribute to closing the water demand gap. Focus will be placed on the recently enacted (01 June 2015) Spatial Planning and Land Use Management Act (SPLUMA) 16 of 2013 and its legislative requirements for a municipal land use scheme, keeping in mind that the Act only came into operation on the 01 July 2015.

4. Water-conscious land–use planning

The recently enacted Spatial Planning and Land Use Management Act (SPLUMA) 16 of 2013 firmly mandates municipal planning as primarily the task of local governments and declares that “sustainable development of land requires the integration of social, economic and environmental considerations in both forward-planning and ongoing land use management to ensure that development of land serves present and future generations” (Department of Rural Development and Land Reform, 2013). Section 4 of SPLUMA states that the spatial planning system in the Republic of South Africa must consist of the management and facilitation of land use as contemplated in Chapter 5 through the mechanism of land-use schemes. A land use scheme is a planning tool that allows OR restricts certain types of land uses to certain geographic areas using a zoning. Every property in the municipality has a set of regulations (often called “scheme regulations”) that sets out all procedures and conditions associated with the use of land in any of these zones which control development. These regulations are determined by the zoning of the property. As indicated by the planned and unplanned nature of settlement in South Africa, prior to SPLUMA, land use scheme’s (previously known as town planning scheme) were limited to former town or city boundaries excluding any and all informal settlements, rural villages and tribal land. SPLUMA states that all municipalities must adopt and approve a wall-to-wall land use scheme for the entire municipal area and incrementally introduce land use management and regulation in areas under traditional leadership, rural areas, informal settlements, slums and areas not previously subject to a land use scheme. Section 26 (1)(a) of SPLUMA states that “An approved land use scheme has the FORCE OF LAW, and all landowners and users of land, including a municipality, a state-owned enterprise, and organs of state within the municipal area are bound by the provision of such land use scheme.” Section 26 (2)(a) further states that “Land may ONLY be used for the purposes permitted by a land use scheme (RDLR, 2013).” Thus, planners have the opportunity to develop and enforce water-conscious land-use planning with political backing which can facilitate in changing settlements from water-wasteful to water-sensitive. The question that should be asked is who can other sectors contribute to land use management and what information is available on water resources which can be used in a municipal land use scheme?

4.1 *Ecological infrastructure initiatives and information land use management in South Africa*

Even though urban and rural settlements have distinctive differences – they are interlinked and dependent on each other (Global Green Growth Forum, 2014.p3). The modern water cycle is comprised of both engineered infrastructure and ecological infrastructure (Colvin, et al., 2013.p8). Various studies were conducted to explain the importance and benefits of including green infrastructure in spatial planning approaches, but up until recent years, little information on the importance of ecological infrastructure was available. Many would argue that the term green infrastructure and ecological infrastructure can be used interchangeably, but SANBI (2014.p.3) states that “Ecological infrastructure is the nature-based equivalent of the built or hard infrastructure, and is important for providing for providing services and underpinning socio-economic development. It provides these services either directly to society (such as coastal dune protecting a road from sea surge), or as part of a broader infrastructure system that includes built infrastructure (such as a natural catchment area function with a dam and pipes to provide water to nearby settlements.” Green infrastructure is broadly seen as any man-made infrastructure that is good for the environment and promotes sustainable development (SANBI, 2014). Investing in ecological infrastructure has been an emerging area of interest and work within South Africa over the last years and in 2014, a Framework for Investing in Ecological Infrastructure in South Africa was published. Investing in ecological infrastructure involves maintaining functioning ecological infrastructure, as well as restoring degraded ecological infrastructure. The Framework highlights that this can be done by integrating ecological infrastructure into land-use planning and decision-making

processes (SANBI, 2014.p.4). According to (Niemelä, et al., 2010) “the concept of ecosystem services is new and unfamiliar to many actors in land-use planning, although the issues contained in the concept have been included in land-use planning principles based on the objectives of sustainable development”. These categories and implementation thereof is well documented and part of the urban ecology literature, but as correctly stated by Niemelä et al. (2010), is often not ‘basic knowledge’ for City Planners and other land use decision-makers. With over half of the country’s rivers and wetlands ecosystem types considered threatened (Nel, et al., 2011), the National Freshwater Ecosystem Priority Areas projects (NFEPAs) responded to the need to spatially identify the rivers, wetlands and estuaries, and which ones, should remain in natural or near-natural condition (Nel, et al., 2011). The FEPA maps provide the information needed for three broad categories of land and water resource use decisions:

1. Reactive decision-making, such as environmental impact assessment (EIA), agricultural land-use decisions, water-use licensing, and other development control decisions e.g. through provincial land-use legislation;
2. Proactive forward planning, such as informing the National Water Resource Strategy, National Planning Commission processes, Integrated Development Plans (IDPs), Spatial Development Frameworks (SDFs) and zoning schemes;
3. Proactive conservation and rehabilitation, such as biodiversity stewardship, land acquisition for protected areas, clearing of invasive alien plants, and rehabilitating wetlands (Driver, et al., 2011).

Together with the maps and spatial data generated from the NFEPAs project, an implementation manual was developed aimed at those involved with, or contributing to, any planning or decision-making process that should take freshwater ecosystems into account. Intended users include water resource planners and managers, land use planners and land-use decision-makers, and those involved in conservation and rehabilitation. Chapter 6 in the Implementation Manual for Freshwater Ecosystem Priority Areas give clear management guidelines for wetlands, rivers, sub-quaternary catchments associated with rivers and upstream management areas (Driver, et al., 2011. p.69-90) and FEPA for land use practices or activities. Cited from Driver et al., (2011) “The land-use practices and activities highlighted in the guidelines are known to influence the drivers of ecosystem condition (hydrology, geomorphology, water quality), which in turn determine habitat attributes (e.g. habitat availability and condition), which in turn determine biological responses (Kleinhans & Louw, 2007).” The framework for investing in ecological infrastructure (or FEPA) highlights the benefits of investing in ecological infrastructure. These benefits include amongst others a lengthened lifespan of built water infrastructure and reduces maintenance cost, reduces soil erosion and soil degradation and supports food security, buffer settlements from storms and surge events and ecosystems will assist with adapting to climate change (SANBI, 2014. p.5-7). The spatial location of these NFEPAs or ecological infrastructure is often located in the rural areas of municipalities, which may be on private or communal land where landowner themselves are often not receiving the full benefit of the services and will, therefore, tend to under invest. Another issue, which is dominant with the nature of a Developing Country is the fact that many of these landowners are unable to afford the necessary investment (cash) that is required for the large scale and often relatively complex interventions that may be needed in the landscape. For this reason and others, the state should be central to optimal investment in ecological infrastructure (SANBI; 2014.p7). The state can provide subsidies and incentives or create new regulations which directly insures private sector investment in ecological infrastructure. Biodiversity stewardship approach is one approach which allows for a range of agreements to be put in place between the state and the landowner, with the intention of managing and/or protecting the natural environment. Biodiversity stewardship can be used as a mechanism to work with the landowners who have important ecological infrastructure on their land, creating working partnerships between the state and the private sector, and where appropriate, incentivising private landowner investment in the ecological infrastructure (SANBI, 2014. p.12). Wherever possible, ecological infrastructure networks

should be managed strategically, either as part of a larger system of built-green-infrastructure or as ecological infrastructure that provides a direct service.

4.2 *Green infrastructure initiatives and information for land use management in South Africa*

Various studies were conducted to explain the importance and benefits of including green infrastructure in spatial planning approaches, substantiated regarding increased sustainability and resilience. In 2011, the Water Research Commission (WRC) solicited research proposal aimed at guiding urban water management decision-makers on the use of Water Sensitive Urban Design in a South African context. In 2014, the WRC published the “Water Sensitive Urban Design for South Africa: Framework and Guidelines” which emanated from a project entitled Water Sensitive Urban Design (WSUD) for improving water resource protection/conservation and re-use in urban landscapes (WRC Project No. K5/2071). The framework introduces the philosophy of WSUD in RSA and defines water sensitivity in RSA as follow (Armitage, et al., 2014, p. ii) “...the management of the country’s urban water resources through the integration of the various disciplines of engineering, social and environmental sciences – whilst acknowledging that: RSA is water scarce; access to adequate potable water is a basic human right; the management of water should be based on a participatory approach; water should be recognised as an economic good; and water is a finite and vulnerable resource, essential to sustaining all life and supporting development and the environment at large.”

Terminology seemed to have been a major issue thought-out the development process of the WSUD framework and guidelines for South Africa. In order to derive at a context specific vision for water sensitivity in South Africa, Armitage, et al., (2014) suggested to change the term Water Sensitive City to Water Sensitive Settlements (WSS) which now includes a broader range of settlements types (Armitage, et al., 2014, p. 17). Although, water sensitive settlements in the South African context aims to include various settlement types, the prominent focus of the WSUD Guidelines is on urban settlements and acknowledge the fact that more research is needed when it comes to implementing the concept of water sensitivity in rural South Africa. Novonty et al.,(2010) describes the vision for WSSs as “one where the urban water cycle is managed for the benefit of all while simultaneously protecting the environment. This is also increasingly being referred to as the provision of ‘blue-green infrastructure’, or the creation of ‘blue-green cities’ – aimed at recreating a natural water cycle while contributing to the amenity and liveability of urban environments (cited by Armitage, et al., 2014). The concept of green-blue infrastructure has emerged internationally as a way of understanding how green assets and ecological systems function as part of the infrastructural fabric that supports and sustains society and builds resilience (Harrison et al., 2014:67) and secure the provisioning of ecosystem services in human-dominated city landscapes (Colding, 2011). The WSUD Guidelines clearly defines the vision of and goals of water sensitive urban design in South Africa and illustrates how blue-green infrastructure can be implemented in the urban environment and is summarised as vegetated swales, permeable paving, bio-retention areas, green roofs, vegetated swales, detention ponds and underground rainwater storage tanks, etc. Although case studies of green infrastructure in South Africa are limited and generally on small scale development, the guidelines are targeted to inform spatial planners on the use of water sensitive urban design in strategic planning and land use management.

As previously stated, SPLUMA stipulates that municipalities must adopt and approve a wall to wall land use scheme which incrementally introduces land use management and regulation in areas under traditional leadership, rural areas, informal settlements, slums and areas not previously subject to a land use scheme. Although, the land use scheme must be developed for the entire municipal area, the way in which land is managed will differ between urban and rural areas, due to the financial ability, administrative capabilities and spatial

information available. The legal requirements for a municipal land use scheme is stipulated in section 24 of the Act. The following sections present opportunities for the development of a water sensitive land use scheme:

- 24(2)(a) Include appropriate categories of land use zoning and regulations for the entire municipal area;
- 24(2)(b) Take cognisance of any environmental management instrument adopted by the relevant environmental management authority, and must comply with environmental legislation;
- Section 24(2)(c) Include provisions that permit the incremental introduction of land use management and regulation in areas under traditional leadership, rural areas, informal settlements, slums and areas not previously subject to a land use scheme;
- 24(2)(e) Include land use and development incentives to promote the effective implementation of the Spatial Development Framework and other development policies;

Section 24 (2)(a);(b);(c) and (e) can and must be informed by the spatial information and data provided by the “National Freshwater Ecosystem Priority Areas” project (Nel, et al., 2011), the guidelines for land use management in NFEPA’s from the “Implementation Manual for Freshwater Ecosystem Priority Areas.” The recently published “Framework for Investing in Ecological Infrastructure in South Africa” will assist municipalities and spatial planners to make informed decisions regarding ecological infrastructure and specifically in rural areas. Whereas the Water Sensitive Urban Design Guidelines for South Africa can inform land use decisions and development controls in urban areas.

5. Recommendations:

South Africa has developed a comprehensive set of tools for working in an integrated manner within a mosaic of land uses, including protection, restoration and production. Guided by progressive legislation, SPLUMA, a range of programmes and approaches exist that can support and complement the development of water sensitive land use schemes. This includes mainstreaming ecological infrastructure and green infrastructure into land-use planning and decision-making processes as describe below:

- Water sensitive land use planning must incorporate the protection and management of ecological infrastructure in the municipal land use scheme, specifically in rural areas where information is limited. Land use management in urban areas can incorporate the implementation of green infrastructure developments such as WSUD thought the land use scheme.
- Spatial data and management guidelines from the FEPA’s project must inform zoning codes and scheme clauses which can and must address site-specific ecological conditions. Zoning can regulate development by directing development to appropriate locations, requiring development to be setback from riparian areas, limiting the total impermeable site coverage, establishing appropriate lot sizes, limiting or enhancing density, requiring adequate drainage, and prohibiting potentially polluting uses in areas where aquifers must be protected. This might not be fully accepted in rural areas as these town planning terms are typically associated with Western thinking, but the incremental introduction of these land use management guidelines will benefit all.
- Overlay zones can protect stream corridors, lakeshores, and watersheds thereby maintaining and improving the water quality - even as the community becomes more developed. An overlay zone can protect water quality by setting new standards for development and by incorporating site-specific review procedures.
- The Land Use Scheme must include conservation regulations where environmental management authorities aim to limit impermeable areas, drainage, and keeping

permitted uses to those that are non-polluting. Natural channel design and landscaping can include the planting of edible and nutritious food. Opportunities for job creating (green jobs) can be introduced, as this is a familiar activity for farmers in rural areas.

- Municipalities can provide incentives through the use of rebates for implementation of on-site measures which may reduce the need for drainage infrastructure upgrade (Biodiversity Stewardship program). Land Use Scheme and development controls have the ability to incentivise developers on a financial or non-financial manner. Typically, incentives are linked to existing dwellings or retrofit situations where opportunities for implementing of Water Sensitive Planning and site design elements. Non-financial incentives include, for example, increasing the allowable floor space ratio, or increasing the impervious area of a residential allotment, provided the development includes sustainability initiatives such as rainwater harvesting, living green walls, water re-use, and water efficient appliances.

6. Conclusion

SPLUMA introduced a multidisciplinary approach to planning in the new requirements for municipal land use schemes to be developed in South Africa. Simply put – planning is no longer enough. Planning needs to be supported by demographic, environmental and socio-economic analysis to understand who and what we are planning for and within what resource limitations. Planning requires environmental input to protect and integrate environmentally sensitive areas or FEPS's as part of sustainable management of land resources. Planning proposals and land use management must incorporate built infrastructure as well as ecological infrastructure analysis into land use schemes to ensure that future development needs can be supported in a sustainable manner. In order for land use planning to become water sensitive, planners should make a shift in thinking approaches, from current silo management to one where land, water, environment and infrastructure is managed holistically. A trans-disciplinary approach to spatial planning and water management is needed for the development and implementation of a water-sensitive land-use scheme.

7 References

2030 Water Resource Group, 2009. *Charting Our Water Future: Economic frameworks to inform decision-making*, s.l.: McKinsey & Company.

Armitage, N. et al., 2014. *Water Sensitive Urban Design (WSUD) for South Africa: Framework and Guidelines- WRC Report No. TT 588/14*, Pretoria, South Africa: Water Research Commission.

Armitage, N. et al., 2013. *Alternative technology for stormwater management. The South African Guideline for Sustainable Drainage Systems. Report TT 558/13*, Pretoria, South Africa: Water Research Commission of South Africa.

Asmal, K., 2000. Dealing with differences: the South African Experience. In: F. Boal, ed. *Ethnicity and Housing: Accommodating Differences*. England: Ashgate Publishing, pp. 27-33.

Bosshoff, L., 2014. *Evidence-Based Spatial Planning Analysis for Improved Urban Planning and Management. Presented at Annual World Bank Conference on Land and Poverty.*, Washington DC: World Bank.

CIESIN, 2005. *The Growing Urbanization of the World - GRUMP mapping project finds urban areas increasing in surprising ways*, Columbia: The Earth Institute at Columbia University.

Colvin, C. et al., 2013. *An Introduction to South Africa's Water Source Areas*, South Africa: WWF-SA.

DEA, 2011. *National Climate Change Response White Paper*, Pretoria: Republic of South Africa.

DEA, 2014. *Climate Change Adaption: Perspectives on Urban, Rural and Coastal Human Settlements in South Africa. Report No.4 For the Long Term Adaption Scenarios Flagship Research Program (LTAS)*., South Africa: Department of Environmental Affairs.

Department of Rural Development and Land Reform, 2013. *Spatial Planning and Land Use Management Act No. 16 of 2013*, Cape Town: Government Gazette.

Dewar, D., 1998. Settlements, change and planning in South Africa since 1994. In: H. J. a. I. Vladislavic, ed. Rotterdam: Nai: Blank Architecture, Apartheid and After., pp. 369-375.

Donaldson, R. & M. L., 2002. Preface: Transforming rural and urban spaces.. In: I. R. D. & L. Marais, ed. *Transforming rural and urban spaces in South Africa during the 1990s*. s.l.:s.n.

Driver, A. et al., 2011. *Implementation Manual for Freshwater Ecosystem Priority Areas. WRC Report No. 1801/1/11*, s.l.: Water Research Commission.

DWS, 2013. *Proposed National Water Resource Strategy 2: Summary. Managing water for an Equitable and Sustainable Future*, s.l.: Republic of South Africa.

DWS, 2013. *Strategic Overview of the Water Service Sector in South Africa*, Pretoria: Department Water and Sanitation.

FAO/UNEP, 1999. *The Future of Our Land. Guidelines for Integrated Planning for Sustainable Management of Land Resources*., Roma: Agriculture Organizations of the United Nations & United Nations Environmental Programme.

Global Green Growth Forum, 2014. *Transformation for Collaborative Partnerships to Advance Green Growth*, s.l.: Svanemaerkt Tryksag.

Goga, S. & Pegram, G., 2014. *Water, energy and food: A review of integrated planning in South Africa. Understanding the Food Energy Water Nexus*., South Africa: WWF-SA.

Golder Associates, 2008. *Assessment of Johannesburg's Vulnerability the Global Threat of Climate Change*, Johannesburg: s.n.

Haskins, C., 2012. *Capetown Sustainable approach to urban stormwater management*., City of Capetown: Catchment, Stormwater and River Management Branch.

Hoffman, T. M., 2014. Changing Patterns of Rural Land Use and Land Cover in South Africa and their Implications for Land Reform. *Journal of Southern African Studies*, 40(4), pp. 707-725.

Kleinhans, C. & Louw, M., 2007. *River EcoClassification: Manual for EcoStatus determination (Version 2). Module A: EcoClassification and EcoStatus determination. WRC Report No. TT 329/08*, Pretoria, South Africa: Water Research Commission.

Madden, K., 2015. *Perspectives on Green Growth Partnerships: Strategic Water Partners Network South Africa*, s.l.: 2030 Water Resources Group.

Maitima, J. et al., 2009. The linkages between land use change, land degradation and biodiversity across East Africa. *African Journal of Environmental Science and Technology*, 3(10), pp. 310-325.

Nel, J. et al., 2011. *Atlas of Freshwater Ecosystems Priority Areas in South Africa: Map to support sustainable development of water resources. WRC Report No. TT 500/11*, Pretoria: Water Research Commission.

Nel, J., Driver, A. & Swartz, E., 2011. *National Biodiversity Assessment 2011: Freshwater component* ., Stellenbosch, South Africa: CSIR Report, Council of Scientific and Industrial Research.

- Niemelä, J. et al., 2010. *Using the ecosystem approach for better planning and conservation of urban green spaces: a Finland case study.* s.l., Biodivers Conserv 19:3225-3243.
- Novonty, V., Ahern, J. & Brown, P., 2010. *Water-centric Sustainable Communities: Planning, Building and Retrofitting Future Urban Environments*, Hoboken, NJ: J.Wiley & Sons.
- Phalatshe, N. & Mbara, G., 2009. *Impacts of Climate Change and Vulnerable Communities at the City of Johannesburg*, Johannesburg: s.n.
- RDLR, 2013. *Spatial Planning and Land Use Management Act No. 16*, Republic of South Africa: Government Gazette.
- SANBI, 2014. *A Framework for Investing in Ecological Infrastructure in South Africa*, South Africa: South African National Biodiversity Institute.
- Seto, K. C., Fragkias, M., Güneralp, B. & Reilly, M. K., 2011. A Meta-Analysis of Global Urban Land Expansion. *PLoS ONE*, 6(8).
- Stats SA, 2012. *Census 2011: Population Dynamics / Statistics South Africa Report No. 03-01-67*, Pretoria: Statistics South Africa.
- StatsSA, 2012. *Statistics South Africa*, Pretoria: Statistics South Africa.
- Steffen, W. et al., 2004. *Global Change and the Earth System: A Planet Under Pressure*. Berlin, Germany, Springer-Verlag.
- The World Bank Institute, 2014. *Sustainable Urban Land Use Planning – Module 03: How to Integrate Land Use and Infrastructure*, s.l.: s.n.
- Thomson-Smeddle, L. & Roux, J., 2016. *Sustainable Neighbourhood Design Manual.*, s.l.: Sustainability Institute.
- Turner, B. I. et al., 1990. *The Earth as Transformed by Human Action. Global and Regional Changes in the Biosphere over the Past 300 Years*. Cambridge, England: Cambridge University Press; 1990, Cambridge, England: Cambridge University Press.
- UN DESA, 2015. *World Population Prospects: The 2015 Revision, Key Findings, and Advance Tables. Working Paper No. ESA/P/WP.241.*, New York: United Nations Department of Economic and Social Affairs.
- UN, 2015. *World Day to Combat Desertification*. [Online]
Available at: <http://www.un.org/en/events/desertificationday/background.shtml>
[Accessed 14 04 2016].
- UNESCO-IHP, 2015. *Water in the Post-2015 Development Agenda and Sustainable Development Goals. Discussion paper*, Paris, France: UNESCO.
- United Nations Habitat, 2013. *Urban Planning for City Leaders*, Nairobi: UN-Habitat.
- United Nations Population Division, 2010. *World Urbanization Prospect: The 2009 Revision*, New York: UN Population Division.
- Vitousek, P. M., Mooney, H. A., Jane Lubchenco, J. & Melillo, J. M., 1997. Human Domination of Earth's Ecosystems. *Science*, 277(5325), pp. 494-499.
- Wilson, S., Bray, R. & Cooper, P., 2004. *Sustainable drainage systems: Hydraulic, structural and water quality advice*, London: CIRIA C609.
- Woltjer, J. & Als, N., 2007. Integrated Water Management and Spatial Planning. *Journal of the American Planning Association*, 2(73), pp. 211-222.
- Ziervogel, G. et al., 2014. Climate change impacts and adaptation in South Africa. *WIREs Clim Change* 2014, Volume 5, p. 605–620.

The Framework of Water Management in Spatial Planning in Netherlands

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Netherlands is home to spatial planning and has been integrating water issue with spatial planning in the practice of land reclamation and polders, change from water to metalled road, building water ways as driving force for development, water management, key projects on waterfront, etc. Since a large proportion of inhabitable land is below sea level, the principal dealing with water issue in spatial planning is to combine water planning and design with delta management, regional transportation, flood control, military defense, agriculture irrigation, urban and architectural design under the framework of Deltares, Water board, Ministry of Infrastructure and Environment within "Water Act". Secondly, this paper firstly retrospects history of water management in Netherlands. Then it identifies components of water management from the technical perspectives, including river, canals, the Meuse, regional waterways, etc. Thirdly, it illustrates the administrative system of both water management and spatial planning in Netherlands, and the Water Assessment policy. Finally, the Delta Program, as the typical embodiment of water management program in spatial planning, is probed with respect to delta decisions and preferential strategies, and financial and administrative system of it, in special reference to "Room for the River" program.

Water Management Spatial Planning Netherlands Delta Program

Netherlands is a man-made country, as the most important North-West European Delta of the Rhine, Meuse and Scheldt rivers. Netherlands is home to spatial planning and has been integrating water issue with spatial planning in the practice of land reclamation and polders, change from water to metalled road, building water ways as driving force for development, water management, key projects on waterfront, etc. Since a large proportion of inhabitable land is below sea level, the principal dealing with water issue in spatial planning is to combine water planning and design with delta management, regional transportation, flood control, military defense, agriculture irrigation, urban and architectural design under different layers of administration within "Water Act". Its water management oriented with majorly four typical issues, namely flooding, heavy rain, freshwater shortage, seawater intrusion and rising sea level.

Water poses both opportunities and danger to Netherlands. It drives economy through waterways, while subjecting it to frequent flooding, drought, freshwater shortage, soil subsidence and seawater intrusion. As a result, the flood protection infrastructure and fresh water supply facilities are well planned and implemented on regional level for maintaining secure living environment and creating livable and productive habitation. This paper probes into the framework of resolving water issues in spatial planning of Netherlands. It firstly examines history of water management in Netherlands, and secondly elaborates on the spatial planning system for water management with reference to current spatial planning movements including Delta Program and "Make Room for the River".

1. History of water management in Netherlands

The early man-made land reclamation dates back to 1607 when the most famous Beemster in the province of North-Holland was drained. The IJsselmeer polder and the Haarlemmermeer polder are also similar to it. Cornelis Lely (1854-1929), who was the engineer and Minister for maintenance of infrastructure, trade and industry in three different governments, had contributed much to Netherlands' land reclamation through technical feasible plans. To meet the demand of agriculture self-sufficiency and flood protection after 1916 flooding, Lely's plan involved much reduction of the length of the coastlines with the construction of Afsluitdijk dyke. Later on, many other polders followed up for accommodating the growing housing need in the north wing of the Ranstad.

Waterways subsequently constitute the driving force for development at various scales more than network of roads. River water levels became more adjustable and navigable when bends from the rivers were removed and the building of barrages were deepened. Many rivers have been canalized in this way, promoting the accessibility to remote industrial areas. In 17th century, the transportation means of towed barges were vital for inter-town connection, especially in Zuid-Willemsvaart canal. At the end of the 18th century, further canal construction enabled the waste moved out of the town of Den Bosch, thereby facilitating the reclamation of Peel and Kempense heath area. From 1930 onwards, the Twente canals and the Amsterdam –Rhine canal were excavated by the national agency for the maintenance of dykes, roads, bridges and navigability of canals. In nowadays, ports, river and canals have established a cross-border network for Dutch logistic and people flow.

After the catastrophic flooding in 1953, the Delta works and water management were highly valued by the national agency for maintenance of dykes, roads, bridges and navigability of canals, which reduced the length of the sea by 700 km by damming arms of the sea. And the first Delta works were solid dams, however leading to the deteriorating freshwater environment. Then the storm surge barrier works gained much improvement in both technological and ecological sense, less disturbing the brackish water bio-system.

In terms of urban construction related to water management and water harvest, waterfront has long been treated as the strategic places for urban planning and design. The first generation of key projects emerged from the Fourth National Spatial Planning Policy Document in 1988, aiming at restructuring in towns and cities, including Rotterdam and Amsterdam. In the background when a lot of European countries were carrying out urban redevelopment of old ports and industrial sites on waterfront, Netherlands was no exception. The revitalization of waterfront constitutes the catalyst for rejuvenation of inner cities. It also supplemented the traditional planning paradigm of dominant policy documents, global visions and generic policies in the past. For example, in 1987, the Maastricht council began to redevelop the 23-hectare former site of the Sphinx earthenware company through public private partnership. Many other waterfront redevelopment key projects were booming up, with special focus on mixture of housing, employment, retail, restaurant, etc.

2. Technical perspective of water management

Due to the low altitude, Netherlands has become a mosaic of rivers, canals, lakes and dammed estuaries, interlaced with a system of ditches, town canals and channels. The water is directed from Rhine and Meuse to scattered locations in cities and towns. IJsselmeer functions as the huge reservoir for freshwater storage, which could be further used for drink and irrigation. Canals are built not only for shipping purpose, but also for prevention of saline intrusion of groundwater. Figure 1 shows the general idea of water management in Netherlands.



: Water management in Netherlands. Source: "Water management in Netherlands" report of the Ministry of Infrastructure and Environment.

2.1 Component of water management

(1) Rivers and canals

Sluice gates are applied to control river water distribution, especially the weir at Driel, which determines how much water would flow to the IJssel, the Neder-Rijn and the Waal.

(2) The Meuse

The Meuse is a rain-fed river, subject to periodic little discharge. For maintenance of water level for shipping, seven weirs were constructed in the 20th century, which are still functional nowadays. They are opened only when heavy rainfall happens. Meuse flows across the border at Eijsden, and immediately divides into three channels for different purposes.

(3) The canals in Middle-Limburg and Noord- brabant

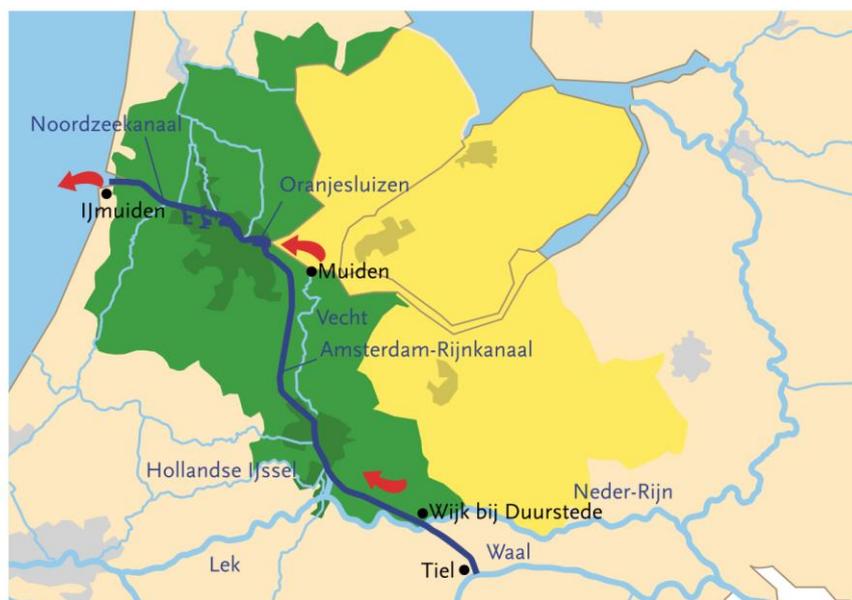
The province of Limburg and Noord-Brabant rely on the Meuse for water supply. Netherlands and Belgium have signed agreement for mutual water supply. In sum, water management of the canals in Middle-Limburg and Noord-Brabant is laid down in a water agreement guaranteeing equal water supply and discharge among areas managed by the regional water boards.

(4) The Rhine and its distribution

The Rhine crosses the Dutch border at Lobith, where the river bifurcates into the Waal and the Pannendersch Kanaal. The distribution of the water discharge guarantees a sound navigation depth of river branches. And the ideal scenario could be maintained for nine months on average.

(5) The Amsterdam-Rijnkanaal and the Noord zee kanaal

The Amsterdam-Rijnkanaal and the Noordzeekanaal are significant for shipping connections between IJmond, Amsterdam and Germany for regional water management. And the canals form the single system. Figure 2 shows the catchment area for this system. 60% of the water is supplied by regional water discharged by water boards. The whole system drains into the North Sea at the point of IJmuiden. The water flows through the discharge sluices when the sea level is low, while the pumping station is in operation when sea level is high. Additionally, water is withdrawn from the Amsterdam-Rijnkanaal and the Noordzeekanaal for regional water supply and combat of salinization of the polders in dry seasons, while maintaining the navigable sea water level.



: Catchment area in Amsterdam-Rijnkanaal and the Noordzeekanaal. Source: "Water management in Netherlands" report of the Ministry of Infrastructure and Environment.

(6) IJsselmeer area

This water system consists of lakes IJsselmeer, Markermeer, IJmeer and Randmeren. And it is the largest freshwater basin in Western Europe as the buffer and fresh water supplier to northern part of the Netherlands. Its primary function is to discharge water from the river basins of IJssel, Overijsselse Vecht and Eem. During the periods of drought, a sequence of priorities is set in operation, which determines the order in which the scarce supply of water would be allocated to users.

(7) Southwestern delta

It is a complex system of interconnected and mutually influential fresh-and-saltwater waterways (figure 3). Part of the waterways is stagnant, while others are tidal. And water distribution is largely regulated by the Haringvliet sluice gates for water discharge. Recently, more gradual transition from seawater to river would be developed to allow migratory fish pass through. However, with the excavation of the Nieuwe Waterweg to secure access to the port of Rotterdam, brackish water intrudes further inland, compromising the water supply to Delfland.



: Dam system of southwest delts. Source: "Water management in Netherlands" report of the Ministry of Infrastructure and Environment.

(8) Regional waterways

A wholesale network of ditches, streams and canals in Netherlands also comprise the regional water system, interconnected with main water systems at several locations. Figure 4 illustrates the water valves in the main and regional systems. During heavy rainfall, the regional system drains into the main system. And it could also be supplemented by main system during drought. In the low-lying area of the Netherlands, the entering water functions for prevention of subsidence of peat bogs. But in higher area, the water is supplied primarily for irrigation purposes.



: Water valves in the main and regional systems. Source: "Water management in Netherlands" report of the Ministry of Infrastructure and Environment.

Extreme circumstance intervention

The above water management functions well under normal circumstances. However, more interventions are needed for extreme scenarios, such as dyke collapse, water shortage, huge flooding, heavy water logging and continuous salinization. Secondary water defense should supplement primary water defense in case of emergency. And risk analysis should be based on the probability of a failure multiplied by the consequences. Excess of water should be tackled through Low Impact Development strategies. For water shortage and droughts, priority should be judged based on the sequence of irreversible damage, utilities, small –scale high quality use and other economic-social factors. Water quality should be further guaranteed. However, all of these further improvements are based on the whole regional framework of water management and supplement it on more specific level.

3. Spatial planning system for water management in Netherlands

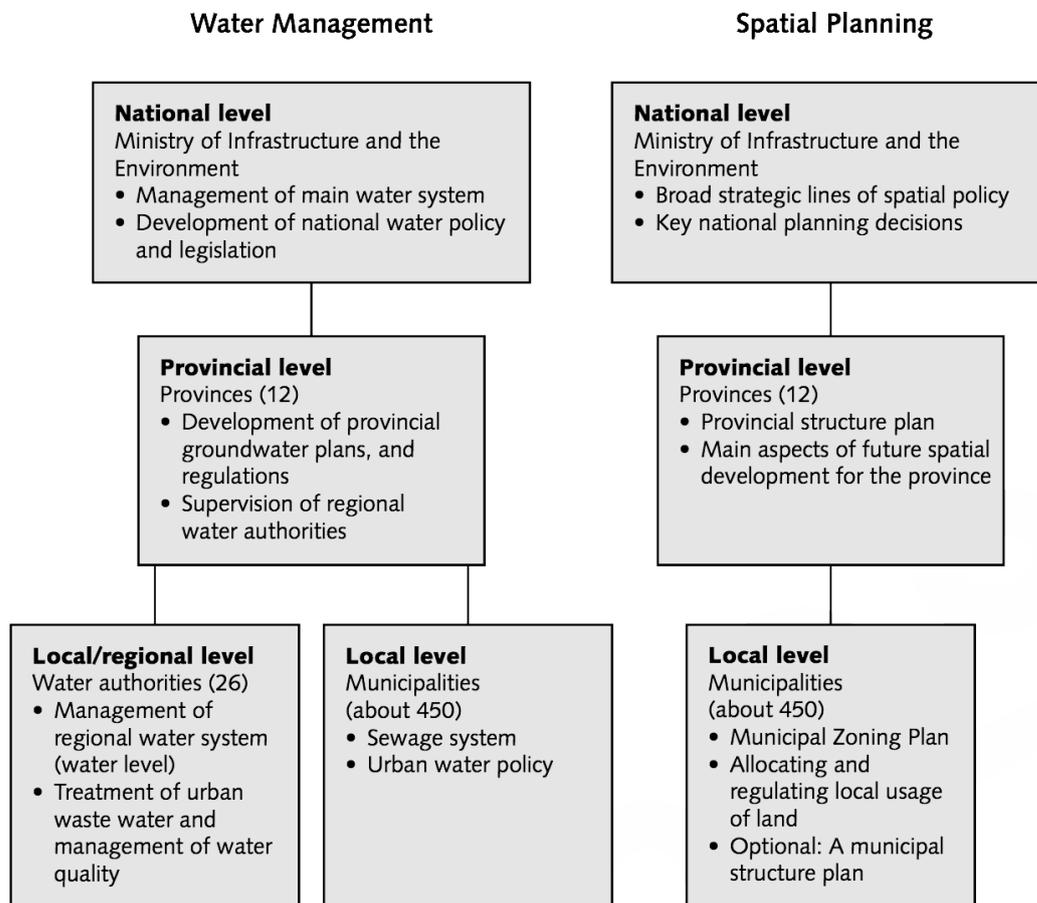
3.1 Administrative system of water management and spatial planning

The responsibility for Dutch water management consists of the National Water Authority and the Regional Water Authority. The National Water Authority, which is one of the agencies of the Ministry of infrastructure and the Environment, is in charge of the coastal zone and the major rivers. The Regional Water Authority takes responsibility of the rest waters.

Water management contains flooding control and both of the water quantity and quality management. Flood control aims to ensure that dykes, dams, and dunes are always in good condition. Water quantity refers to the pumping techniques to maintain proper water level. And water quality management focuses on waste treatment and ecological perspectives of the water for recreation and agriculture.

Figure 5 compares the administrative system of the water management and spatial planning. In general, on national level, the Ministry of Infrastructure and the Environment takes responsibility of broad strategic lines of spatial policy and key national planning decisions in terms of spatial planning. For water management, it also accounts for management of main water system and development of national water policy and legislation.

On provincial level, spatial planning mainly refers to provincial structure plan and main aspects of future spatial development for the province; while water management orients with development of provincial groundwater plans and regulations, and supervision of regional water authorities. On local or regional level, spatial planning is within the working scope of about 450 Municipalities, including municipal zoning plan, allocating and regulating local usage of land, and optimization of municipal structural plan; while water management falls into the scope of Municipalities for sewage system and urban water policy; and the scope of water authorities for water management of regional water system, treatment of urban waste water and management of water quality. For implementation of water management and spatial planning, the Ministry works in close relationship with provincial and municipal authorities, the private sector, the research organization, and the public, implying the importance of consensus in political cultural of Dutch decision making. So the spatial planning underlines necessity to incorporate water as an important structuring principle and in light of water system characteristics.



: Administrative system of water management and spatial planning. Source: <http://www.helpdeskwater.nl>

3.2 Water assessment in spatial planning

In 2001, Dutch government had passed new policies of implementation of water assessment on all spatial plans relevant to water. And in 2003, water assessment has become the obligatory for any formal spatial plans, including municipal zoning plans and project decisions. Besides, national and regional public authorities also have to resort to water assessment for non-formal spatial plans and water-relevant decisions. Thus water assessment has been applied to all scales of spatial planning, from national level all the way

to local level on various plans and designs. Water assessment functions in supplement to EIA (Environmental Impact Assessment) and SEA (Strategic Environment Assessment).

The objective of water assessment is to ensure that not only water issues takes account of spatial and land use planning, but also negative effects of water system are excluded or compensated. There are two ways for integration of water and spatial planning. One is the assessment of plan on its impacts on water system; and the other is the assessment of water system on its impact on existing or future land use pattern.

However, the evaluations in 2003 and 2006 reveals that water assessment is more effective on the level of zoning plans and development plans, than strategic planning level, for which it was originally devised. In 2011, a new evaluation was consequently more focused on how water assessment fits in strategic spatial planning projects and whether spatial water issues receive sound attention.

There are two key subjects for water assessment: the spatial planning authority and the water authority. And there would be more than one water authority if the impact on water crosses water authority boundaries or the plan would influence both surface water and groundwater. In the whole process of water assessment, it goes through the phases of agreement and cooperation on water assessment criteria, water recommendation, water paragraph.

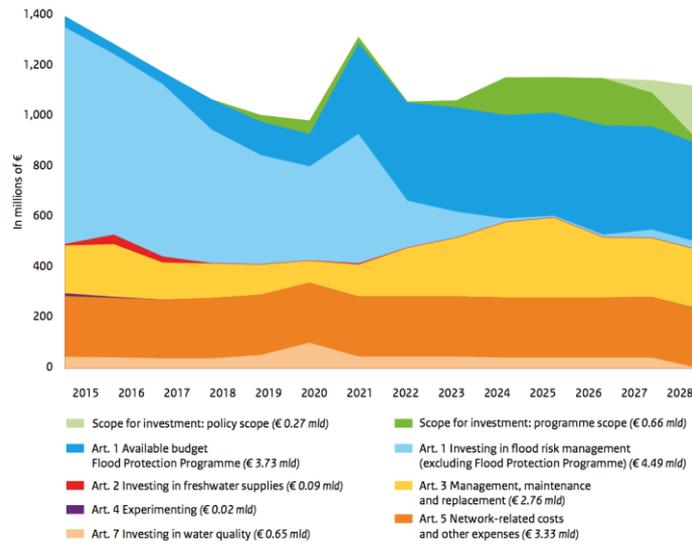
4. Delta Program

The most representative program of spatial planning in resolving water issues is the national Delta Program, where the central government, provinces, municipal councils and water boards cooperate with social organizations and the business communities. The main goal of it is to keep Netherlands safe from flooding and sufficient of freshwater. It was initiated in 2011 and this paper examines framework of the newest released 2015 Delta Program.

4.1 Delta decisions and preferential strategies

The Delta program is not in answer to the disaster, but in advance to prevent it through multi-governance, adaptive strategies, institutional arrangements and multifunctional measures. As a result, five delta decisions are proposed for 2015 Delta Program: delta decision on flood risk management, on freshwater, on spatial adaptation, on the Rhine-Meuse Delta, and on the IJsselmeer region. Additionally, the Delta Program Commissioner proposes sand replenishments along the coast. Each of the decision is elaborated in sequence of social importance, proposals, explanation, overview of measures and implementation.

For the multi-layer flood risk management, the risk of floods is limited by majorly three layers of measures: preventive measures to limit probability of a flood (layer 1); spatial organization of an area to limit the consequence of any flood (layer 2); disaster and crisis management to respond effectively to any flood (layer 3). This is fully embodied in combination of delta decision on flood risk management and spatial adaption. The delta decision on flood risk management mainly focuses on layer 1, containing the contents of new standard specifications for primary flood defense systems. But in special cases, the layer 1 could be replaced with layer 2 and layer 3 for smart combination. In contrast, the delta decision on spatial adaption centers at layer 2, for prevention of any subsequent flood-related damage from spatial development. As to layer 3, security regions, road authorities and water boards are taking responsibility of improving coping capacity of citizens and companies. Figure 6 and figure 7 shows the general spatial plan of flood management and freshwater supply system in Netherlands respectively. The delta program translates delta decisions into preferential strategies further, with the key points of customized work,



: Draft budget during 2001 -2008 of the Delta Program. Source: "Working on the Delta" report of the Ministry of Infrastructure and Environment

4.3 Room for the River

Although incorporated as part of the Delta Program, "Room for the River" functions as the semi-independent program. It comprises 34 measure made in 2006 for the River Key Planning Decision (PKB). The primary measures are intended at the Rhine distributary discharge of 16000 m³/s. It also includes the measure in the downstream part of the Meuse. The secondary objective is the enhancement of the spatial quality of river regions. The features refer to relocation of dykes, lowering of the level of floodplain, reduction of the height of the groynes, construction of a "Green Channel", increase of the depth of the side channels, and removal of obstacles.

Provinces, municipalities, water boards and Rijkswaterstaat are working together on the implementation of the Room for the River. The Ministry of Infrastructure and Environment takes the full responsibility of it. This program also requires collaboration with neighboring countries where the Rhine, Meuse and Scheldt rivers flow. Figure 9 shows the position of various projects in the program of "Room for the River".



: *Project location of "Room for the River". Source: Spatial Planning Key Decision of Room for the River, the Explanatory Memorandum.*

5. Conclusion

Netherlands is a country flourished by deep-water port, also rendering it in high risk of seawater intrusion, heavy rainfalls, freshwater shortage and flooding. It necessitates comprehensive water management for livable habitat from regional level all the way to local level. It has gone through the vicissitudes of combat and harvest of water, also creating various water landscape. The history of water management reveals it path of sea reclamation of polders for habitation and agriculture, construction of waterways and canals for transportation, delta works for flooding control, and waterfront key projects for urban regeneration. The basis of resolving water issues in Netherlands lies in the water management integrated with spatial planning. The components of water management includes rivers and canals, the Meuse, the canals in Middle-Limburg and Noord-Brabant , the Rhine and its distribution, the Amsterdam-Rijnkanaal and the Noordzeekanaal., IJsselmeer area, southwestern delta and regional waterways. In addition to the primary water defense, secondary defense is also needed for intervention in extreme scenarios. The administrative system of water management in spatial planning consists of three levels including national level, provincial level and local level for different scope of working and responsibilities. Water assessment also supplement existing Environment Impact Assessment in evaluation of the mutual influence of water system and land use pattern. The Delta Programs is the typical embodiment of water management in spatial planning with specific delta decisions and preferential strategies, updated every year since 2011. And it is fulfilled successfully only when multi-layer of government and private sectors cooperate both horizontally and vertically,

References

- Wiering, Mark, and Irene Immink. "When water management meets spatial planning: a policy-arrangements perspective." *Environment and planning C: Government and policy* 24.3 (2006): 423-438.
- Louw, E., Erwin van der Krabben, and H. Priemus. "Spatial development policy: changing roles for local and regional authorities in the Netherlands." *Land Use Policy* 20.4 (2003): 357-366.
- "Water management in Netherlands" report of the Ministry of Infrastructure and Environment.
- "Working on the Delta" report of the Ministry of Infrastructure and Environment
Spatial Planning Key Decision of Room for the River, the Explanatory Memorandum.
<http://www.helpdeskwater.nl/>

Main Title**Designing Rainwater Harvesting Cities****Abstract**

The ever-increasing urbanisation in South African cities has resulted to high demand for water consumption. It is well known that South Africa is a water scarce country, in spite of that there are no effective ways of harnessing other sources of water other than relying on municipal water supply system which is failing to supply enough water in some parts of the city. The South African cities are designed to channel water from the rooftop through pipes to water drainage. As water becomes scarcer there is a need to change this general approach of design and start designing buildings that accommodate rainwater harvesting. This will not only reduce the high demand of water supply to the people by the municipalities but this will also reduce the cost of paying municipal water bills.

Keywords: Scarcity of water, Harvesting Rainwater, Municipal water supply system, Design water harvest spaces, Integration to planning

1. Introduction

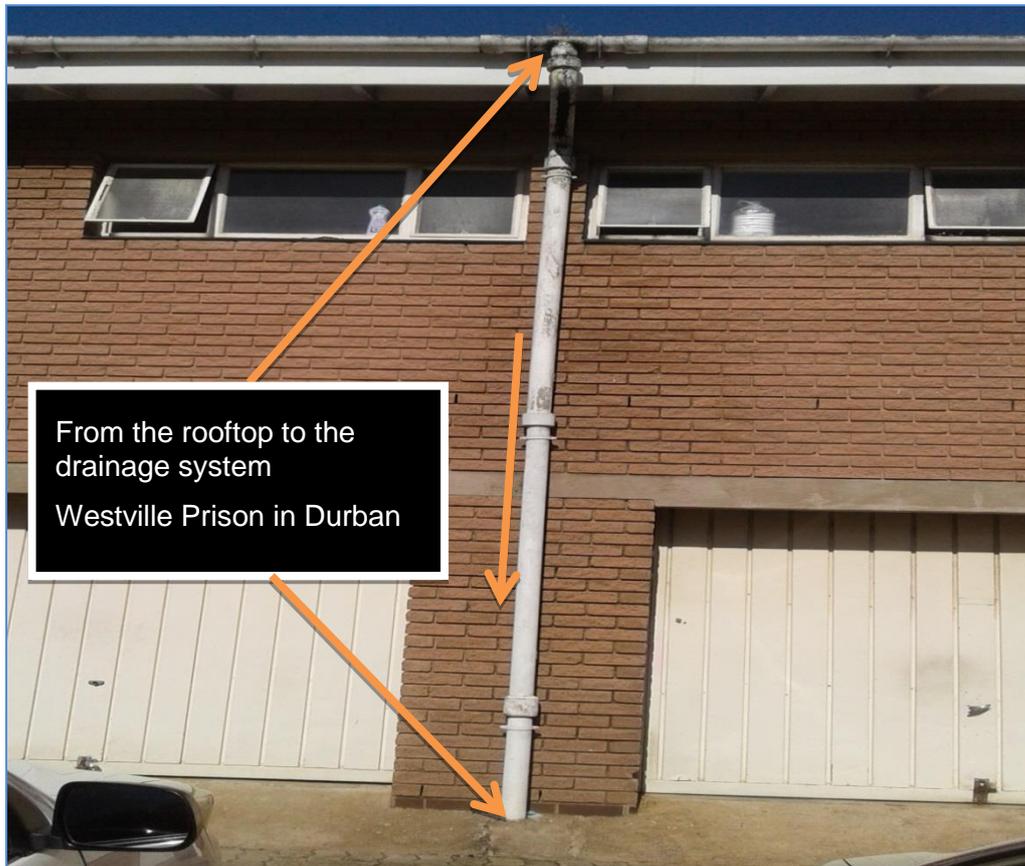
Globally water resources have been stressed by the demands placed on them by increased population growth and development¹. On the other side there is rapid urbanisation which is outpacing public service provisions in developing world and the overall number of people without access to safe water and sanitation in urban areas is increasing². Urban areas are also characterised by concentrated demand of water because of high population densities and the sheer number of people³. In spite of the scarcity of water in South African cities, there are no drastic steps to harvest rainwater; city residents are entirely depended on municipal water supply system which is failing sometimes to supply water to the consumers. South African cities have been designed to channel rainwater from the rooftop to the storm water drainage instead of harvesting rainwater from rooftop to water conservation tanks for other uses. The main purpose of this paper is to pursue South African cities to design their buildings in such a way that there are on-site spaces for rainwater harvesting purposes.

2. Water challenges

Section 27 (1) (b) of the Constitution of the Republic of South Africa No.8 of 1996 stipulates that, “everyone has the right to have access to sufficient food and water”⁴. However, there are a number of challenges that make this constitutional obligation to be difficult to achieve. The scarcity of rain has lowered the capacity of dams as the main source for municipal water supply system and this has resulted to sparingly availability of water to the consumers, often resulting in what is locally known as “water shedding”. In South Africa rain that usually come and supply the country’s water has come infrequently, for example in Durban the dams are 20% lower than at the start of 2010⁵. In cities such as eThekweni there are already water saving campaigns for example in its water bill statement it has issued a statement in which consumers are urged to reduce water consumption by 15%. Other sources of water prove to be cost effective, this include the desalinisation of ocean water. The drilling of underground water has also proven to be less effective because of the scarcity of underground water. It has been confirmed by the National Development Plan that the amount of water being taken from the earth’s underground reservoirs or aquifers which are essential for agriculture is over 400 million tons a day more than is being replaced by rain⁶. It is stipulated that surface water and ground water sources have been depleted in many urbanised areas, cities will have to go further or dig deeper to access water or will have to use more advanced technologies such as reverse osmosis for desalination⁷. The city residents used their money to pay for their water bill, the money that could have been saved if there was a water harvesting devise in place.

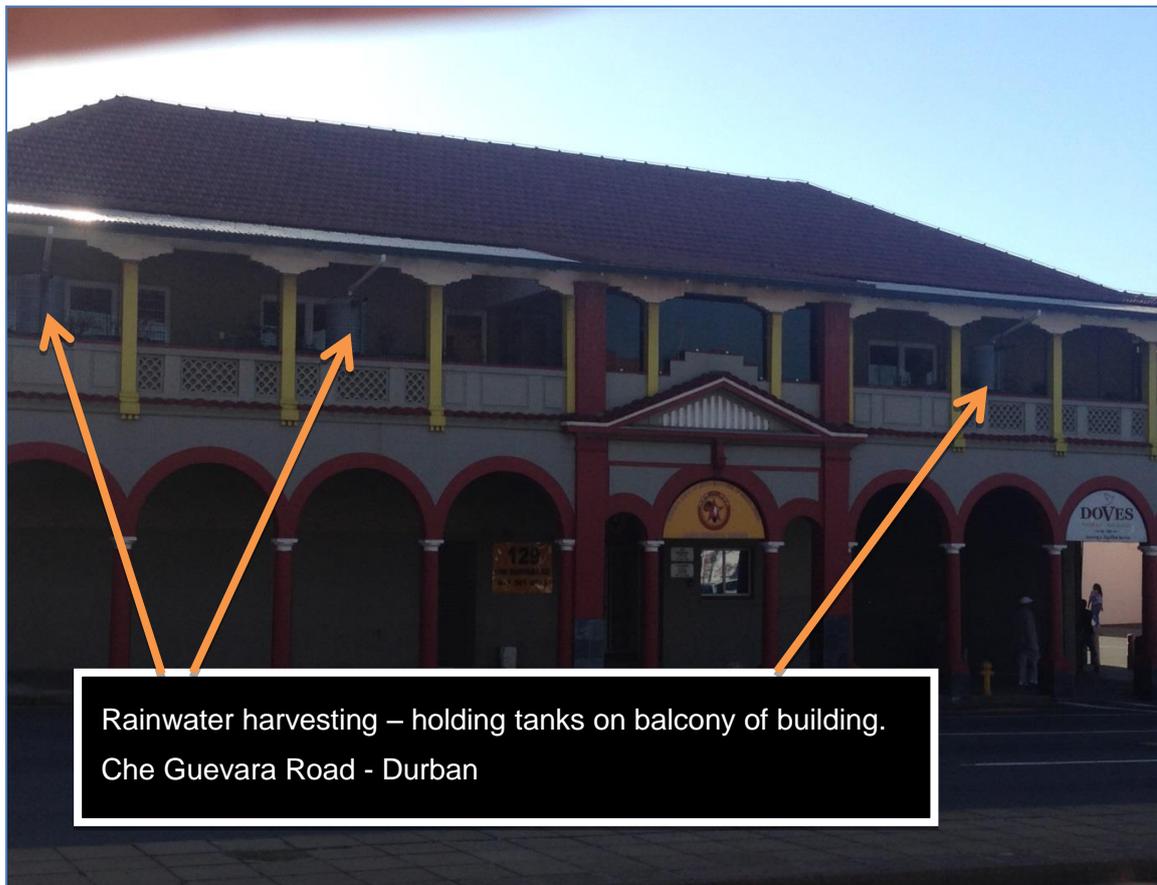
In one of the public comments submitted at the budget/IDP consultation forum 2013, among major challenges that eThekweni public experience, insufficient water supply was rated second after Housing⁸. This also indicates the seriousness of the water challenge in eThekweni.

3. Conservation of Rainwater



Picture 1: indicating building that channels water to the drainage

The building in Picture 1 is in Westville prison in Durban. The Picture indicates the existing trend of guttering water from the rooftop of the building to the drainage system thus wasting water that could have been conserved for future use. There is a need stop this as the water becoming scarcer.



Picture 2: indicating Rainwater harvesting design in the city of Durban

The building in picture 2 was taken in the city of Durban. The design of the building is accommodating the harvesting of rainwater. If this practice can be common in all South African cities there will no problem of water shortage.

4. The Benefits of Harvesting Rainwater

Cities can harvest rainwater in parks for irrigation purpose and people can be encouraged to use rainwater for flushing toilets, for irrigation purpose and other uses other than consumption. Some cities like Singapore have diversified its water sources to include rainwater harvesting, reclaimed water and desalination and as a result the city has reduced its vulnerability to prolonged dry periods⁹. If South African cities can adopt the same approach the problem of water scarcity can be reduced. In the city of Dhaka it was found that through harvested rainwater 20% of the total water demand can be fulfilled¹⁰.

Rainwater Harvesting has the following objectives:

- (a) To provide supplementary water requirement;

- (b) To mitigate urban flooding; and
- (c) To increase ground water levels¹¹.
- (d) Through rainwater harvesting the water shortage protest can be avoided;
- (e) The cost of water bill can be reduced;
- (f) Rainwater harvesting reduces stress from city water supply¹².

5. Integration to planning

While it is a requirement to have an on-site Storm-water Management Plan it is also important to consider having an on-site Rainwater Harvesting Plan as part of developmental requirement. There is a need for planners, engineers and architects to rethink their design to include water harvesting space in their design.

The land use development controls are used to regulate development for the purpose of sustainable use of land and management of land, example of land use control are as follows:

ZONE: BUSINESS PARK	
DEVELOPMENT PARAMETERS: SPACE ABOUT BUILDINGS	
Building line: Front	7,5 M
Building lines: side and rear	3.0 M
Minimum ERF size	1800 M ²
Height in Storeys	4
Coverage	50%
Floor Area Ratio	0,50

Source: eThekweni Outer West Land use Scheme 2013¹³

The municipalities need to consider including the water harvesting space in their development parameters while at the same time ensuring that the space is used efficiently.

eThekweni Municipality has various levels of services offering to domestic customers:

- Full pressure water supply fed directly to the household from the city's supply network;
- Semi pressure supply received by the household via a roof-tank;
- 300 litres of water per day available via an individual household supply (ground tank or metered flow limiter connected to a yard tap);
- Standpipes/ water dispensers that are provided to supply informal communities as an interim measure;
- Water sachets or tanked water in the case of prolonged service interruptions;
- Water boreholes where there is no water reticulation¹⁴

In spite of the above mentioned various levels of services offered by eThekweni municipality nonetheless there are no effective ways of collecting rainwater for domestic customers and other uses.

6. Recommendations

South African cities need to do research on money that can be saved when rainwater is harvested. The research will help cities to determine whether the water harvesting approach will assist them to reduce costs of supplying water to the consumers and reduce the water pressure requirements from the consumers.

The city officials responsible for water can test rainwater harvesting initiatives in public institutions such as prisons, clinics, hospitals and any other public institution and then encourage throughout the city. The starting point can be the use of rainwater for non-consumption purposes such as discharge water into the sewer system, the use of rainwater for irrigation purpose, the use of rainwater for washing cars, clothes and cleaning the floor as well as other non-consumption purposes. The best unit for water harvesting in urban areas is the individual house followed by apartments, neighbourhoods, institutions, industries and common areas such as parks, roads, playgrounds and other common areas¹⁵.

The following recommendations are suggested:

- South African cities should harness the available rainwater harvesting methods;
- Schools and universities should be encouraged to come up with creative ways to harvest rainwater;
- Best rainwater harvesting practices should be learnt from other parts of the world and adopted if it is not costly;
- Private sectors especially real estate companies must be engaged in installing rainwater harvesting systems¹⁶.
- Mass awareness building and training programmes on practice and storage procedure of rainwater harvesting¹⁷.
- All buildings should implement rainwater harvesting systems in their premises in order to reduce the water scarcity problem¹⁸.
- Rainwater harvesting should be promoted through education and training, and the municipal by laws should include rainwater harvesting measures¹⁹.
- Designing a storm water drainage system that collects rainwater at a particular point; and
- South African cities need to have Rainwater Harvest Plan.

7. Conclusion

The overlooked water problem in South African cities will have huge economic implications in the near future. Some cities in other parts of the world have already started the initiative of harvesting rainwater. In order to fulfill the South African constitutional obligation of access to sufficient water, South African cities need to

diversify sources of water in order to ensure that the problem of future water challenge is delayed. South African cities can learn from other cities of the world that have already started saving rainwater. The rainwater harvesting system can also reduce the municipal water supply stress. Through rainwater harvesting, the current trend of channeling water to storm-water drainage can be replaced by channeling rainwater to water conservation tanks instead. Designing rainwater harvesting buildings can also help in saving large sum of money that could have been used in the payment of water bills.

Endnotes

¹eThekwini municipality, Durban's Sustainable Best Practice Portfolio, Water Special edition 2007/8, Environmental Management Department, Durban South Africa, www.durban.gov.za

²The United Nations World Water Development Report 2015, Water for a Sustainable World, Paris UNESCO. <http://www.unesco.org/open-access/terms-use-ccbysa-en>

³Vishwanath, S. Rainwater Harvesting in Urban Areas. Bangalore, India <http://www.rainwaterclub.org/docs/R.W.H.Industries.Urban.pdf>

⁴The Constitution of the Republic of South Africa No.8 of 1996

⁵www.iol.co.za/news/South Africa/Kwazulu-Natal/ethekwini

<https://thewaterproject.org/water-crisis/water-in-crisis-south-africa>

⁶National Planning Commission 2012. National Development Plan 2030,

⁷The United Nations World Water Development Report 2015, Water for a Sustainable World, Paris UNESCO. <http://www.unesco.org/open-access/terms-use-ccbysa-en>

⁸eThekwini Municipality Integrated Development Plan 2012/14

⁹The United Nations World Water Development Report 2015, Water for a Sustainable World, Paris UNESCO. <http://www.unesco.org/open-access/terms-use-ccbysa-en>

¹⁰Tabassum A, et. (2013) Rainwater harvesting as an alternative option for sustainable water management of Dhaka city, The Sustainable City viii, Vol.1 327. Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology (BUET). Bangladesh, www.witpress.com

¹¹Vishwanath, S. Rainwater Harvesting in Urban Areas. Bangalore, India <http://www.rainwaterclub.org/docs/R.W.H.Industries.Urban.pdf>

¹²Maharam Dakua (2013) Potential of Rainwater Harvesting in Buildings to Reduce over Extraction of Groundwater in Urban Areas of Bangladesh, European Scientific Journal volume 3 December 2013, pages 68-74.

¹³eThekwini Outer West Land Use Scheme, 2013

¹⁴eThekwini Municipality, ninth edition, July 2015/2016, eThekwini Water and Sanitation, Service Level Standard,

¹⁵Vishwanath, S. Rainwater Harvesting in Urban Areas. Bangalore, India
<http://www.rainwaterclub.org/docs/R.W.H. Industries. Urban.pdf>

¹⁶Tabassum A, et. (2013) Rainwater harvesting as an alternative option for sustainable water management of Dhaka city, The Sustainable City viii, Vol.1 327. Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology (BUET). Bangladesh, www.witpress.com

¹⁷Sabina Yeasmin and Khan F. Rahman (2013) Potential of Rainwater Harvesting in Dhaka City: An Empirical Study, ASA University Review, Vol. 7 No. 1, January-June, 2013, pages 144-150

¹⁸Tabassum A, et. (2013) Rainwater harvesting as an alternative option for sustainable water management of Dhaka city, The Sustainable City viii, Vol.1 327. Department of Urban and Regional Planning, Bangladesh University of Engineering and Technology (BUET). Bangladesh, www.witpress.com

¹⁹Kahinda M.J 2008. Water Resources Management in Rainwater Harvesting: An Integrated System Approach, Water Research Commission, Pretoria, South Africa.

Climate Change, Water and Wastewater, risks and uncertainties: case study of Kenya Cities and Towns

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Abstract

Water is predicted to be the main channel through which climate change impacts will be felt by people, ecosystems and economies (Bates et, 2008). The range of challenges related to climatic change and cities in regard to water supply and waste water treatment sector is enormous world over. Most of these challenges have general characteristics, however some are more specific to particular cities, depending on their geographic, economic, administrative capacity and more importantly demography.

Climate change impacts in the form of changing rainfall regimes and increased evaporation under higher temperatures have far reaching implications for traditional water and sewerage services providers. Increased demand from domestic households, urban agricultural and industrial consumers, and ecosystems, compounds these challenges in cities. As a result, basing future water management on past hydrological trends does not protect against a range of uncertain and non-stationary future climates.

Water resource pressures already facing Africa's urban populations are expected to increase dramatically over the coming decades. Estimated urban population growth averages an unprecedented 5 percent per year. At this rate, Africa's urban population will double before 2030. Where a significant number of urban residents have a challenged access to improved water and sanitation services, this poses a large and growing challenge to sustainable development, and is bound to be compounded by climate change.

Kenya is classified among the water stress countries. This notwithstanding; the country is highly vulnerable to the impact of climate change, particularly its main economic sectors. The Stockholm Environment Institute (SEI 2009) estimates that the costs of climate change in the country could be equivalent to a loss of almost 3% of GDP by 2030 impacting negatively on long-term growth. The deteriorating of water availability and quality, caused by climatic change may have indirect effect of raising operational costs and escalating the price of water and sewerage, making the services unaffordable for low income households.

This research paper will attempt to examine risk and uncertainties of climate change in the context of water service providers, delve on how climate change is being mainstreamed, take stock of the gains and unveil gaps, and propose intervention. The study will focus on three cities and five sampled towns in Kenya, namely Nairobi, Mombasa, Kisumu and Eldoret, Nyeri, Malindi, Meru and Nakuru respectively.

Research Plan

The research will be based on a review of literature and data, supported by a number of stakeholder interviews mainly drawn from the Water Service Providers Association, based Water Action Groups and Community Based Organizations particularly in informal settlements that have already been established and are operational in the respective cities and sampled urban towns, with government officials, donors, civil society and the private sector.

Background

Climate change is greatly affecting weather patterns and the world ecosystem and, in particular, posing a serious challenge to the world's water supply. The phenomenon is causing profound effect on how communities can reliably access clean water. Impact of climate change is instigating poor water quality, exacerbating scarcity of fresh water resources in regions that hitherto are deprived off adequate water resource. This situation of water stress, more often than not triggers water conflicts among communities living in these geographical regions and to an extent puts significant strain on water infrastructure.

Climate change generally refers to change in average temperature, precipitation, and weather intensity. Climate experts agree that the main cause of global warming is the increasing levels of greenhouse gases in the atmosphere. The mechanism by which the buildup in the atmosphere of CO₂ and other heat trapping gases (GHG) leads to change in climate is referred to as the greenhouse effect. While a certain level of greenhouse gasses are essential to maintaining the temperature of the earth, higher levels raises the earth's temperature causing climate change (Karl et, 2003). Analysis from data collected, indicates that there is a steady increase of global temperature by an average 0.6^o c as illustrated by the graph below.

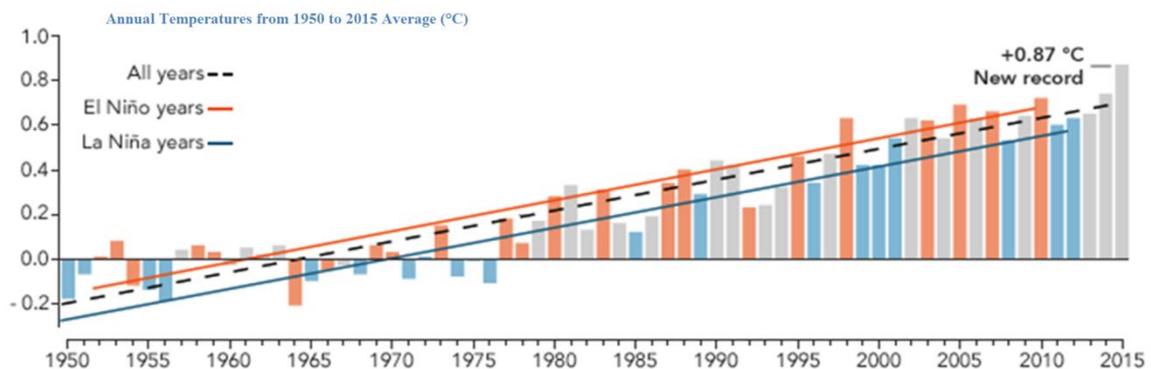


Figure 1: Source; NASA/GSFC/Earth Observatory 2016

The Sustainable Development Goals (SDG) observes that climate change constitutes a risk to many dimensions of sustainable development. Lack of adaptation and mitigation on climate change poses a risk and makes it difficult to achieve and sustain gains realized on SDG over time (ICSCU, 2015). Indeed the Intergovernmental Panel on Climate Change (IPCC) has warned that many regions of the globe are bound to be subjected to changes in the supply and quality of freshwater resources. The resulting consequences from climate change may imperil sustainable development, poverty reduction and child mortality goals.

Climate Change and Water Resources in Africa

Many countries in Africa are water stress. (WGBU, 2003) gives the definition of water stress countries, as those countries which use more than 20% of their renewable water resources. Climate change is having a multitude of immediate and long term impact on water resources in Africa. These include flooding, drought, sea-level rise, drying of rivers, poor water quality in surface and groundwater systems, precipitation and water evaporation distortions. Notable evidence on climate change impact on water resources in Africa include the receding of the Nile Delta, at rate of 3-5 millimeters per year (Sterma, 2009). Recent data analysis divulges that one of Africa's largest freshwater lakes, Lake Chad is now highly decimated. In 1960 it

covered 45,000 square kilometers but by 1998, it had shrunk to 10,000 square kilometers (Associated Press, 2006). Lake Victoria the largest tropical lake at 68,790 square kilometers and world's second largest freshwater lake is losing water at an alarming rate, (Stuteville, 2008), observes that on average the lake loses water at 1.5 feet annually.

Due to their geographic location, coupled by low technological and institutional capacity to adapt to rapid changes in the environment, as well as greater reliance on climate-sensitive renewable natural resources such as water and agriculture, sub-Saharan Africa countries are likely to suffer the most devastating impact of climate change (Eboh, 2009). This situation is even more exacerbated by anthropogenic factors for instance, increased encroachment for human settlement and agricultural activities to cater for expanding human population whose aftermath has resulted in desertification and declining run-off from water catchments.

Climatic change in Kenya

The evidence of climatic change in Kenya is unmistakable. Temperatures have risen throughout the country. Rainfall patterns have become irregular and unpredictable and when it rains, downpour is more intense according to Kenya Meteorological Department (KMD). Extreme and harsh weather is now the norm in Kenya. More specifically, since the early 1960s, both the minimum (night) and maximum (day) temperatures have been on a warming trend. The minimum temperature has risen generally by 0.700^o c to 2.00^o c and the maximum by 0.20^o c to 1.30^o c, depending on the season and the region, according to the KMD. This changing climatic (rainfall and temperature) patterns have had adverse impacts on Kenya's socio-economic sectors. Figure 2 below indicates the gradual retreat of glaciers on Mt Kenya. According to (UNEP 2007), the glaciers on Mount Kenya receded from an area of 0.60 square kilometers in 1890 to 0.26 square kilometers in 1982.

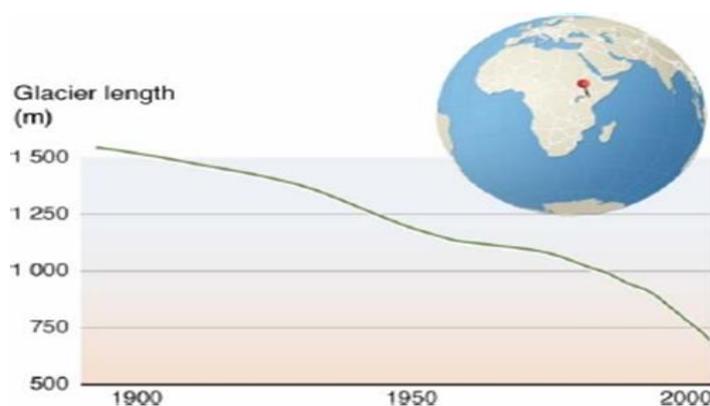


Fig 2: Shrinking Lewis Glacier, Mount Kenya. Source: UNEP/GRID (2007)

Kenya is a water scarce country. The natural endowments of renewable freshwater resources are unevenly distributed in both time and space. Climate change will worsen this precarious situation as it affects the main hydrological components of precipitation and run-off. This will alter the spatial and temporal availability of water resources. Serious droughts have occurred in the recent past. Major rivers show severe reduced volumes during droughts, and many seasonal ones completely dry up. The impact of drought has intensified

over the years and is likely to worsen with climate change. Available records indicate that in the last 100 years the country has experienced over 29 droughts. In the past four decades droughts have become more frequent, more widespread, and more intense. Major recent droughts were in 1983/1984, 1991/1992, 1996/1997, 1999/2001, 2005/06, 2008/09 and 2011. Indeed, (Nyariki, et,2007) observes that as an effect of climate change, Kenya has witnessed more frequent droughts and floods cycles have shortened to every 2-3 years instead of 5-7 years in the past

In response to the challenges posed by climate change, Kenya has developed a National Climate Change Response Strategy (NCCRS 2010), National Climate Change Action Plan (NCCAP 2013) and a National Adaptation Plan (NAP). These policies provide a vision for low carbon and climate resilient development pathway. The documents present Kenya Intended Nationally Determined Contribution (INDC) in response to decisions adopted at the 19th and 20th sessions of the conferences of the Parties to the United Nations Framework Convention on Climatic Change (UNFCCC); that invites parties to communicate to the secretariat their INDCs, towards achieving the objective of the UNFCCC.

Kenya Vision 2030 – the long-term development blueprint for the country – aims to transform the country into “a newly industrializing, middle-income economy providing a high quality of life to all its citizens in a clean and secure environment.” A low carbon climate resilient development pathway, as set out in the National Climate Change Action Plan (NCCAP), will help meet Vision 2030's goals through actions that address both sustainable development and climate change. This pathway can also help the Government achieve the SDGs and other internationally agreed development goals without compromising the environment and the natural resource base.

Achieving long-term sustainable economic growth up to and beyond Vision 2030 in the face of climate change is a primary concern. Kenya is already extremely susceptible to climate related events and such events pose a serious threat to the socio-economic development of the country. Droughts and floods in particular have devastating consequences on the environment, society and the wider economy. According to the science of climate change, these impacts are likely to continue to affect the country in the future. Since Kenya's contribution to global emissions of greenhouse gases is negligible, it is not responsible for causing this problem.

Nexus of Climate Change, urban water services and other sectors in Kenya

Water is a cross-cutting theme in urban life and functions. It is at the pinnacle on many issues regarding how climate change impacts on urban centers. Water is predicted to be the main channel through which climate change impacts will be felt by people, ecosystems and economies (Bates et, 2008). The effect of climate change on urban water will impact other urban sectors, equally climate change effects on other sectors, will in many cases, impact on the urban water systems. The complexity of provision of water and wastewater services in urban centers in Kenya is to an extent explained by the vulnerability to the negative impact of climate change.

While global warming poses a business challenge to water utilities, utilities also contribute to the global warming problem through their energy use. Processing and eventual distribution of portable water and treatment of wastewater in Kenya heavily relies on power driven

treatment system. The use of petroleum product for mobility in execution of operations and maintenance schedules results to emission of undesired gases into the atmosphere.

Impact of Climate Change on Provision of Water and Wastewater in Kenya

The range of challenges related to climate change in regard to water and wastewater sector in Kenya is significant. The country is classified among the water stress countries. This notwithstanding; the country is highly vulnerable to the impact of climate change, particularly its main economic sectors. The Stockholm Environment Institute (SEI 2009) estimates that the costs of climate change in the country could be equivalent to a loss of almost 3% of GDP by 2030 impacting negatively on long-term growth.

There are about 40 million people living in Kenya, of which about 17 million (43%) do not have access to water (World Bank, 2010). For decades, water scarcity has been a major issue in Kenya, caused mainly by years of recurrent drought, poor management of water supply, neglect and weakness in strict enforcement of environmental protection laws, contamination of the available water resources and sharp increase in water demand due to relatively high population growth. For instance, cases of deliberate tree logging in Mau forest, one of the main water towers, in the country leading to devastating reduction on forest cover has been observed. Fig 3 below compares two satellite images of Mau forest. The image to the left is from 1986 and the image to the right is from 2003 (Morgan 2009). Both images portray the loss of forest cover (which is shown in red) and the infringement (arrows) into the Mau forest reserve. As shown in figure(3), the extent of deforestation increased from 1986 to 2003 because the arrows symbolize the increase of settlers and invasion into the Mau forest, which has had a huge impact on the loss of forest cover

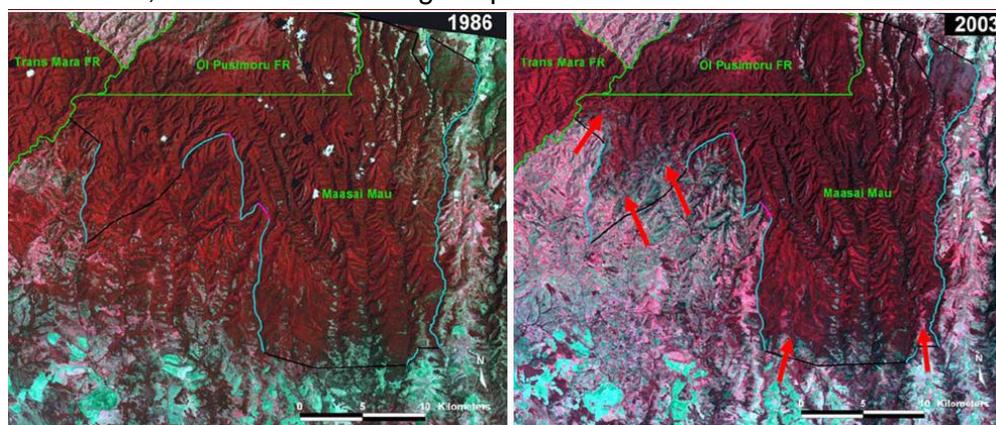


Figure 3: Massai Mau Forest Degradation. Source: Morgan (2009)

The availability of water resources in Kenya has been decreasing over time as a result of persistent droughts and land use patterns. The climate scenarios show that rainfall variability and increased evaporations due to high temperatures will lead to further decreases in the available water. Already there are dramatic reductions in the snow and glaciers of Mount Kenya, believed to be associated to the global warming. This disappearance of glaciers will affect the availability of water for both rural and urban populations. In 2009 drought witnessed the water reservoir of Thika Dam, which has a storage capacity of 70 million cubic metres, hold 26 million cubic metres of water at the height of the drought. Environmentalists attributed the low water levels not only to the failed rains, but also to the destruction of the forests.

The function of formal urban water supply and wastewater sector in Kenya includes abstraction and storage of raw water, treatment and distribution of processed water, and wastewater treatment and disposal. The infrastructure generally includes water and wastewater utility systems with large raw water storage facilities, portable and wastewater treatment and plant equipment, distribution network and portable water storage facilities. Many of these facilities, structures, supply sources and wastewater disposal mechanisms are vulnerable to adverse effects from climate change (Case,2008).

Water supply and wastewater treatment infrastructure in urban centers in Kenya are subjected to climate change induced stress. Water quality could suffer in areas experiencing increases in rainfall. Heavy downpours can increase the amount of runoff into rivers, washing high sediment loads, trash animal waste and other materials into water supplies, a situation that will require more inputs in water treatment besides overwhelming water and wastewater treatment plant by increased volumes. Erosion reduces the storage capacity of the reservoirs and water quality is compromised by pesticide runoff.

Wastewater discharge and wastewater treatment process are sources of greenhouse gas emissions. Carbon dioxide, nitrous oxide and methane which are generated from wastewater treatment plants have been the main focus in climate change calculation.

Conclusion

Climate change will not only have widespread implication for water utilities, but also for communities and businesses. An important step in addressing climate change challenges is identifying ways to limit greenhouse gas emissions and educate people about the risks of global warming and how it portends? on water resources. While the water utility industry must demonstrate leadership here, it cannot succeed alone. A unified effort between government, business, and consumers is needed to implement near and long term solutions and develop broad strategies to address adverse impact of global warming on water industry in relation to water and wastewater services provision. Policy reviews, funding for infrastructure, development of alternative water supplies and expanding on reservoirs coupled with awareness campaigns and public education will be necessary in making significant progress. Water utilities must continue to assess their own contributions and track greenhouse gas emissions to find ways to reduce their impact on the environment. There are a number of strategies for doing so, including undertaking regular energy audits to determine how they can become more efficient.

Reference

Associated Press, 2006

Bryson Bates, Zbigniew W. Kundzewicz, Shaohong Wu and Jean Palutikof eds., Climate Change and Water, Technical Paper VI, International Panel on Climate Change (June 2008)

Case, T. (2008). Climate change and infrastructure issues. AWWA Research Foundation, Drinking Water Research, Climate Change Special Issue,

Eboh, Eric C. (2009) Introduction: Debating Policy Options for National Development; Enugu Forum Policy Paper 10. African Institute for Applied Economics (AIAE), Enugu, Nigeria

German Advisory Council on Global Change, WBGU (2003) Climate Protection Strategies for the 21st century: Kyoto and Beyond. WBGU, Berlin, Germany: 77pp.

Government of Kenya, (2007) Kenya Vision 2030: Nairobi: The Government of Kenya. page vii.

ICSU, ISSC (2015): Review of the Sustainable Development Goals: The Science Perspective. Paris: International Council for Science (ICSU).

Karl, Thomas R.; Kevin E. Trenberth(2003). Modern Global Climate Change

Morgan, James (2009) Kenya's Heart Stops Pumping, *Nairobi*, Kenya

Nyariki, D.M., Kinyua P.I.D. & Wasonga, V. (2007). A comparative study of commercial consumptive and non-consumptive utilization options for wildlife conservation strategies in Kenya, IFAW.

Sterman, David July (2009) Climate Change in Egypt: Rising Sea Level, Dwindling Water Supplies. Climate Institute.

Stuteville (2008) Lake Victoria beset by environmental problems. Chronicle Foreign Service. Hearst Communications Inc.

UNEP/GRID-Arendal. (2007), Shrinking Lewis Glacier, Mount Kenya [Internet]. UNEP/GRID-Arendal Maps and Graphics Library

Determining the social and spatial vulnerability of a place from potential natural hazards

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Abstract

As a region continues to grow in terms of demographic, economic and cultural backdrop, its vulnerability to potential hazards also increases. The increasing intensity of natural hazards from past few decades has resulted in escalation of the losses of life and property, prompting a modification in the disaster reduction policy. Effective preparedness and mitigation of disasters need identification of potential hazard and an assessment of vulnerability elements in a particular place. The vulnerability of a place however, is not specifically dependent upon the proximity to the hazard source. Social factors play an important role that defines the resilience of a system. This paper presents a spatially explicit method to assess the social vulnerability of a place from potential cyclone threat, which is a major natural hazard in the coastal regions.

1. Introduction

Natural hazards are unavoidable. Simultaneously, due to increasing population and demand for a better life, development is inevitable. The greatest challenge in the recent urban and regional planning is to deal with the natural catastrophe, and at the same time to secure the human lives and infrastructure. To overcome this challenge there is always a necessity to know what makes a place more vulnerable than the other, assuming a similar intensity of hazard. Nonetheless, it seems like a very simple question, but the complexity lies in the societal phenomena of unequal distribution of resources, access to basic services etc., that gives rise to vulnerability. Vulnerability is considered as a degree of exposure of a system from any potential threat (Cutter, 1996). While dealing with such a complex process of vulnerability in planning one needs to assess the existing scenario of social status of a place (Adger, 2006; White, 1936; Birkmann, 2006) The assessment of social vulnerability conceptualizes the place specific social elements that could be a possible high impact factor for the vulnerability of that location. Therefore, for such an assessment, quantification of social vulnerability is 'a must' in order to identify the vulnerable places. In this context, Cutter et al. (2003) had established a methodology to determine the probable factors of social vulnerability in the USA. Later on, this methodology was modified and applied to various regions around the globe (Holand et al., 2011; Schmidlein et al., 2008; Chakraborty et al., 2005). In India, few attempts has been made to study vulnerability in social context. Mazumdar and Paul (2016a) had studied the vulnerability by considering an exhaustive social and infrastructural variables to identify the vulnerability of eastern coastal districts of India. However, a large number of work has been done in revealing the physical vulnerability of place (Kumar and Kunte, 2012; Das, 2012; Sharma and Patwardhan, 2008). Hence, there is a need for a comprehensive social vulnerability assessment in order to highlight the importance of vulnerability to hazard studies in social context. This gap is to be filled with the proposed Social Vulnerability Assessment Index (SVAI).

The present paper addresses the issue of social vulnerability to natural hazard by assessing the existing scenario of the blocks of Odisha state in India. It provides an insight to the level of resilience of the blocks from natural hazards, particularly tropical cyclones. The paper address the questions of vulnerability to natural hazards, highlighting the issues of what are the places that are vulnerable to potential cyclones and why they are vulnerable. In addressing these questions, an attempt has been made to construct the Social Vulnerability Assessment Index (SVAI), in order to identify the blocks, which are prone to potential cyclones, and are the underlying factors responsible for the vulnerability of those blocks. The SVAI reveals certain characteristics of the population that exposes and makes them susceptible to hazard threat.

In context to the cyclone hazard of Odisha, the objective of SVAI is to identify and quantify the factors responsible for social vulnerability. The input variables selected for this index are based on the notion of 'most probable factors' that could increase or decrease the vulnerability at the time of cyclone. Some of the variables (like education, health infrastructure, employment etc.) in the index could also be used for measuring vulnerability to other hazards. This is a 'standalone index' and endures no direct dependency on hazard factors. It rather indicates and captures the social vulnerability causes of each block of Odisha.

1.1. Importance of social vulnerability to city and regional planners

The focus of urban and regional planners is to prioritize the most realistic, constructive and reasonable set of preparedness goals of disaster. While planning the benefits of SAVI for planners and disaster managers, the emphasis should underline the following:

- Act as optimal criteria for social vulnerability information system that can be quantitatively measured.
- Act as a geo-informatics mapping tool to enhance spatial visualization of the social vulnerability factors.
- It should bridge the gap between identification of social vulnerability factors and prioritize the selection of preparedness actions.

2. Study area

The present vulnerability study has been applied to all the blocks of Odisha state lying on the east coast of India (Figure 1). 477 blocks exist within the 30 districts in Odisha. Every year on an average 4 cyclones hit the coast of Odisha disrupting the everyday lives of the people. Odisha is exposed to 480 km long coastline. The topographic characteristics, bathymetry, near-funnel shape of the coast make Odisha a naturally

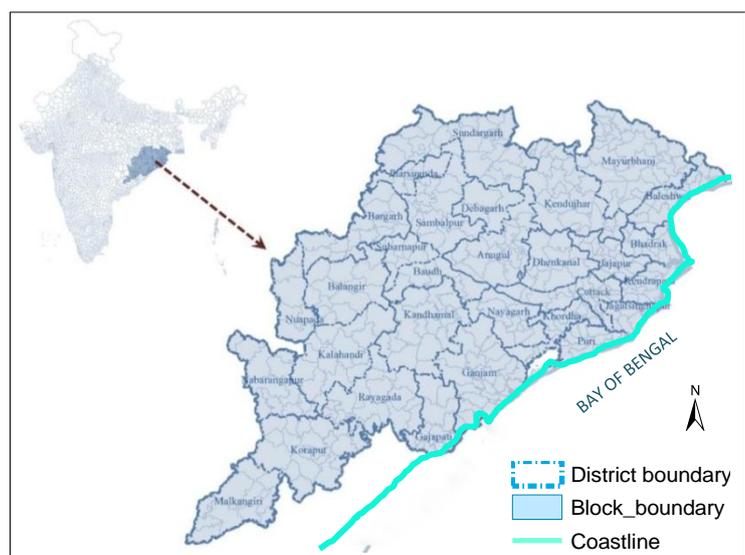


Figure 1. Location of Odisha

vulnerable place from cyclones (Dube et al., 2000).

3. Methods

3.1. Vulnerability Index Framework

The indices of vulnerability consist of numerous social, economic and infrastructural variables that explain the distribution of spatial vulnerability across the study area. The creation of SVAI variables is based on an exhaustive literature review. Most of the data are collected from the Census of India 2011 in order to make sure that the variables are location and scale specific.

The Principal Component Analysis (PCA) with an input of 33 variables was selected (Table 1). Once the variables were identified, the pre-processing of the data was done in order to remove multicollinearity and log transform the variables, which reduce kurtosis and skewness in the data. The primary method applied here is "factor analysis" which was computed in SPSS. Specifically, PCA was applied for the reduction of a large number of variables, which was extracted from the Census. PCA has been considered as one of the best way to reduce a large number of variables into factors due to its reliability (Cutter et al., 2003). The usability of PCA is dependent on Barlett's test of Sphericity, Kaiser-Meiyer-Olkin (KMO) test. The values higher than Eigen value 1 has been retained (Figure. 2).

Table 1. Description of variables for SVAI

Variables	Description	Sources
House_Den	Housing density	(Winsor et al., 1994; Cutter et al., 2003)
Wall_kucha	%Wall Kuccha	(Das, 2012)
No_sanit		(Cutter et al., 2003)
Untrt_water	%Household having untreated water	(World-Bank, 2003)
No_br		(Mazumdar and Paul, 2016b)
Opn_drn	% Household with open drainage	(Lee, 2014; Balica et al., 2012)
No_drn	% Household with no drainage	(Mazumdar and Paul, 2016b)
No_radio	%Household having access to radio communication	(Adger et al., 2004)
No_internet	%Household having no access to internet	(Adger et al., 2004)
No_telephone	%Household having access to telephone	(EM-DAT, 2009)
2wheeler	%Household having access two wheeler	(Das, 2012)
Popden	Population density	(Armaş and Gavriş, 2013)
Margwrker	%Total marginal workers	(Holand et al., 2011; Borden et al., 2007)
% Livable housing	% Housing under livable condition	(Cutter et al., 2003; Birkmann, 2007)
%Dilap_housing	%House dilapidated	(Schmidtlein et al., 2008)
%Roof_kuchha	% Roof Kuchha*	(Mazumdar and Paul, 2016b)
%Floor_kuchha	%Floor Kuchha	Mazumdar & Paul, 2016b)
%HH_away_water	%Household having access to portable water away from residence	Mazumdar & Paul, 2016b)
%HH_electricity	%Household having access to electricity	(de Sherbinin, 2014)
%HH_no_sanitation		(EM-DAT, 2009)
%T_HH_bank	%Household having access to banking	(EM-DAT, 2009)

	facilities	
%Hh_tv	%Household having access television	(EM-DAT, 2009)
%HH_mobile	%Household having access mobile phones	(EM-DAT, 2009)
%HH_cycle	%Household having bicycle	(EM-DAT, 2009)
%HH_no_asset_specified	%Household having no basic assets	(EM-DAT, 2009)
%H_temp_structure	%House having temporary structure	(EM-DAT, 2009; Joerin et al., 2012)
%SC_pop	% Scheduled caste population	(EM-DAT, 2009)
%ST_pop	% Scheduled tribe population	(EM-DAT, 2009)
%Illiterate_pop	% Illiterate population	(Mazumdar and Paul, 2016b)
Hhsize_morethan5	% Household having more than 5 members	(Mazumdar and Paul, 2016b)
Child_pop	%Child population (0-6 years)	(Das, 2012)
Sexratio	Sex ratio- female per thousand males	(Cutter et al., 2003)
Non_worker	% Workers who are not employed in any sectors.	(World-Bank, 2003)

*Census of India defines Kuchha houses which are made up of non-masonry materials

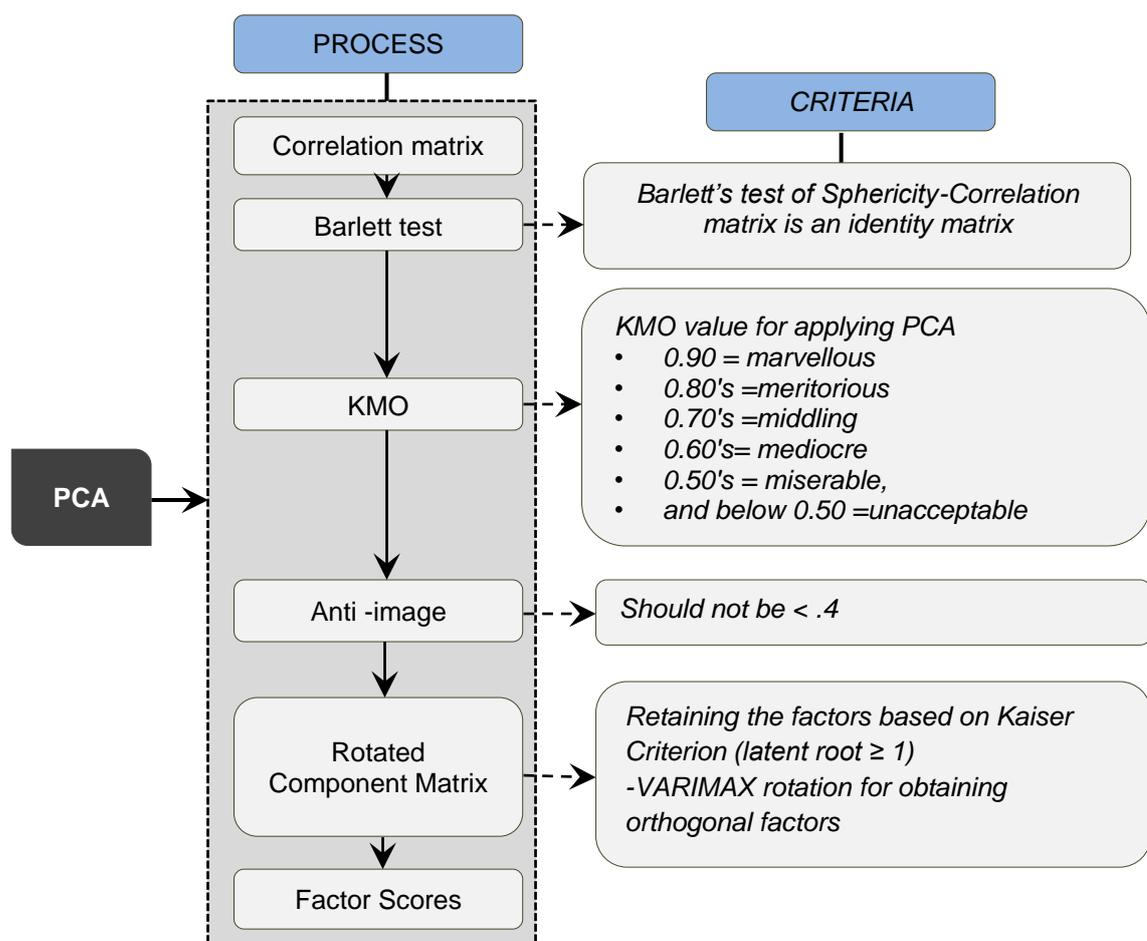


Figure 2. Methodology for applying PCA

3.2. Mapping vulnerability

Spatial mapping of vulnerability is a powerful tool to visualize the areas of high vulnerability. The applicability of GIS in this paper lies in the spatial identification of vulnerable blocks. The factor scores generated from PCA has been applied for the spatial mapping of social vulnerability using Jenk's Natural break technique in ArcGIS software.

4. Results

4.1. Statistical consistency of PCA

The input of 33 variables reveals the seven latent factors that explain 77.72% of the total variance. The Barlett's test of Sphericity and KMO is 0.866 which is within the acceptable range for the application of PCA. A total of 7 Principal Components (PCs) were retained after varimax rotation (Kaiser criterion) having ≥ 1 Eigen value (Table.2).

Table 2. Extracted components from rotated component matrix*, variance explained by each factors and its description

Components of SVAI	Variance explained (in %)	Description
PC-1: Access to basic services and entitlement of assets	25.53	It improves living conditions as well as creates awareness in the society. Therefore, it decreases impact on vulnerability.
PC-2: Marginalized population	17.33	Population under this category generally sustain on government welfare and they are difficult to identify at the time of disaster. It increases vulnerability
PC-3: Density	8.99	Any kind of density is a potential risk at the time of hazard as it increases the congestion and reduces the open space for evacuation process.
PC-4: Poor Housing structure	8.24	Houses that have non-masonry structure are considered more vulnerable. Thus, it has positive loading effect on vulnerability.
PC-5: Health and sanitation	6.44	Poor sanitation increases the chances of flooding, and poor health care facilities reduce the capacity of a place to tackle with the causalities that might occur at the time of cyclone event. Hence, it increases social vulnerability.
PC-6: Dilapidated housing	5.85	Dilapidated houses are more prone at the time of cyclone. Therefore, it increases vulnerability.
PC-7: Unemployment	5.31	Unemployment reduces the capacity of population to recover after a hazard event. Hence it increases social vulnerability

*Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 8 iterations.

4.2. Spatial Analysis

The social vulnerability assessment mapping illustrates the spatial distribution of social vulnerability within the blocks of Odisha. By using Jenk's natural break method for classification, social vulnerability was categorized into five classes (Very low, Low, Medium, High and Very High), in order to provide a spatial visualization of vulnerable blocks (Cutter and Finch, 2008; Borden et al., 2007). The higher social vulnerability has positive loadings while negative scores represent lower vulnerability in the blocks. The overall place vulnerability shows several spatial patterns of exposure in each block (Figure-3). SVAI scores are highest along the coastal blocks of northern Odisha and parts of southern Odisha, such as blocks in the districts of Balasore, Bhadrak and parts of Jajapur. The percentage share of population under each SVAI category shows that around 7% of the population are in "very high" category followed by 24.60% in "high" category of social vulnerability. Remaining share of population are in medium, low and very low category (Figure 4). Figure 5. (a-g) shows the spatial pattern of each score for each of the blocks of Odisha (the detail of each component of SVAI has been described in Table 2.)

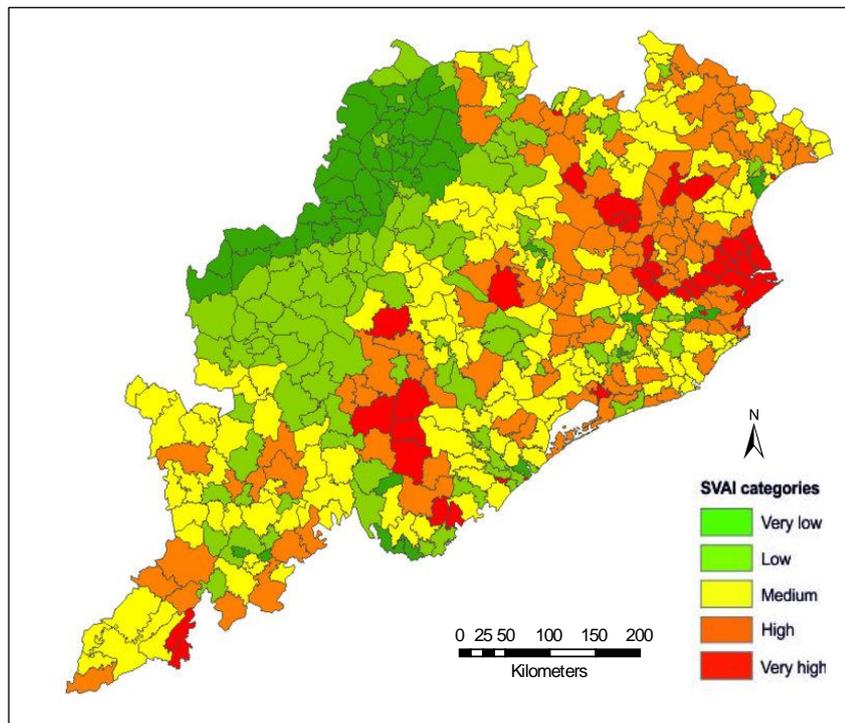


Figure 3. Spatial distribution of social vulnerability

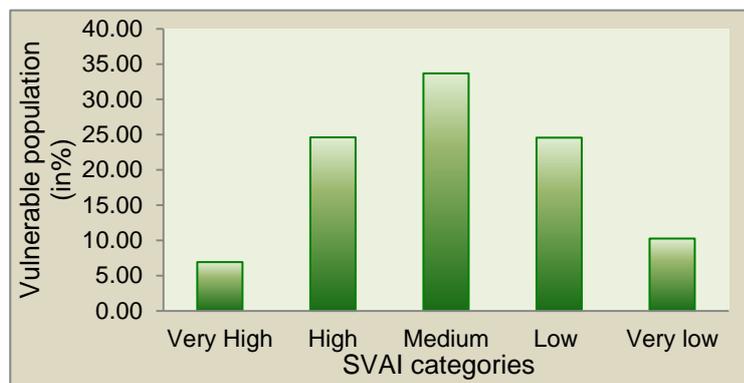


Figure 4. Percentage share of population under SVAI categories

Figure 5(a) - This spatially illustrates that the concentration of vulnerability arises due to lack of access to basic services and entitlement of assets. Blocks with higher loading on this factor are highly concentrated on the western parts of Odisha. However, few blocks in the eastern coastal districts of Balasore, Bhadrak and Ganjam in the southern coast are also included. The main variables contributing to the vulnerability of these blocks are households having no drainage facilities that might increase the chances of flooding at the time of cyclone due to heavy rain. Other contributors are, households having no banking facilities, no access to television, internet, mobile phones – which are used for the dissemination of early warning system. This factor (PC-1) has highest loading on SVAI and has positive functional relationship with social vulnerability.

Figure 5(b) - The second factor of SVAI is the marginalize population which consists of scheduled tribe, scheduled cast, children below 6 years age and higher sex ratio. They are also contributors of vulnerability. Positively loaded blocks are forming a cluster in the western and eastern parts of Odisha while, negatively loaded blocks are concentrated in the southern parts, few are in central Odisha.

Figure 5(c)-This factor consists of two variables i.e. population density and housing density. Higher density of any factor leads to congestion and unplanned growth that might hamper evacuation process at the time of disaster. Most of the blocks in this category are highly concentrated on the eastern coastal areas.

Figure 5(d) - Most of the blocks under this factor are concentrated in the districts of Cuttack, Jagatsinghpur and Balasore in northern coastal area, districts of Baudh and Anugul in central part and few scattered blocks in the southern parts of Odisha. This factor of vulnerability has positive relationship with social vulnerability.

Figure 5(e)-The positively loaded blocks in this category are highly concentrated in the northern part of Odisha while negatively loaded blocks are in the southern districts. Health and sanitation are complimentary to each other as it is a proven fact that good sanitation leads to healthy life. Therefore, it has a negative relationship with social vulnerability.

Figure 5(f) - Most of the positively loaded blocks in this category are scattered in the central parts of Odisha that are under very high-risk category. It has a positive relationship with vulnerability.

Figure 5(g) - The category of unemployment is highly concentrated in the urban blocks located in the coastal areas. In addition, most of the population from rural parts of Odisha move to cities located in coastal areas like Cuttack, Bhubaneswar, Khorda and Berhampur for employment and end up being unemployed due to high demand and low supply of jobs. It has positive relation with social vulnerability.

The results clearly illustrate the spatial variation in the distribution of social vulnerability across the state of Odisha. It shows that the exposed coastal blocks experience higher vulnerability than the blocks located inward from the coast. Thus, the increase in cyclonic winds accompanied by heavy rain can pose an adverse threat to the coastal communities, which need to be taken care of on a priority basis.

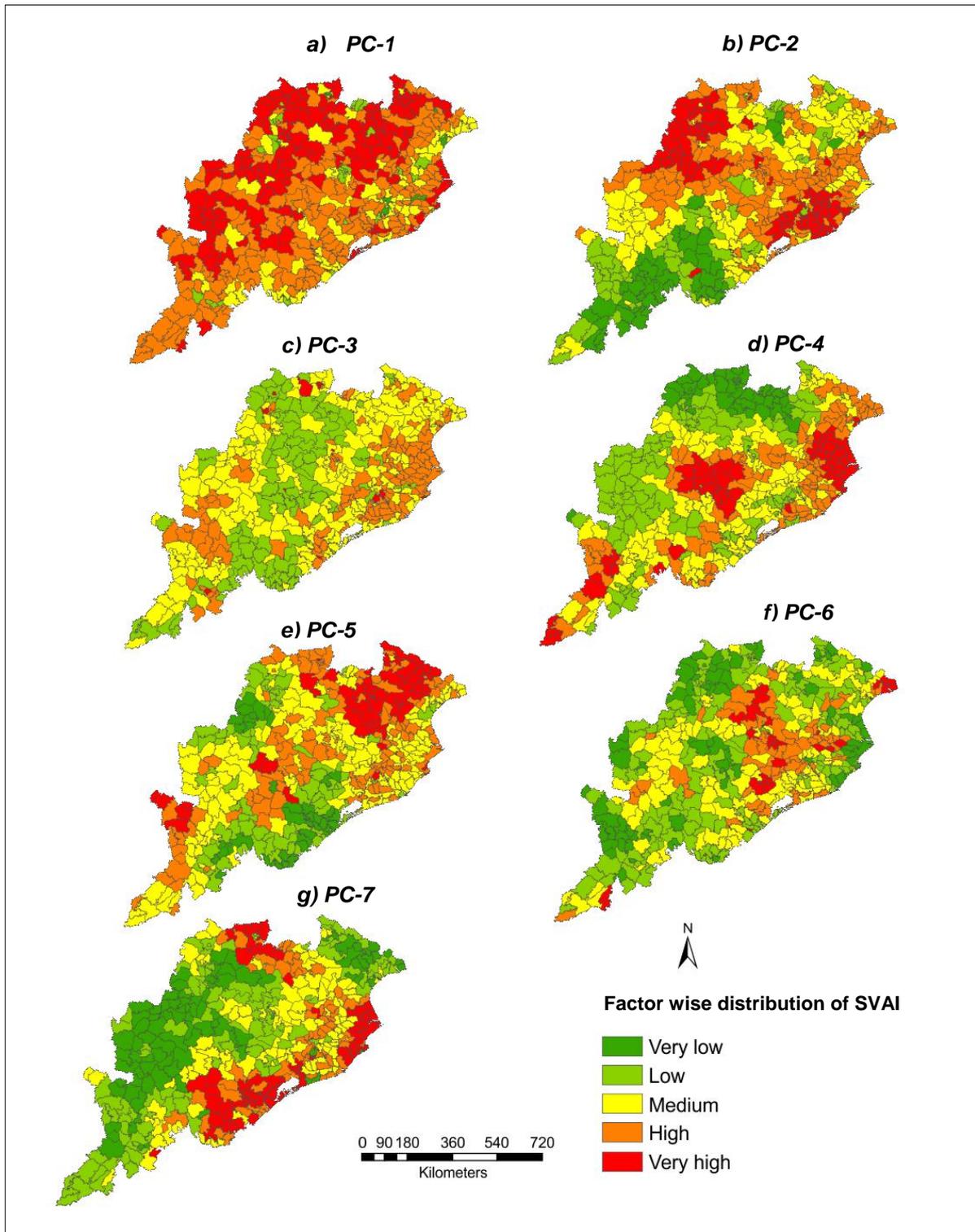


Figure 5. Spatial distribution factors of SVAI (for description of PCs refer table1)

5. Discussion

Social vulnerability is a product of inequality, poverty, inaccessibility to resources, and lack of entitlement (de León 2006; Turner et al. 2003; Blaikie et al. 1994). The motive behind emphasizing the place specific vulnerability assessment is that local level analysis gives an understanding of those places that are undergoing substantial amount of social vulnerability. Numerous studies on vulnerability have been done in global context, which has emphasized

the significance of social vulnerability research in studying the impact of hazard on society (Schmidtlein et al. 2008; Cutter, Mitchell & Scott 2000; Rød et al. 2012). Certain questions are important, such as, 'what actually triggers disaster, and whether it is solely dependent on the physical features of the area or social status of the population in order to tackle with the hazard impact. Nevertheless, physical features like topography distance from sea, path of cyclone track, bathymetry etc. play a very important role in exposing a place from hazard event (Cutter et al., 2003; Boruff et al., 2005; Borden et al., 2007). However, social factors act as an 'add-on' mechanism to the increasing vulnerability of the affected place.

This paper highlights the importance of social vulnerability assessment at sub-district level. The SVAI identifies the strength and weakness of each blocks based on social attributes that might contribute to high vulnerability. It is possible that the factor scores of two or more blocks have equal vulnerability score, but with the use of this index it is possible to identify which factor is actually contributing to the place vulnerability of that area. Additionally, spatial mapping of SVAI illustrates a spatial variation in the distribution of social vulnerability across the whole state of Odisha. The visual representation through geospatial techniques is highly recommended by various researchers, planners, and disaster managers in order to identify the location of vulnerable areas (Kumar & Kunte 2012; Mahendra et al. 2011; Montz & Tobin 2011). The recommended policies for SVAI implementation are:

- Inclusions of SVAI notion or similar vulnerability indices at national, state and local level disaster management documents and make it available at the time of drafting regional development plans.
- Encourage more research on social vulnerability to potential hazard events. The use of GIS and statistical approach with ground survey details should be incorporated in such research themes.
- The implication of SMART cities concept could only be achievable completely when planners start taking into account not only the vulnerability of built structure, but also place emphasis on the social factors.

6. Conclusion

The methodological conceptualization of SVAI demonstrated in this paper is not an ultimate tool for assessing the susceptible population. It is designed and conducted to assess the probability of being susceptible to any potential hazard events and to ensure the well-being of population in each block of Odisha. Additionally, SVAI reveals that spatial inequality persists in the distribution of social vulnerability across Odisha and attempts to find out the most important factors contributing to it. Therefore, the issue of social vulnerability is important and should be addressed by the planners, policy makers and disaster managers for a resilient society.

References

- Adger, W. N. 2006. Vulnerability. *Global Environmental Change*, 16(3), pp 268-281.
- Adger, W. N., Brooks, N., Bentham, G., Agnew, M. & Eriksen, S. 2004. New indicators of vulnerability and adaptive capacity,

- Mazumdar, Jublee and Paul, Saikat, Social and Spatial Vulnerability of a Place From Natural Hazards, '52nd ISOCARP Congress 2016'
- Armaş, I. & Gavriş, A. 2013. Social vulnerability assessment using spatial multi-criteria analysis (SEVI model) and the Social Vulnerability Index (SoVI model) – a case study for Bucharest, Romania. *Natural Hazards Earth System Science*, 13(6), pp.
- Balica, S. F., Wright, N. G. & Meulen, F. 2012. A flood vulnerability index for coastal cities and its use in assessing climate change impacts. *Natural Hazards*, 64(1), pp 73-105.
- Birkmann, J. (ed.) 2006. *Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies*: United Nations University.
- Birkmann, J. 2007. Risk and vulnerability indicators at different scales: Applicability, usefulness and policy implications. *Environmental Hazards*, 7(1), pp 20-31.
- Borden, K. A., Schmidtlein, M. C., Emrich, C. T., Piegorsch, W. W. & Cutter, S. L. 2007. Vulnerability of US cities to environmental hazards. *Journal of Homeland Security and Emergency Management*, 4(2), pp.
- Boruff, B. J., Emrich, C. & Cutter, S. L. 2005. Erosion Hazard Vulnerability of US Coastal Counties. *Journal of Coastal Research*, 932-942.
- Chakraborty, J., Tobin, G. & Montz, B. 2005. Population Evacuation: Assessing Spatial Variability in Geophysical Risk and Social Vulnerability to Natural Hazards. *Natural Hazards Review*, 6(1), pp 23-33.
- Cutter, S. L. 1996. Vulnerability to environmental hazards. *Progress in Human Geography*, 20(4), pp 529-539.
- Cutter, S. L., Boruff, B. J. & Shirley, W. L. 2003. Social Vulnerability to Environmental Hazards. *Social Science Quarterly*, 84(2), pp 242-261.
- Cutter, S. L. & Finch, C. 2008. Temporal and Spatial Changes in Social Vulnerability to Natural Hazards. *Proceedings of the National Academy of Sciences of the United States of America*, 105(7), pp 2301-2306.
- Das, S. 2012. The role of natural ecosystems and socio-economic factors in the vulnerability of coastal villages to cyclone and storm surge. *Natural Hazards*, 64(1), pp 531-546.
- de Sherbinin, A. 2014. Climate change hotspots mapping: what have we learned? *Climatic Change*, 123(1), pp 23-37.
- Dube, S. K., Chittibabu, P., Rao, A. D., Sinha, P. C. & Murty, T. S. 2000. Extreme Sea Levels Associated With Severe Tropical Cyclones Hitting Orissa Coast of India. *Marine Geodesy*, 23(2), pp 75-90.
- EM-DAT. 2009. *The OFDA/CRED international disaster database*, www.emdat.net. *Universite catholique de Louvain, Brussels* [Online].
- Holand, I. S., Lujala, P. & Rød, J. K. 2011. Social vulnerability assessment for Norway: A quantitative approach. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography*, 65(1), pp 1-17.
- Joerin, J., Shaw, R., Takeuchi, Y. & Krishnamurthy, R. 2012. Assessing community resilience to climate-related disasters in Chennai, India. *International Journal of Disaster Risk Reduction*, 0), pp.

- Mazumdar, Jublee and Paul, Saikat, Social and Spatial Vulnerability of a Place From Natural Hazards, '52nd ISOCARP Congress 2016'
- Kumar, A. & Kunte, P. D. 2012. Coastal vulnerability assessment for Chennai, east coast of India using geospatial techniques. *Natural Hazards*, 64(1), pp 853-872.
- Lee, Y.-J. 2014. Social vulnerability indicators as a sustainable planning tool. *Environmental Impact Assessment Review*, 44(0), pp 31-42.
- Mazumdar, J. & Paul, S. K. 2016a. Socioeconomic and infrastructural vulnerability indices for cyclones in the eastern coastal states of India. *Natural Hazards*, 1-23.
- Mazumdar, J. & Paul, S. K. 2016b. Socioeconomic and infrastructural vulnerability indices for cyclones in the eastern coastal states of India. *Natural Hazards*, 1-23), pp.
- Schmidtlein, M. C., Deutsch, R. C., Piegorsch, W. W. & Cutter, S. L. 2008. A Sensitivity Analysis of the Social Vulnerability Index. *Risk Analysis*, 28(4), pp 1099-1114.
- Sharma, U. & Patwardhan, A. 2008. Methodology for identifying vulnerability hotspots to tropical cyclone hazard in India. *Mitigation and Adaptation Strategies for Global Change*, 13(7), pp 703-717.
- White, G. F. 1936. The Limit of Economic Justification for Flood Protection. *The Journal of Land & Public Utility Economics*, 12(2), pp 133-148.
- Winsor, B., Blaikie, P., Cannon, T. & Davis, I. 1994. *At Risk: Natural Hazards, People's Vulnerability, and Disasters*: Routledge, London.
- World-Bank. 2003. Building Safer Cities: The Future of Disaster Risk,

Sustainable Goods and Services

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The types of goods and services used by households have a direct link to sustainability. Goods and services that rely on fossil fuels and are used wastefully can have significant negative environmental impacts such as high carbon emissions, pollution and deforestation. At the same time, goods and services based on well-designed systems can have beneficial local impacts such as better health, the creation of employment and a diversified economy. Household and neighbourhood built environments can support more sustainable goods and services and enable enhanced access to these. For instance, negative environmental impacts associated with vehicular transport can be reduced, or eliminated, if products are produced and consumed locally, instead of being imported.

This paper explores the relationship between goods and services, the built environment and sustainability in households. An ecological footprint calculator to understand what constitutes more 'sustainable goods and services' in households and neighbourhoods. Analysis is applied to this concept to ascertain the role of built environments in supporting, and enhancing access to, sustainable goods and services. This analysis is used to determine a set of built environment assessment criteria which are tested by being applied to a household and neighbourhood. The paper critically reviews the methodology followed for the study and the findings of the study in order to discuss the significance of the study and make a number of recommendations for further research.

1. Introduction

The focus on 'environmental friendly' products indicates an increasingly interest in the relationship between products, services and sustainability (Seyfang, 2009). However there is still limited guidance on how 'environmentally friendly' a product, or service, has to be in order for the product or service to be designated as 'sustainable' (Knight & Rosa, 2011). Therefore, it is often still not clear how 'sustainable' a particular product or service really is, despite the claims that may be made by a manufacturer or supplier (Princen, 2002; Andersson, & Lindroth, 2001). Similarly the relationship between goods and services and the built environment is also not well understood and there is limited direction on how buildings can support more sustainable goods and services.

This paper investigates this field. It is based on a literature review, analysis and desk top study. Through the literature review, goods and services assessment criteria for households and neighbourhood built environments are developed and applied. A critical review of the criteria and methodology and an evaluation of the findings are used to discuss the value of the approach and to make recommendations for further research.

The paper is structured in the following parts. The first part outlines the research questions addressed by the study. The second part describes the methodology followed. The third part is a literature review. This is followed by an analytical process to determine characteristics of 'sustainable goods and services' and translate these into built environment assessment criteria. The fourth part applies these criteria to a household and neighbourhood to test their relevance and effectiveness. The fifth part critically reviews the study in order to ascertain the

value of the approach. This forms the basis of the final part, where conclusions are drawn and recommendations made.

2. Objectives Research questions

The objective of the study is to understand the nature and characteristics of sustainable goods and services and their implications for the built environment. It also aims to establish, and test, criteria that can be used to assess the extent to which built environments support 'sustainable goods and services'. The research questions therefore are as follows:

1. What is the relationship of goods and services to sustainability?
2. What contribution do goods and services make to the ecological footprints of households?
3. What are 'sustainable goods and services'?
4. What built environment characteristics and configuration are required to support 'sustainable goods and services'?
5. Can built environment characteristics and configuration identified in 4, be distilled into assessment criteria?
6. Is it possible to test the assessment criteria defined in 5, by applying them to a neighbourhood?
7. What can be learnt from the study and are there useful recommendations for built environment assessment tools in relation to goods and services?

3. Approach Methodology

The methodology followed by the study is structured in three phases. First, a literature review is undertaken to define sustainability and goods and services and ascertain the relationship between the two for the study. This review also introduces the ecological footprint calculator and describes how it will be used.

Second, the ecological footprint calculator is used to calculate the ecological footprint of an identified residential household (Redefining Progress, 2003). This is carried out to ascertain the impact of goods and service on the overall ecological footprints of a household. A range of measures, including reducing consumption of goods and services and selection criteria are then applied in order to understand the nature of goods and services that can be considered sustainable. The study refers to this as a 'sustainable goods and services'.

Third, measures to enhance the use of sustainable goods and services are evaluated, in order to determine built environment characteristics and configuration that will enhance this. These characteristics are critically evaluated by distilling them into built environment assessment criteria and testing them through application to the identified household and neighbourhood.

Finally, the study discusses the results of the study and evaluates the value of the approach in order to make recommendations for further research. In particular, recommendations are made for the refinement of the built environment waste assessment criteria and their integration into built environment assessment tools.

4. Literature Review

The Literature Review describes sustainability and waste definitions used in the study. It also introduces the ecological footprint calculator applied in the study and describes how the waste-related component of this works.

4.1 Sustainability

The main problem with many definitions of sustainability is that no specific quantified target is provided. (Costanza & Patten, 1995). This makes it difficult to ascertain whether a particular service, or product, can be deemed to be 'sustainable'. Fortunately, this issue is addressed in a definition developed by the World Wildlife Fund. This defines sustainability the ability of mankind to achieve a Human Development Index of above 0.8 and an ecological footprint of less than 1.8 gha per person (World Wild Life Fund, 2006).

The Human Development Index (HDI) was developed by the United Nations and is widely used as a measure of quality of life (United Nations Development Programme, 2007). It is based on:

- A long healthy life, measured by life expectancy at birth
- Knowledge, measured by the adult literacy rate and combined primary, secondary, and tertiary gross enrolment ratio
- A decent standard of living, as measure by the GDP per capital in purchasing power parity (PPP) in terms of US dollars

The achievement of an HDI of 0.8 or above is generally accepted as evidence that minimum acceptable standards of quality of life have been achieved (World Wild Life Fund, 2006).

An ecological footprint is the amount of land and sea required to provide the resources that a human population consumes and to absorb the corresponding waste. Consumption of resources and production of waste and emissions used in the footprint are drawn from the following areas:

- Food, measured in type and amount of food consumed
- Shelter, measured in size, utilization and energy consumption
- Mobility, measured in type of transport used and distances travelled
- Goods, measured in type and quantity consumed
- Services, measured in type and quantity consumed
- Waste, measured in type and quantity produced

The area of land and sea required for each of these areas is calculated in global hectares (gha) and added together to provide an overall ecological footprint per person, or per population (Wackernagel & Yount, 2000). The Earth's surface area provides a limit for personal ecological footprints and is calculated by dividing the Earth's carrying capacity by human population. In 2006, this was calculated to be 1.8 global hectares (gha) per person in (World Wild Life Fund, 2006).

This definition is useful for built environments as it provides targets which have clear implications for buildings. However to understand all of the implications of these definitions

for the built environment is a large task. This paper therefore takes two of the sub measures of ecological footprint and aims to understand the implications of this for be built environment.

4.2 Goods and Services

Goods and services can be defined in the following way. Goods and services are the 'most basic products of an economic system that consist of tangible consumable items and tasks performed by individuals' (Business Dictionary, 2015).

The main goods and services which need to be considered in ecological footprint calculations for households have been identified in a household ecological footprint calculator (Redefining Progress, 2003). These goods and services are listed in table 1 and 2.

Clothes and textiles
cotton
wool
synthetic
Furniture (wooden)
Furniture (plastic/metal)
Major appliances
Computers and electronic equipment
Small appliances
Durable paper products (books) and hygenic paper products (toilet/tissue paper)
Car parts for repair
Metal items, tools
Leather
Plastic products and photos
Porcelain, glass
Medicine
Hygiene products, cleaning stuff
Cigarettes, other tobacco products

Table 1. Goods measured in calculating ecological footprint calculators

Postal services
international
domestic
Hotels, motels
Water, sewer, garbage service
Dry cleaning or external laundry service
Telephone
Medical insurance and services
Household insurance
Entertainment
Education

Table 2. Services measured in calculating ecological footprint calculators

Entering data into the household ecological footprint calculator can be used to understand existing patterns of consumption within households and to calculate their ecological footprint (Redefining Progress, 2003). This calculation was been carried out for a household of 5 people in Muckleneuk, Pretoria, South Africa. This indicates that the household has an overall ecological footprint 6.7 gha, with goods consisting of 1.35gha, and services 1.45 gha, of this total. Goods and services, in this instance, are therefore responsible for about 30 to 40 % of the ecological footprint of the household. In addition, the 6.7gha ecological footprint far exceeds the 1.8gha target required for sustainability. It is therefore important to understand how the ecological footprint of goods and services can be reduced.

A review of the goods and services criteria can be used to determine a set of measures which will reduce the ecological footprint of goods and services used within the household (Andersson & Lindroth, 2001; Gale, 2000). These are listed below.

4.3 Measures to reduce the ecological footprint of goods

The following measures can be used to reduce the ecological footprint of Goods.

1. Reduce purchase of unnecessary clothing.
2. Purchase durable furniture.
3. Purchase durable and long lasting appliance and computers.
4. Reduce paper usage through use of electronic devices.
5. Avoid purchase of cars, equipment and if required, access these from a community pool or hire company.
6. Avoid purchase of unnecessary tools, leather, plastic products, porcelain and glass and where these are required, purchase only durable long lasting items.
7. Reduce purchases of medicine through improved health and fitness.
8. Avoid purchasing cigarettes and tobacco.

4.4 Measures to reduce the ecological footprint of services

The following measures can be used to reduce the ecological footprint of Services.

1. Reduce requirement for postage through telephone and email.
2. Avoid use of hotels and motels through use of telephone and skype. Where travel is required use lower ecological footprint accommodation options such as Airbnb.
3. Reduce requirement for medical services and insurance through improved health and fitness.
4. Provide health care through low cost / free health service.
5. Reduce household insurance premiums through robust building construction that acknowledge increases risks from aspects such as climate change.
6. Provide local community facilities for entertainment such as parks and sports facilities.
7. Reduce education impacts through access to local low cost high quality education institutions and online learning.

Adopting these measures, and recalculating the household ecological footprint, indicates that ecological footprints for goods of 0.51gha and services of 0.43gha can be achieved. This represents about 30% of the total ecological footprint. Along with other measures in the other areas (such as food, shelter and transport) this enables the achievement of the target 1.8gha required for sustainability (World Wild Life Fund, 2006). Therefore these measures can be used to as a basis to define requirements that built environments must meet.

5. Implications for the built environment

The measures for reducing ecological footprints of goods and services can be analysed in relation to the built environment. This enables the building implications and requirements to achieve more sustainable good and services to be determined. These are outlined below.

.1 Built environment requirements for low ecological footprint Goods

The following aspects are required in built environments to achieve a low ecological footprint for Goods.

1. The neighbourhood should include a local retailer of durable, appropriate new and second hand clothing.
2. Ensure there is a local retailer of durable, appropriate new and second hand furniture within the local area.
3. Ensure there is a local retailer of durable, appropriate new and second hand appliances within the local area.
4. Ensure there is a local retailer of internet and communication technology (ICT) devices such as tablets that can be used to reduce the requirement for printing.
5. Ensure there is local free or low cost access to the internet or intranet where information can be posted.
6. Ensure that all facilities that have to be regularly visited, such as schools, places of employment, retail, entertainment, sports facilities are all within walking or cycling distance.
7. Ensure there is a hire / pool car service for occasions when motorised transport is required.
8. Ensure there is a local retailer of high quality durable household items.
9. Ensure that there are facilities which promote health and fitness locally.
10. Reduce the ease with which cigarettes and tobacco can be purchased.

.2 Built environment requirements for low ecological footprint Services

The following aspects are required in built environments to achieve a low ecological footprint for Goods.

1. Provide high quality email and internet facilities locally.
2. Ensure there is good access to video conference facilities and facilities such as skype. Ensure there is good access to the internet and intranet to be able to access accommodation services such as Airbnb
3. Reduce requirement for medical services and insurance through improved health and fitness. Provide health care through low cost / free health service.
4. Reduce household insurance premiums through robust building construction that acknowledges increases risks from aspects such as climate change.

5. Provide local community facilities for entertainment such as parks and sports facilities.
6. Reduce education impacts through access to local low cost high quality education institutions and online learning.

These requirements can be used to develop simple assessment criteria for the evaluation of housing and neighbourhoods.

.3 Criteria for the assessment of households and neighbourhoods

Built environment requirements for low EF Goods and Services can be translated into a simple framework illustrated in table 3.

	Criteria
GS 1	High quality low cost / free access to internet is provided within household and the neighbourhood
GS 2	There is a retailer within the neighbourhood where high quality durable clothing can be purchased.
GS 3	There is a retailer within the neighbourhood where high quality durable furniture can be purchased.
GS 4	There is a retailer within the neighbourhood where high quality durable appliances can be purchased.
GS 5	There is a retailer within the neighbourhood where high quality durable ICT devices can be purchased.
GS 6	There is a retailer within the neighbourhood where high quality durable household items can be purchased.
GS 7	The following facilities are located within the neighbourhood; a primary and secondary school, a park, food retail and a community facility with recreation and sporting amenities
GS 8	There is a facility (car hire or car pool) within the neighbourhood where a vehicle can be rented when motorised transport is required.
GS 9	A free / low cost high quality health care service is provided within the neighbourhood.
GS10	Built environments and the neighbourhood are designed to be resilient to extreme events, such as weather events related to climate change.

Table 3. Goods and services criteria for the assessment of houses and neighbourhoods

.1 Mapping criteria on to a neighbourhood

The criteria identified in table 1 can be tested by applying this to a neighbourhood. The neighbourhood selected is Muckleneuk, Pretoria, South Africa (latitude -25.76329, longitude 28.20816) and is the shaded area indicated in figure 1.

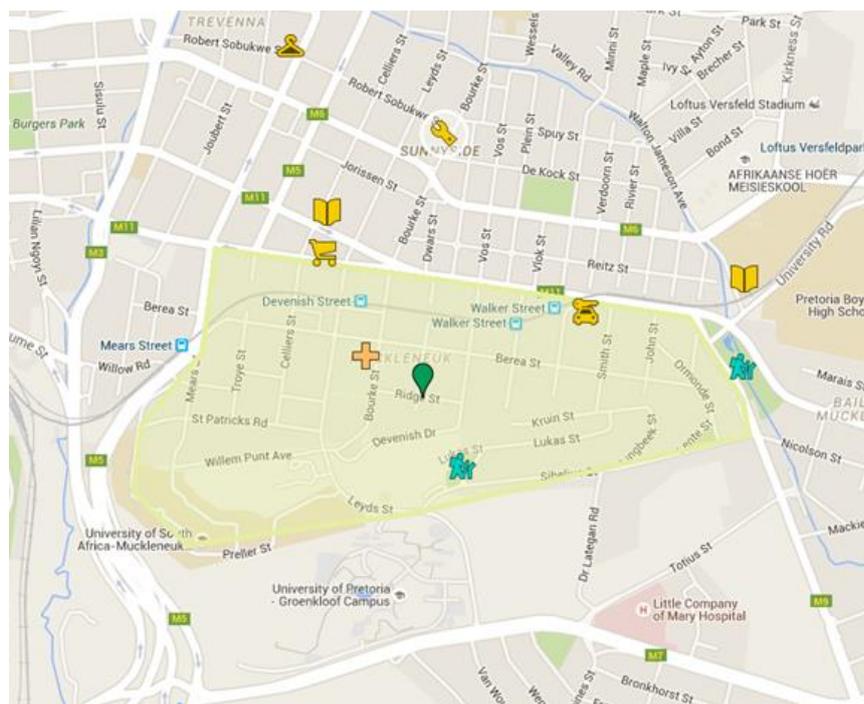


Figure 1. Map of neighbourhood, indicating Goods and Services facilities

A location in the centre of the neighbourhood is identified (green pointer). Facilities required for a low ecological footprint such as a retailer(s) of durable clothing, furniture and household items can be then identified and marked on the map. Facilities that are within the neighbourhood or nearby are marked on the map in figure 1 using icons (ie hanger for clothes retailer). The distance of these facilities to the centre of the neighbourhood is also measured and recorded in the assessment and captured in table 4.

The first column of table 4 indicates the assessment criteria for built environment aspects of goods and services. The second column indicates the assessment. This includes the distance of the facilities from the centre of the neighbourhood in metres and provides a key for the symbols on the map in brackets (ie shopping trolley).

	Criteria	Assessment
GS 1	High quality low cost / free access to internet is provided within household and the neighbourhood	Yes this is provided in the form of ADSL lines and there is free Wi-Fi in some areas.
GS 2	There is a retailer within the neighbourhood where high quality durable clothing can be purchased.	There is no clothes retailer within the neighbourhood. However one is located within 1870m from the neighbourhood. (hanger icon)
GS 3	There is a retailer within the neighbourhood where high quality durable furniture can be purchased.	There is no retailer of durable furniture within, or near the neighbourhood.
GS 4	There is a retailer within the neighbourhood where high quality durable appliances can be purchased.	There is no retailer of durable appliances within, or near the neighbourhood.
GS 5	There is a retailer within the neighbourhood	There is no retailer of durable ICT

	where high quality durable ICT devices can be purchased.	within, or near the neighbourhood.
GS 6	There is a retailer within the neighbourhood where high quality durable household items can be purchased.	There is no retailer of durable household goods within the neighbourhood. However there is one within 959m (shopping trolley)
GS 7	The following facilities are located within the neighbourhood, a primary and secondary school, a park, food retail and a community facility with recreation and sporting amenities	A park exists within the neighbourhood, Other facilities such as primary school (859m) and secondary school (1750m) and food retail (959m) exist. (hiking figure)
GS 8	There is a facility (car hire or car pool) within the neighbourhood where a vehicle can be rented when motorised transport is required.	A car hire facility exists within 963m. (car with keys)
GS 9	A free / low cost high quality health care service is provided within the neighbourhood.	There is no free or low cost health care. A private hospital exists within the neighbourhood (95m) (Cross)
GS 10	Built environments and the neighbourhood are designed to be resilient to extreme events, such as weather events related to climate change.	Built environments are generally 50 to 100 years old and have not been built to withstand extreme weather events.

Table 4. Goods and services criteria for the assessment of houses and neighbourhoods.

6. Discussion

This section of the study discusses the findings of the study. The limitations of the study are acknowledged and findings are critically evaluated. In addition, the value of the study is discussed.

6.1 Research Limitations

The study is based on the use of a household ecological footprint calculator and therefore has a strong focus on the main types of goods and services that affect ecological footprints. This leaves out impacts from goods and services such as emissions of toxic wastes and the extent to which non-renewable products use land for their production and disposal (Andersson, & Lindroth 2001). Therefore the approach could be said to 'under-report' impacts. In addition, the study is exploratory in nature and further research (as outlined at the end of the paper) should be carried to confirm the initial findings and the approach proposed in this paper.

6.2 Critical Analysis

A critical analysis of the criteria and their application has been carried out to determine weaknesses in the approach and identify how this could be improved. This critical analysis is provided below.

The methodology includes criteria which refer to retail facilities for specific items such as durable clothing and household items. No specific criteria for 'durability' however are included in the assessment criteria. This could lead to the subjective assessments. It would

be useful to develop a definition in relation to this property and methods such as life cycle assessment (LCA), could be drawn on (Ljungberg, 2007).

The criteria in the framework refers to having the facilities 'within the neighbourhood', however the example revealed that in many cases the facilities did not exist within the selected neighbourhood, but were located nearby. The distance to these facilities from within the centre of the neighbourhood is in all cases within 2km. In some contexts, this distance still could be considered within walking distance, suggesting that these facilities should be taken into account in assessing the neighbourhood (Gibberd 2015). However, in other contexts, such as the US and Europe 'easy walking distances' are defined as being significantly lower than 2km (USGBC, 2015). Therefore, the criteria for walking distance may need to vary and would depend on the local context.

While the neighbourhood appeared to have most of the facilities required to support low ecological footprint, this may not be achieved in practice as the costs of access may prohibit use of these facilities. For instance, even though a health care facility is available within the neighbourhood, cost of access to this facility may be high and only affordable to wealthier inhabitants and households with medical insurance.

Finally, the methodology assumes that inhabitants will use the lowest ecological footprint option. In reality this is not true; people may not use local facilities or purchase durable items and instead can be influenced by personal preferences and fashion (Ljungberg, 2007).

Despite some of the limitations of the study, the approach provides a valuable basis for further work by establishing the link, and some of the key parameters, between built environments and goods and services.

7. Conclusion and Recommendations

The study provides useful insight into how built environments may support the reduction of ecological footprints associated with good and services. While a number of criticisms can be levelled at the approach, it provides a simple way of assessing the extent to which the built environment may be configured to support sustainability. It accepts that other factors, such as affordability and personal preference, may result in the potential of the local built environment to reduce ecological footprints not being used (Gibberd, 2015). These issues should be addressed if the methodology is developed further.

.1 Recommendations

From a review of the study the following recommendations are made:

- A. Criteria related to 'durability' and 'affordability' of products should be developed. For instance, expected life span could be used as an indicator of durability and the cost of the product or service as a proportion of average local income could be used as an indicator of affordability.
- B. Instead of requiring products and services to be within the neighbourhood a better criteria may be to require these to be within a certain distance of the centre of the neighbourhood. For instance, a distance of 2 km, which is a reasonable walking distance, may be used.
- C. Criteria should attempt to include measures that may capture the 'attractiveness' of a local facility to users. This could be carried out by simple local survey of user of the facility.

- D. Refined and tested criteria should be integrated into relevant sustainable building assessment tools and methodologies such as the the Built Environment Sustainability Tool (BEST) and the Sustainable Building Assessment Tool (SBAT) (Gibberd, 2002; Gibberd, 2015).

8. Acknowledgements

The study acknowledges the valuable role played by the household ecological footprint calculator, developed by Redefining Progress. It also acknowledges the importance of the Built Environment Sustainability Tool (BEST) in providing a framework within which the research is framed. This work is based on the research supported in part by the National Research Foundation of South Africa (Grant Numbers 103996)

9. References

- Andersson, J.O. & Lindroth M. 2001. 'Ecologically unsustainable trade', *Ecological Economics* 37, 113–122.
- Business Dictionary, 2015. 'The Business Dictionary'. Retrieved from <http://www.businessdictionary.com/> [accessed: 1 February 2015]
- Costanza, R. & Patten, B. 1995. 'Defining and predicting sustainability'. *Ecological economics*, 15(3), 193-196.
- Gale, F.P. 2000. 'Economic specialization versus ecological diversification: the trade policy implications of taking the ecosystem approach seriously'. *Ecol. Econ.* 34, 285–292.
- Gibberd, J. 2002. 'The Sustainable Building Assessment Tool: Assessing How Buildings Can Support Sustainability in Developing Countries'. Built Environment Professions Convention, 1 – 3 May 2002, Johannesburg, South Africa.
- Gibberd, J. 2015. 'Measuring capability for sustainability: the Built Environment Sustainability Tool (BEST)', *Building Research & Information* 43.1: 49-61.
- Knight, K.W. Rosa, E.A. 2011. 'The environmental efficiency of well-being: A cross-national analysis', *Social Science Research* 40, 931–949
- Ljungberg, L. 2007. 'Materials selection and design for development of sustainable products', *Materials and Design* 28, 466–479
- Princen, T. 2002. 'Consumption and its externalities: where economy meets ecology'. In: Princen, Thomas, Maniates, Michael, Conca, Ken (Eds.), *Confronting Consumption*. The MIT Press, Cambridge, MA, pp. 23–42 (Chapter 2).
- Redefining Progress, 2003. 'Household Ecological Footprinting Calculator. v 3.2', Redefining Progress, available at: www.globalchange.umich.edu/globalchange2/.../ef_household_0203.xls [accessed: 1 December 2015].
- Seyfang, G. 2009. 'The New Economics of Sustainable Consumption', *Seeds of Change*. Palgrave Macmillan, New York.
- United Nations Development Programme, 2007. 'Human Development Report 2007/2008', New York: United Nations Development Programme.
- USGBC, 2015. LEED, available at: <http://www.usgbc.org/leed> [accessed: 1 December 2015]
- Wackernagel, M, and Yount, D, 2000. 'Footprints for Sustainability: the Next Steps', *Environment, Development and Sustainability* 2, Kluwer Academic Publishers, 21-42.
- World Wild Life Fund, 2006. 'The Living Planet Report'. 2006. WWF, available at: http://awsassets.panda.org/downloads/living_planet_report.pdf [accessed: 1 December 2015]

Sustainable Waste Streams

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The Human Development Index and Ecological Footprint are used to measure the sustainability performance of human populations. The type and amount of waste produced by populations is a significant contributor to ecological footprints and it is therefore important to understand how this can be influenced in order to improve sustainability performance. Built environments affect waste related ecological footprints of populations in a number of ways. For instance, providing access to recycling facilities can be used to reduce waste directed to land fill and increase the amount of waste that is reused and recycled. This paper investigates the relationship between ecological footprints, waste and built environments. It aims to identify, and quantify, key factors within a built environment that affect the ecological footprint of waste produced by occupant populations. This is used to develop simple waste assessment criteria for buildings and neighbourhoods. Criteria developed are tested by applying them to a neighbourhood in Pretoria, South Africa. The results provide a useful insight into the potential contribution built environments can make in reducing waste related ecological footprints. The paper discusses the findings of the study in order to draw conclusions and make recommendations for further development of the methodology.

1. Introduction

The problem with many definitions of sustainability is that they are not specific and do not provide clear quantified targets. Without a specific 'end' to be aimed at, it is difficult to define, and sequence, the 'means' by which this will be achieved (Costanza & Patten, 1995). Therefore in order to make progress in achieving sustainability, an effective definition is required (Robèrt et al, 2002).

In this paper, a definition of sustainability developed by the World Life Fund (WWF) is adopted. This sets specific Human Development Index and Ecological Footprint targets that must be attained in order for sustainability to be achieved (World Wild Life Fund, 2006).

The paper analyses this definition in order to understand the implications of this for waste in the built environment. It uses a household ecological footprint calculator to understand the relationship between waste and ecological footprints and to define waste characteristics and production patterns that can be regarded as 'sustainable' (Redefining Progress, 2003).

The implications of a 'sustainable waste stream' are then examined in order to extrapolate implications for the built environment and to develop a simple set of assessment criteria. These assessment criteria are tested by applying them to a neighbourhood in Pretoria, South Africa. The result of this assessment and a review of the methodology and criteria are discussed in order to evaluate the value of the approach. Finally, the paper draws conclusions and makes recommendations for further study.

2. Objectives Research questions

The objective of the study is to understand the nature and characteristics of low ecological footprint waste and waste production patterns and their implications for the built environment. It also aims to establish, and test, criteria that can be used to assess the extent to which built

environments support the achievement of 'sustainable waste streams'. The research questions therefore are as follows:

1. What is the relationship of household waste to sustainability?
2. What contribution does waste make to the ecological footprints of households?
3. What are the respective contributions to ecological footprints of different types of waste?
4. What is a 'sustainable waste stream'?
5. What built environment characteristics and configuration are required to support 'sustainable waste streams'?
6. Can built environment characteristics and configuration identified in 5, be distilled into assessment criteria?
7. Is it possible to test the assessment criteria defined in 6, by applying them to a neighbourhood?
8. What can be learnt from the study and are there useful recommendations for built environment assessment tools in relation to waste?

3. Approach Methodology

The methodology followed by the study is structured in three phases. First, a literature review is undertaken to define sustainability and waste and ascertain the relationship between the two for the study. In addition, the review introduces the Ecological Footprint Calculator and describes how this will be used.

Second, the Ecological Footprint Calculator is used to calculate the ecological footprint of an identified residential household (Redefining Progress, 2003). This is carried out to ascertain the impact of waste on the overall ecological footprints of a household. A range of measures, including reducing waste streams and increasing recycling of waste are then applied in order to understand the nature of waste streams that can be considered sustainable. The study refers to this as a 'sustainable waste stream'.

Third, measures to reduce and recycle waste as well as the specific nature of the 'sustainable waste stream' are then evaluated, in order to determine the built environment characteristics and configuration that will be required to achieve this. These characteristics are critically evaluated by distilling them into built environment assessment criteria and testing them through application to the identified household and neighbourhood.

Finally, the study discusses the results of the study and evaluates the value of the approach in order to make recommendations for further research. In particular, it recommendations are made for the refinement of the built environment waste assessment criteria and their integration into built environment assessment tools.

4. Literature Review

The Literature Review describes sustainability and waste definitions used in the study. It also introduces the ecological footprint calculator applied in the study and describes how the waste-related component of this works.

4.1 Sustainability

This study is based on a definition of sustainability developed by the World Wildlife Fund. This defines sustainability as the achievement of a Human Development Index (HDI) of above 0.8 and an Ecological Footprint (EF) of less than 1.8 gha per person (World Wild Life Fund, 2006).

The Human Development Index (HDI) was developed by the United Nations and is applied internationally as a measure of quality of life (United Nations Development Programme, 2007). The HDI is based on:

- A long healthy life, measured by life expectancy at birth
- Knowledge, measured by the adult literacy rate and combined primary, secondary, and tertiary gross enrolment ratio
- A decent standard of living, as measure by the GDP per capital in purchasing power parity (PPP) in terms of US dollars

The WWF definition of sustainability indicates that the achievement of an HDI of 0.8, or above, should be accepted as evidence that minimum acceptable standards of quality of life have been achieved (World Wild Life Fund, 2006).

An ecological footprint is the amount of land and sea required to provide the resources that a human population consumes and to absorb the corresponding waste. Consumption of resources and production of waste and emissions used in the Footprint are drawn from the following areas:

- Food, measured in type and amount of food consumed
- Shelter, measured in size, utilization and energy consumption
- Mobility, measured in type of transport used and distances travelled
- Goods, measured in type and quantity consumed
- Services, measured in type and quantity consumed
- Waste, measured in type and quantity produced

The area of land and sea required for each of these areas is calculated in global hectares (gha) and added together to provide an overall ecological footprint per person (Wackernagel & Yount, 2000). The Earth's surface area is used to define limits for personal ecological footprints and this is calculated by dividing the Earth's carrying capacity by the size of the human population. This calculation results in a limitation of 1.8 global hectares (gha) per person (World Wild Life Fund, 2006).

This definition is provides clear criteria and targets that can analysed to establish their implications for the built environment. This paper will not look at all of the aspects that make up the definition but will focus on the contribution of waste to ecological footprints. In particular, it attempts to develop indicators of built environment capacity to support the achievement of sustainable waste streams.

4.2 Waste

Waste can be defined as 'unwanted or unusable material, substances, or by-products: nuclear waste, hazardous industrial wastes' (Oxford Dictionaries, 2015). Waste can be categorised in a range of different ways, however in this study, which has a focus on ecological footprints, waste is classified and measured in terms of energy intensity and in relation to the quantities produced, and the extent to which waste is recycled within households and neighbourhoods (Lehmann, 2011; Beigl et al, 2008). This outlined in more detail in the Ecological Footprint Calculator, in the next section.

4.3 Ecological Footprint Calculator

The Ecological Footprint Calculator used in this study was developed by Redefining Progress. The calculator determines the ecological footprint of households. The contribution of waste to this footprint is based on the types of household waste indicated in table 1.

Household waste:	
paper and paperboard	[kg]
aluminum	[kg]
other metal	[kg]
glass	[kg]
plastic	[kg]

Table 1. Aspects of waste production measured ecological footprint calculator Redefining Progress, 2003 .

The impacts of different types of waste on ecological footprint are determined through energy intensity of the material, the quantities of waste produced and the extent this recycled. Assumptions used in the calculator different waste streams are indicated below (Redefining Progress, 2003).

- Paper and paperboard in the EF calculator has an energy intensity of 35 MJ/kg. The calculator measures energy consumption associated with this waste stream based on this intensity, the quantity of waste produced (in kg) and the extent to which this is recycled (as a %). The calculator indicates that 45% of the energy intensity of the material can be saved through recycling.
- Aluminium has an energy intensity of 250 MJ/kg. The calculator measures energy consumption associated with this waste stream based on this intensity, the quantity of this type waste produced (in kg) and the extent to which this is recycled (as a %). The calculator indicates that 95% of the energy intensity of the material can be saved through recycling.
- Other metals have an energy intensity of 60 MJ/kg. The calculator measures energy consumption based on this energy intensity, the quantity of this type waste produced (in kg) and the extent to which this is recycled (as a %). The calculator indicates that 15% of the energy intensity of the material can be saved through recycling.
- Glass has an energy intensity of 250 MJ/kg. The calculator measures energy consumption associated based on this energy intensity, the quantity of waste

produced (in kg) and the extent to which this is recycled (as a %). It indicates that 95% of the energy intensity of the material can be saved through recycling.

- Plastic has an energy intensity of 50 MJ/kg. The calculator measures energy consumption associated based on this energy intensity, the quantity of this type waste produced (in kg) and the extent to which this is recycled (as a %). The calculator indicates that 70% of the energy intensity of the material can be saved through recycling.

5. Research Analysis

Research analysis in the study is presented in two parts. The initial part presents findings based on applying the Ecological Footprint calculator to an identified household. This is used to define a 'sustainable waste stream' and identify the measures required to achieve this. The second part analyses these measures, and the 'sustainable waste stream', to ascertain their implications for the built environment and develops assessment criteria. The final part applies the assessment criteria to the identified household and neighbourhood built environments in order to test the criteria and develop recommendations for further development.

.1 Household ecological footprint of waste

An analysis of waste impacts on ecological footprint determined by the Ecological Footprint Calculator indicates that impacts vary widely between different waste materials. Paper and paperboard have the lowest impact, followed by and plastics and other metals. Aluminium and glass waste have the highest impacts and these are 7 times greater than paper, paperboard and plastic waste.

The Household Ecological Footprint Calculator can be used to understand the impacts of waste on the overall ecological footprint of households. Applying the Calculator to a household of 5 people in Muckleneuk, Pretoria, South Africa shows that the household has an overall ecological footprint of 6.7 gha/person. Of this total, waste contributes 1.3 gha, or 20 % of the total impact, as shown in table 2.

Ecological Footprint distribution	
Categories	Totals
Food	19%
Housing	9%
Transportation	15%
Goods	15%
Services	23%
Waste	20%
Total	100

Table 2: Activity categories and their respective contribution to household ecological footprints

The resulting overall ecological footprint of 6.7gha/person far exceeds the 1.8gha/person target required for sustainability and represents unsustainable consumption of services and products and excessive waste (Rice, 2008; Princen, 2002). In order to achieve an ecological footprint of 1.8gha, a wide range of measures are required, such as changing food consumption patterns, avoiding flights and motor vehicular travel and reducing consumption of services and products. Within the area of waste, recycling all waste results in a very

significant reduction the ecological footprint associated with waste, and reduces this to 0.7gha/person. However, in relation to the 1.8gha/person target, this is still too high and the type and quantity of waste also has to be reduced. Avoiding aluminium and glass waste and reducing other waste streams by 50% results in a waste ecological footprint of 0.3gha/person, which is about 16% of the target footprint of 1.8gha/person.

A review of the overall ratios attributed to different categories indicates that this level of waste and recycling could be considered to be sustainable; this is therefore referred to in the paper as a 'sustainable waste stream'. It is important to note that the concept of a 'sustainable waste stream' assumes that all measures required in other categories to reduce the overall ecological footprint to 1.8gha/person are taken. Thus, the achievement of a sustainable waste stream requires a number of stringent measures, which can be summarised as follows:

- Aluminium and glass is only be used in durable products, where their high energy intensity could be discounted over their lifespan. Aluminium and glass would not be used in disposable products, such as food packaging.
- Transportation and storage of household products, such as food and cleaning products, would be carried out using durable, reusable containers rather than disposable ones.
- Disposable packaging would be avoided as far as possible. However, where this was used this only paper, paperboard and plastic packaging would be used.
- All waste would be recycled.
- These measures represent a significant departure from current practice and would require radical changes in product design and in manufacturing and packaging processes as well as different retail models. Attitudes and the behaviours of consumers, manufacturers and retailers would also need to change (Sidique et al, 2010, Henry et al., 2006). In addition, there would need to be corresponding changes in the design and management of built environments.

.2 Built environment implications of a 'sustainable waste stream'

Built environments need to ensure that the proposed new sustainable waste practices are easy to achieve and discourage less sustainable practices. Simple performance requirements for household and neighbourhood built environments that enable this can be summarised as follows:

- Households are able to purchase products that are durable and have a long service life in preference to poor quality, short service life products.
- Retailers are encouraged to transport, store and present products in reusable containers rather than use disposable packaging.
- Households are encouraged to purchase, transport and store products in reusable containers rather than use disposable packaging.
- Household are able to avoid products that are packaged using aluminium and glass and encouraged to do so. Retailers are encouraged to avoid products packaged using aluminium and glass.
- Where packaging cannot be avoided, only paper, paperboard and plastic is used.
- Retailers and households are required to ensure that 100% of all waste is recycled.

.3 *Built environment sustainable waste stream assessment criteria*

These performance requirements can be developed into household and neighbourhood assessment criteria, as outlined in the table 3.

Ref	Area	Criteria
WA1	Durable products	A local retailer exists within 2km of the household that sells durable furniture, equipment and containers. Durable furniture consists, as a minimum, of dining table(s), chair(s), bed(s) and cupboard(s). Durable equipment consists, as a minimum, of 5 items of household equipment used in households locally such as a TV, a DVD player, a computer, an electrical kettle and lamps. Containers include, as a minimum, containers for potable liquids such as water, milk and juice, containers for fresh vegetables and fruit, containers for bakery products, containers for beans and pulses, containers for eggs and dairy products such as cheese, containers for cereal products such as maize meal, oats and flour and containers for cleaning products such as soaps. Durability is defined as products that are designed to last at least 5 years in normal use. Durable equipment is defined as equipment that has a guarantee that covers repairs and maintenance from the manufacturer for this period.
WA2	Retail reusable containers	A local retailer within 2km of the household provides the following products: water, milk and juice, fresh vegetables and fruit, bakery products, beans and pulses, eggs and dairy products such as cheese, cereal products such as maize meal, oats and flour and cleaning products such as soaps <i>without packaging</i> . Purchasers of these products are able to obtain the quantities of product they require, decant and transport these in their own reusable containers.
WA3	Household reusable containers	Households have facilities in the form of space and reusable containers to store water, milk and juice, fresh vegetables and fruit, bakery products, beans and pulses, eggs and dairy products such as cheese, cereal products such as maize meal, oats and flour and cleaning products such as soaps. The capacity of the space and containers provided should be adequate for at least 1 week's consumption of these products. Facilities in the form of sink and a drying area of 0.5m ² should also be provided to clean and dry reusable containers.
WA4	Avoidance of aluminium and glass waste	Grocery retailers within 2km of the household do not have products that use aluminium or glass as packaging.
WA5	Household recycling	Households should have at least 1m ³ of accessible volume with recycling containers for waste streams in the kitchen or within 10m of the kitchen. A recycling space with 1m ³ volume per household should be provided within 2km of each household. Containers should be

		provided for at least the following types of waste; paper and paperboard aluminium, other metal, glass, plastic, organic waste. The space should be covered, well ventilated, protected from vermin, provided with a water supply and have surfaces that can be readily cleaned. The location should be within 10m of a public highway and easily accessed by both households and recycling contractors.
WA6	Retail recycling	Grocery retailers should have a recycling area with at least 1m ³ volume per 100m ² of retail space. Containers should be provided for at least the following types of waste; paper and paperboard aluminium, other metal, glass, plastic, organic waste. The space should be covered, well ventilated, protected from vermin, provided with a water supply and have surfaces that can be readily cleaned. The location should be within 10m of a public highway and easily accessed by both the retailer and recycling contractors.

Table 3. Sustainable waste stream assessment criteria for the assessment of houses and neighbourhoods built environments

These assessment criteria are applied to the household and neighbourhood identified earlier in the study (Muckleneuk, Pretoria) in order to test these. The neighbourhood is shown in light green and the pointer, in red, indicates the location of the house and is shown on figure 1. The shopping trolley indicates the location of the local retailer identified within 2km of the household.

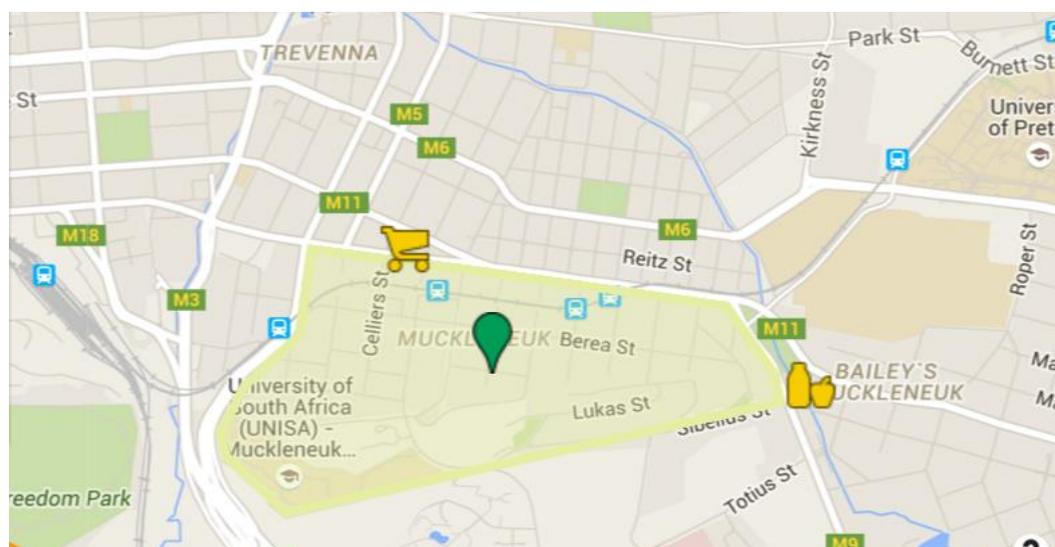


Figure 1: Map indicating household, neighbourhood and local retail and recycling facilities.

Assessment of the household and neighbourhood against the criteria is shown in table 3. This shows that most of the sustainable waste stream criteria are not met by household and neighbourhood built environments. However, an exception is WA3, where the assessment reveals that the household meets the criteria for facilities and space to support the use of reusable containers.

Table 3. Assessment of household and neighbourhood using the sustainable waste stream criteria

6. Discussion

This section of the study discusses the findings of the study. The limitations of the study are acknowledged and the findings are critically evaluated. In addition, the value of the study is discussed.

6.1 Research Limitations

The research limitations of the study are acknowledged. The study is based on a literature review, an analysis and limited fieldwork. Findings from the study should therefore be seen in this light and more comprehensive studies should be carried out to validate the initial findings presented in this paper. The study is based on the use of a household ecological footprint calculator and therefore has a strong focus on the main types of waste that affect ecological footprints.

However there are waste streams, such as organic waste, that are not addressed in the ecological footprint calculator. In addition, the approach does not address aspects such as land area related to landfill and environmental impacts related to transportation of waste. These aspects are not likely to make a very significant difference to ecological footprint, but are acknowledged as limitations of the study.

Other methodologies such as life cycle assessment (LCA) can be an effective way of including this level of detail (Bovea & Powell, 2006). However, by proposing a built environment assessment framework and criteria directly related to a quantified sustainability target, the study provides a valuable basis for further work in this field.

6.2 Critical Analysis

A critical analysis of the criteria and their application has been carried out to determine weaknesses in the approach and identify how this could be improved. This critical analysis is provided below.

The WA1 criterion is useful as it identifies the need for more durable products that have a longer service life. However, more work may be needed to identify the most suitable products for inclusion. This work would need to take into account the waste streams associated with the different products in order to identify the set of 'essential' products per household. In addition, it is likely that the products identified will have to be adapted to respond to the local context. For instance, in poorer households, items such as TV and DVD player may need to be replaced by items such as radios and CD players.

An additional criticism that could be levelled at the WA1 criterion, and a number of other criteria, is the requirement for the retail and recycling facility to be within 2km of the household. This is a significantly greater distance than the walking distances used in tools such as LEED, a US tool (USGBC 2015). It is however aligned with the 2km used in BEST which is based on developing country contexts (Gibberd 2015).

A criticism of criterion WA2 is that this is excessively stringent, as it requires packaging to be avoided. This is a valid criticism, as the work using the Ecological Footprint calculator, early

in the study indicated that a level of waste associated with paper, paperboard and plastic could be regarded as sustainable. Therefore this criterion may be refined to allow for limited use of plastic and paper/paper board packing.

An additional criticism could be that the use of reusable containers will lead to increased waste from spillage and decomposition of products and that additional energy and inputs will be required to clean and reuse containers. This is a valid criticism. However this could be addressed through design (that minimised spillage and decomposition of products) and behavioural change (to ensure that decanting of products is undertaken with care). In addition, it should be noted that the additional waste and energy associated with spills and decomposition as well as for cleaning and reusing containers will be far less than the energy required to manufacture and recycle disposable packaging.

There is likely to be little criticism of criterion WA3, as it appears that this is relatively easy to achieve in most households and will only require minimal additional expense, in the form of reusable containers. In addition, this criterion would require very little behavioural change, as the process of using reusable containers in a household is very similar to processes associated with packaged products.

Criticism of criterion WA4 is likely mainly to come from product manufacturers who are accustomed to using these materials for products such as carbonated and alcoholic drinks. However, there does not appear to be practical reasons why this criterion could not be achieved, as reusable containers and plastic containers have the same functional properties as glass and aluminium and therefore can be used for products such as carbonated and alcoholic drinks.

The WA5 and WA6 criteria are likely to be achieved in many developed countries, such as European countries and Japan. It is therefore likely that these criteria would not be controversial as it is aligned with existing good practice and is already widely applied in urban planning and urban management practices (Sidique et al, 2010)

7. Conclusions and Recommendations

The study provides useful insights into the relationship of waste, sustainability and built environment. It defines sustainable waste streams and charts the implication of this for built environments. An initial framework and criteria are developed which can be used to assess households and neighbourhood built environments. The study therefore makes a valuable contribution in understanding how built environments can support the achievement of sustainable waste streams. It should however be noted that the work presented is exploratory and further research should be carried out to develop and test the ideas and findings of the study. The following recommendations are made:

1. Household waste streams: The detailed analysis of waste streams of households over the long term, such 1 to 2 years, in different locations would provide valuable data on the quantities and sources of different types of waste. This would help refine the criteria developed in this study.
2. Assessments of households and neighbourhoods with differing levels of compliance with the criteria listed (WA1 - 6) should be carried out and compared with the actual waste streams being generated in these sites. This would help establish the evidence

base for criteria and whether full compliance with the criteria actually enables sustainable waste streams to be achieved. It would also establish the relative importance of the different measures and provide a means to weight the respective importance of these.

3. Once criteria have been refined, tested, and shown to be effective they should be used to inform built environment regulation, waste policy and municipal bylaws. They should also be integrated into sustainable building assessment tools such as the Built Environment Sustainability Tool (BEST) (Gibberd, 2015) and the Sustainable Building Assessment Tool (SBAT) (Gibberd 2002).

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9. References

- Beigl, P., Lebersorger, S. & Salhofer, S. 2008. 'Modelling municipal solid waste generation: A review', *Waste Management* 28, 200–214.
- Bovea, M. D. & Powell, J. C. 2006. 'Alternative scenarios to meet the demands of sustainable waste management', *Journal of Environmental Management* 79, 115–132.
- Costanza, R. & Patten, B. 1995. 'Defining and predicting sustainability'. *Ecological economics*, 15(3), 193-196.
- Gibberd, J. 2002. 'The Sustainable Building Assessment Tool: Assessing How Buildings Can Support Sustainability in Developing Countries'. Built Environment Professions Convention, 1 – 3 May 2002, Johannesburg, South Africa.
- Gibberd, J. 2015. 'Measuring capability for sustainability: the Built Environment Sustainability Tool (BEST)', *Building Research & Information* 43.1, 49-61.
- Henry, R. K. Yongsheng, Z. & Jun, D. 2006. 'Municipal solid waste management challenges in developing countries – Kenyan case study', *Waste Management* 26, 92–100.
- Kitzes, J, et al, 2009. 'A research agenda for improving national Ecological Footprint accounts', *Ecological Economics* 68.7, 1991-2007.
- Lehmann, S. 2011. 'Optimizing Urban Material Flows and Waste Streams in Urban Development through Principles of Zero Waste and Sustainable Consumption', *Sustainability*, 155–183 .
- Oxford Dictionaries, 2015. 'Oxford Dictionaries', available at: <http://www.oxforddictionaries.com/definition/english/waste> [accessed: 1 December 2015].
- Princen, T. 2002. 'Consumption and its externalities: where economy meets ecology'. In: Princen, Thomas, Maniates, Michael, Conca, Ken (Eds.), *Confronting Consumption*. The MIT Press, Cambridge, MA, 23–42.
- Redefining Progress, 2003. 'Household Ecological Footprint Calculator'. v 3.2, Redefining Progress, available at: www.globalchange.umich.edu/globalchange2/.../ef_household_0203.xls [accessed: 1 December 2015].

- Rice, J. 2008. 'Material consumption and social well-being within the periphery of the world economy: An ecological analysis of maternal mortality'. *Social Science Research* 37.4, 1292-1309.
- Robèrt, K. et al, 2002. 'Strategic sustainable development—selection, design and synergies of applied tools', *Journal of Cleaner production* 10.3, pp. 197-214.
- Sidique, S. F. Joshi, S. V. & Lupi, F, 2010. 'Factors influencing the rate of recycling : An analysis of Minnesota counties Resources', *Conservation and Recycling*, 54, 242–249.
- United Nations Development Programme, 2007. 'Human Development Report 2007/2008', New York: United Nations Development Programme.
- USGBC, 2015. 'LEED', available at: <http://www.usgbc.org/leed> [accessed: 1 December 2015]
- Wackernagel, M, and Yount, D, 2000. 'Footprints for Sustainability: the Next Steps, Environment', *Development and Sustainability* 2, Kluwer Academic Publishers, 21-42.
- World Wild Life Fund, 2006. 'The Living Planet Report'. WWF, available at: http://awsassets.panda.org/downloads/living_planet_report.pdf [accessed: 1 December 2015]

Assessment of socio-economic vulnerability using select indicators

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Abstract: Developing nations as a whole and the underdeveloped pockets within such countries in particular often face many hindrances to development being socio-economically vulnerable. An assessment of this vulnerability responsible for making such regions susceptible is the need of the day. An initial understanding of the degree of susceptibility and its consequent impact on the extent of socio-economic vulnerability can eventually help planners and policy makers streamline the path of future strategies of mitigation and restore a balanced development across constituent regions. The extent of susceptibility is measured in terms of a particular region's inherent inability to adjust with the forces of rapid urbanization, advanced industrialization and globalization (Morrow, 1991; Turvey, 2007; Holmes, 2010). An acceptable yardstick of development against which the degrees of susceptibility can be assessed is required. This paper attempted to answer the following question:

How assessments of socio-economic vulnerability within susceptible regions can become significant from an examination of interdependence between the selected demographic components and the socio-economic components as governed by Human Development Index?

The work has been carried out taking the case of a relatively susceptible region of West Bengal, a state in eastern part of India. The paper has tried to review the concept of socio-economic vulnerability in national and international context, different dimensions of vulnerability and interdependence of socio-economic growth components and demographic growth components leading towards different degrees of vulnerability exploring the significance of Human Development Index governed factors in the study of interdependence and vulnerability assessment. Further, the paper has attempted to identify substantial endogenous growth components and most vulnerable pockets. Finally, it has tried to understand the nature of interdependence of socio-economic and demographic growth components in vulnerability assessment.

1. Introduction

In the context of developing nations and specifically, in the cases of their constituent and relatively less developed regions, researches assessing the extent of socio-economic vulnerability are becoming increasingly significant in identifying and assessing the degree of susceptibility, which can create critical hindrances to adequate development process within them. An initial understanding of the degree of susceptibility and its consequent impact on the extent of socio-economic vulnerability can eventually help planners and policy makers

streamline the path of future strategies of mitigation and restore a balanced development across constituent regions. Today, such researches are becoming increasingly relevant to assess the extent of susceptibility measured in terms of a region's inherent inability to adjust with the forces of rapid urbanization, advanced industrialization and globalization (Morrow, 1999; Turvey, 2007; Holmes, 2010). Such researches can be earmarked in terms of the two dimensions of socio-economic vulnerability, which are further explained as follows:

- First, researches on socio-economic vulnerability help policy makers identify key causal factors sieved from a larger pool of indicators representing different levels of development.
- Secondly, such researches may also impart a detailed understanding of socio-economic vulnerability evident from analyses of the nature of interdependence between the components indicating demographic growth of the concerned regions and the components indicating the corresponding socio-economic growth of settlements in them.

Hence, the present paper.

2. Review of literature

The adverse impacts on socio-economic environment are often responsible for creating socio-economically susceptible pockets or sub regions having high tendency of susceptibility and consequent vulnerability within them. Different researches on climatic and environmental sciences have explained vulnerability as the degree, to which a system is susceptible to, or unable to cope with due to inability to deal with adverse effects of climate change, including climate variability and extremes (4th Assessment Report of IPCC, 2007). Analogically, socio-economic vulnerability can be described as the degree, to which a system of region and its community is susceptible to, or unable to cope with due to inability to manage adverse effects of changes in socio-economic climate change, including socio-economic variability or fluctuations and extremes of adverse socio-economic development. Likewise, for quantitative assessment of socio-economic vulnerability, it is considered to be a function of the character, magnitude, and rate of socio-economic climate change and variation, to which a system is exposed. Moreover, the sensitivity or susceptibility of the system and its adaptive capacity are also two important elements of socio-economic vulnerability. Susceptibility can be explained as the degree, to which a system is affected, either adversely or beneficially, by socio-economic development related stimuli. The socio-economic development related stimuli encompass all the elements of socio-economic climate change, its variability and the frequency and magnitude of extremes.

The studies on relevance of socio-economic susceptibility and consequent vulnerability are therefore indispensable to overcome the effect of undesirable changes in socio-economic climate, which in turn are governed by a few definite causal factors (Morrow, 1999; Turvey, 2007; Holmes, 2010).

Source	Context	Causal factors
Briguglio L., 1995	Small island developing states	Small size- limited natural resources, high import content, small domestic market, dependence on export, dependence on narrow range goods, constraint on domestic competition, limited ability to influence domestic prices, problems in administrative services; Industry and remoteness- high transport cost, supply uncertainty, difficulties to meet sudden changes in demand, keeping

Source	Context	Causal factors
		large stocks, additional costs of production; Proneness to natural disaster; Environmental factors- pressure of economic development on natural resources, geographic fragility; Other- dependence on foreign financial sources, emigration.
Morrow H.B., 1999	Mapping of vulnerability to natural disasters	Limited resources and power, Insufficient financial reserves, Geographic fragility, Less access to transport, Unstable employment scenario, Physical and mental limitations, Gender specific limitations.
Adriano L. and Matsuda Y., 2002	Environmental disasters in small islands	A few option of sustainable development, high cost of utilities and public services, scarce human resources, dependency on foreign interference for economic development, locational disadvantages.
Cutter et al., 2003	Social vulnerability to natural hazard	Social inequalities, place inequalities, characteristics of communities and built environment, level of urbanization, growth rates, and economic strength, social fabric (race and gender), locational disadvantages, socio-economic status, age, industrial development, employment loss, rural-urban dichotomy, lack of physical and social infrastructure, social dependence.
Dwyer et al., 2004	Social vulnerability to natural hazard	Personal- age, income, housing characteristics, employment characteristics, disability, health insurance, debt and savings, injuries, mode of transport; Community- reciprocity, social participation, community support, network size, isolation; Geographical-remoteness; Institutional- role of local Government, role of state Government, charity and funding.
Brooks et al., 2005	Determinants of vulnerability	Economy- national wealth, inequality; Health- healthcare availability, nutritional status, food availability; Education; Physical infrastructure; Governance; Resource pressure; Agriculture; Ecology and Technology.
Birkman J., 2006	Disaster resilient society	Initial well-being- nutritional status, physical and mental health; Livelihood and resilience- assets and capitals, income and qualifications; Self-protection- capability and willingness to build a safe home, use a safe site; Social protection- preparedness and mitigation measures; Social and political networks and institutions- social capital, institutional environment.

Table1: Causal factors

These causal factors influence the characteristics of the growth indicators, which are capable of explaining the socio-economic condition of any region. Starting with Malthus (1798), it has been historically established, that the growth indicators are most effective in representing the state of socio-economic, demographic and environmental affairs within any region (Sen, 1986; Kelley and Schmidt, 1995, Kennedy and Veluchamy, 2011; Teller, 2011). This study has largely relied on understanding of the significance of growth indicators in identifying vulnerable pockets or sub regions with a reasonable assumption that the values of the growth indicators reflect the gaps in development within different regions resulting from various causal factors acting in that particular region. In other words, the impact of causal factors up on a susceptible region can be quantified by the performances of different growth indicators of the particular region. Hence, to realistically identify the susceptible regions based on the performance levels of socio-economic growth indicators, the selection of the growth indicators is particularly crucial. The selection should be guided by the level of association between the indicators and susceptibility to undesirable impacts and consequential shocks and injuries. Therefore, in this research, the selection has been guided by Human Development Index (HDI) based indicators as HDI is considered as the measurement for development worldwide.

In the context of developing countries or regions, researchers have pointed out the importance of a study of interdependence between demographic growth and socio-economic growth leading to the identification of characteristics of the key factors that further are capable of explaining vulnerability in a regional system of cities, metropolises and non urban areas (Kelly, 1988; Kelley and Schmidt, 1995; Kelley and Schmidt, 1999; Borooah and Dubey, 2007). Demographic and socio-economic indicators always have shown interaction between each other. Over the ages researchers have identified the relation or interdependence of economy and demography in different manner. In this paper, an attempt has been made to capture the different dimensions of interdependence in assessing socio-economic vulnerability.

3. Case study region

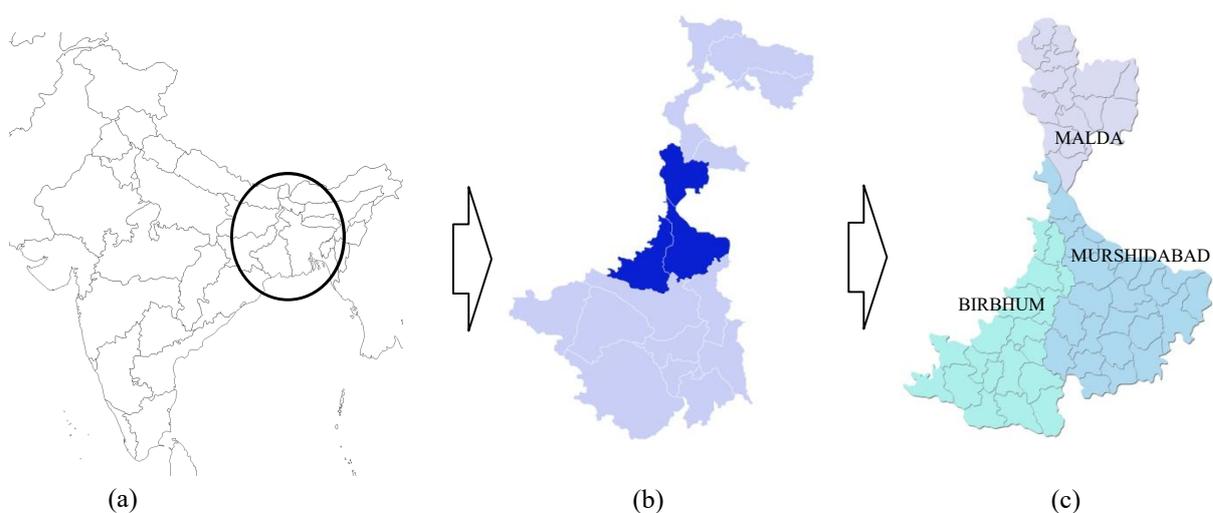


Figure 1: (a) Location of West Bengal in India, (b) location of case study region in West Bengal, (c) Case study region

4. Analyses and interpretations

Identification of vulnerability components has been done by the selection of socio-economic (governed by HDI) and demographic indicators and principal component analysis (PCA). The degrees of vulnerability in the sub region have further been calculated with the help of indices of multiple deprivations (IMD). The steps and results have been discussed in the subsequent sections.

4.1 Identification of socio-economic and demographic components

The indicators have been chosen from the relevant literature and Census of India and matched with HDI.

Socio-economic			Demographic
Health	Education	Economy and standard of living	
No. of hospital beds	No. of primary, middle secondary schools and professional education centre	No of households living in permanent, semi permanent and temporary housing	No of main and marginal cultivator, agricultural labourer, household industry workers, other workers
No. of PHC	Enrolment in primary, middle secondary schools and professional education centre	No of households having toilet, bathroom, drainage, water supply, electricity	No of non worker
No. of doctors	Teachers in primary, middle secondary schools and professional education centre	No. of commercial bank, rural bank, co-operative society, fair price shop	Population growth rate and density
No. of patients treated		Net collection from small savings	No. of BPL households
No. of vaccination for polio		No. of households having radio, television, telephone, bicycle, motor cycle, four wheeler	Sex ratio, crude birth rate, infant mortality rate, literacy rate

Table 2: Selected indicators

The HDI governed indicators have taken an important part in representing the state of susceptibility and consequent vulnerability. Therefore, it has been considered that all the indicators have equal impact on the degree of vulnerability of the concerned region. Hence, when the set of indicators is gone through the standard statistical process of data compilation and categorization, the newly constructed variables become the principal components of

vulnerability. To identify the principal components of vulnerability, a principal component analysis has been conducted. Before the principal component analysis, the z-score for all indicators have been calculated to standardize the data and the standardized values are used for PCA. The identification of vulnerability components has been done for two set of indicators- one set representing the socio-economic components and other set representing the demographic components (table 3).

Socio-economic components		Demographic components	
Component	Name	Component	Name
SEC1	Component of well being	DC1	Component of urban livelihood
SEC2	Component of physical infrastructure	DC2	Component of social characteristics
SEC3	Component of social infrastructure	DC3	Component of rural livelihood
SEC4	Component of economy	DC4	Component of poverty

Table 3: New socio-economic and demographic components

The scores of the components have been taken for the formulation of a vulnerability grayscale for further research on interdependence in all blocks of Malda, Murshidabad and Birbhum. Using the scores, a vulnerability index has been constructed by using Indices of Multiple Deprivation. IMD is one of the additive methods to determine the degrees of vulnerability is known as indices of multiple deprivations (IMD), which is a weight free index (Briguglio, 1995; Briguglio et al., 2008; Havard et al, 2008; Briguglio, 2009; Siddiqui and Hussain, 2010). The method provides similar results as the method used by UNDP in calculating human development index worldwide (Siddiqui and Hussain, 2010).

It is evident from the result that the whole region is more or less vulnerable as VI ranges from 0.9 to 0.3. According to the values or the indices, the most vulnerable location is Raghunathganj I with deprivation index 0.856 and the least vulnerable location within the region is Berhampore with deprivation index 0.384 compared to the other blocks. Based on the vulnerability index, a vulnerability grayscale has been prepared (Figure 2) and further classified into three broad groups:

- | | | |
|---|---|--|
| <ul style="list-style-type: none"> i. Very highly vulnerable (VI 0.9-0.8), ii. Highly vulnerable (VI 0.79-0.7), iii. Vulnerable (VI 0.69-0.6) | } | Category I: Vulnerable (High to higher shades of vulnerability) |
| <ul style="list-style-type: none"> iv. Moderately vulnerable (VI 0.59-0.5) | — | Category II: Moderately Vulnerable |
| <ul style="list-style-type: none"> v. Less vulnerable (VI 0.49-0.4) vi. Least vulnerable (VI 0.39-0.3) | } | Category III: Less Vulnerable (Low to lower shades of vulnerability) |

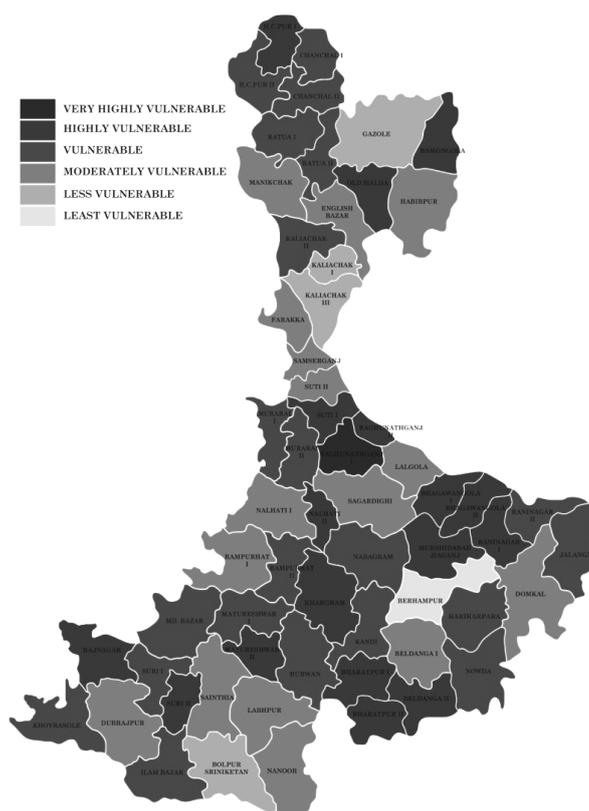


Figure 2: Vulnerability greyscale

4.2 Design of the regression analysis

To understand the interdependence of the growth indicators in vulnerability assessment, a regression analysis has been carried out. The regression analysis has been designed in four parts addressing four different approaches (table 4) and in two stages.

Combinations	Dependent variables	Independent variables
Combination 1 (Overall impact of all demographic components over socio-economic components)	SEC1	DC1,DC2,DC3,DC4
	SEC2	DC1,DC2,DC3,DC4
	SEC3	DC1,DC2,DC3,DC4
	SEC4	DC1,DC2,DC3,DC4
Combination 2 (Rural-urban dichotomy)	SEC1;SEC2;SEC3;SEC4	DC1,DC4
		DC3,DC4
		DC1,DC2
		DC3,DC2
		DC1,DC4,DC2
		DC3,DC4,DC2
Combination 3 (Poverty and social characteristics)	SEC1;SEC2;SEC3;SEC4	DC2,DC4
Combination 4 (Individual impact of demographic component over socio-economic component)	SEC1;SEC2;SEC3;SEC4	DC1
		DC2
		DC3
		DC4

Table 4: Different combinations of regression analysis

At the first stage, the combinations have been applied to the entire region with and without dummy variables. Dummy variables have represented different categories of vulnerable regions. Two dummy variables have been used in performing ANCOVA. They are:

DV1= 1 for vulnerable regions otherwise 0

DT2= 1 for moderately vulnerable regions otherwise 0

In the other hand, ANOVA without dummy variable has been performed. The two results have been compared in terms of adjusted R2, correlation coefficient, F values, t values, and degree of association between dependent and independent variable (η^2 for ANOVA and ω^2 for ANCOVA). The comparison has been done to realize the impact or effect of the regions with different levels of vulnerability on the overall interrelationship between socio-economic and demographic components.

In the second stage, the same combinations have been applied to different categories separately and the regression analysis, ANOVA has been performed to understand the varying degree or level of association between the growth components in different groups. To understand the interrelationship, two examples from both stages have been given.

Example 1 (stage I)

Combination 1: Overall impact of all demographic components over socio-economic components

Under combination 1, there are four types of sub-combinations showing the changing relationships of demographic components with different socio-economic components. Table 5 shows the types of relationships.

SEC1	ANOVA			ANCOVA		
	Adj. R2	R	F	Adj. R2	R	F
	0.711	0.855	37.241*	0.712	0.860	25.272*
Variables	t statistics		η^2	ω^2	* Significant at p=0.05 level of significance † Significant at 95% level of significance (two tailed t-test)	
DC1	7.971 †		0.312	0.144		
DC2	7.757 †		0.295	0.244		
DC3	3.823 †		0.072	0.030		
DC4	-3.261 †		0.051	0.037		
DV1	-		-	0.000		
DT 2	-		-	0.005		
Error	-		0.270	0.000		
SEC2	ANOVA			ANCOVA		
	Adj. R2	R	F	Adj. R2	R	F
	0.128	0.432	3.156*	0.300	0.547	5.223*
Variables	t statistics		η^2	ω^2	* Significant at p=0.05 level of significance † Significant at 95% level of significance (two tailed t-test)	
DC1	1.348		0.028	0.014		
DC2	-1.490		0.033	0.080		
DC3	2.332 †		0.080	-0.011		
DC4	1.747		0.045	-0.011		
DV1	-		-	0.163		
DT 2	-		-	0.076		
Error	-		0.813	0.000		

SEC3	ANOVA			ANCOVA		
	Adj. R2	R	F	Adj. R2	R	F
	0.367	0.640	9.561*	0.423	0.650	8.381*
Variables	t statistics		η^2	ω^2	* Significant at p=0.05 level of significance † Significant at 95% level of significance (two tailed t-test)	
DC1	2.219 †	0.054	0.032			
DC2	-2.043 †	0.045	0.020			
DC3	5.123 †	0.281	0.198			
DC4	-1.704	0.031	0.015			
DV1	-	-	0.008			
DT 2	-	-	0.050			
Error	-	0.590	0.000			
SEC4	ANOVA			ANCOVA		
	Adj. R2	R	F	Adj. R2	R	F
	0.106	0.409	2.756*	0.201	0.532	3.479*
Variables	t statistics		η^2	ω^2	* Significant at p=0.05 level of significance † Significant at 95% level of significance (two tailed t-test)	
DC1	1.289	0.025	0.000			
DC2	-2.365 †	0.085	0.128			
DC3	-0.195	0.001	0.030			
DC4	1.932	0.057	0.000			
DV1	-	-	0.100			
DT 2	-	-	0.072			
Error	-	0.833	0.000			

Table 5: Dependent variable-SEC1, SEC2, SEC3, SEC4;
Independent variables-DC, DC2, DC3, and DC4

Both SEC1 and SEC3 have significant F values and good adjusted R2 values. The correlation of the dependent and independent variables are also good in both cases. However the difference can be noticed in degree of association between dependent and independent variables (η^2 and ω^2). Though for SEC1 and SEC3 the difference is not much, but in other cases the differences are quite strong.

In case of SEC2 and SEC4, adjusted R2 is higher in ANCOVA and the correlation coefficient also imparts a moderately strong relationship with demographic indicators. In estimating the degree of association between the dependent and independent variables, the dummy variable (representing the different categories of regions) have played a crucial role. Here, it has been seen that the dummy variables are explaining 16.3% and 7.6% of the total variance and 10% and 7.2% of total variance respectively. The inclusion of dummy variables has made changes in the level of association of independent variables. The difference can be observed through the values of η^2 and ω^2 .

It has been observed from a varied range of relationships between socio-economic and demographic components that regional differences always have influenced the interdependence of the growth components. In the present research, regional differences refer to the categorical divisions of a whole region according to its vulnerability index. The results have shown that the relationship is better explained when the growth components (continuous variables) are associated with different categories of regions (categorical dummy variables). The change in the level of association and degree of interdependence also varies with different components. Hence, there is need to differentiate the regions in various categories and assess the varying nature of interdependence.

In light of the stated concept, in the next stage the analysis has been carried out for three categories. The combinations have been remaining the same as the stage I.

Example 2 (stage II)

Combination 1: Overall impact of all demographic components over socio-economic components

In category I, SEC1, SEC3 and SEC4 have shown significant relationship with good to moderate adjusted R2 values (0.629, 0.319 and 0.428 respectively). The correlation coefficients are very good to good for SEC1, SEC3 and SEC4 (0.817, 0.624 and 0.698 respectively). In category II, only SEC1 has shown significant relationship with good adjusted R2 value (0.619). The correlation coefficient is very good to moderate for SEC1, SEC2, SEC3 and SEC4 (0.853, 0.685, 0.559 and 0.498 respectively). In category III, there are no significant relationships found.

The similar analysis has been done for all the combinations to come up with following conclusions.

5. Conclusions

In summary, the chapter has addressed two important aspects. First, it has tried to identify socio-economic and demographic vulnerability components at sub regional level (block level). Secondly, identification of vulnerable locations in the highly susceptible region has been attempted by constructing the vulnerability greyscale. Third and finally, the chapter has explained socio-economic vulnerability through the interdependence of socio-economic and demographic growth indicators at the sub regional level. The interdependence of socio-economic and demographic components at different regions (category I, II and III), explains the socio-economic vulnerability of the particular region. The level of association or the strength of interdependence explains the importance of that specific component for the state of vulnerability at that particular region. The paper has tried to reveal the specific components through the study of interdependence, which are the key determinants of socio-economic vulnerability. The diverse changes in the components would cause significant changes in socio-economic climate of the region, which would in turn lead towards high socio-economic susceptibility and consequent vulnerability. The following are the outcomes of the aggregate results and interpretation:

1. Demographic components are influencing components of well being, economy and social infrastructure.
2. A major impact of rural urban dichotomy on socio-economic vulnerability is evident.
3. With high vulnerability index, any region becomes more sensitive towards different categories of socio-economic shocks and consequent injuries. It gets reflected in the nature of interdependence between the socio-economic and demographic components.
4. Regions having low vulnerability index show insignificant relationship between growth components indicating lesser sensitivity towards different kinds of socio-economic shocks and consequent injuries.
5. Degree of socio-economic vulnerability depends upon nature of interdependence between components.

References:

- Adrianto L. and Matsuda Y. (2002). Developing Economic Vulnerability Indices of Environmental Disasters in Small Island Regions. *Environmental Impact Assessment Review*, Vol. 22, pp-393–414.
- Afzal m. (2009). Population Growth and Economic Development in Pakistan. *The Open Demography Journal*, Vol. 2, pp-1-7.
- Borooh, V. and Dubey, A. (2007). Measuring Regional Backwardness: Poverty, Gender, and Children in the Districts of India. Munich Personal RePEc Archive Paper No. 19426, University of Ulster, National Council for Applied Economic Research.
- Briguglio L., Cordina G., Farrugia N., Vella S., (2009). Economic Vulnerability and Resilience: Concepts and Measurements. *Oxford Development Studies*, Vol.37, No.3,pp.229-247.
- Briguglio, L. (1995). Small Island Developing States and their Economic Vulnerabilities. *World Development*, Vol. 23, No. 9, pp.1615-1632.
- Briguglio, L., Cordina, G., Bugeja, S., Farrugia, N. (2006) Conceptualizing and Measuring Economic Resilience. Economics Department, University of Malta.
- Brooks N., Adger Neil W., Kelly Mick P. (2005). The Determinants of Vulnerability and Adaptive Capacity at The National Level and The Implications for Adaptation. *Global Environmental Change*, Vol.15, pp-151–163
- Cutter, S.L., Boruff, B.J., Shirley, L.W. (2003). Social vulnerability to environmental hazards. *Social Science Quarterly*, Vol. 84, No.2, pp.242-261.
- Dwyer, A., Zoppou, C., Nielsen, O., Day, S., Roberts, S. (2004). Quantifying Social Vulnerability: A methodology for identifying those at risk to natural hazards. Australian Government, Geoscience Australia.
- Havard, S., Deguen, S., Bodin, J., Louis, K., Laurent, O., & Bard, D. (2008). A small-area index of socioeconomic deprivation to capture health inequalities in France. *Social Science & Medicine*, Vol.67, pp-2007–2016.
- Holmes, R., Sadana, S., Rath, S. (2010). Gendered Risks, Poverty and Vulnerability in India: Case Study of the Indian Mahatma Gandhi National Rural Employment Guarantee Act (Madhya Pradesh), Overseas Development Institute.
- Intergovernmental Panel on Climate Change. (2007). Climate change 2007: Impacts, adaptation and vulnerability: contribution of Working Group II to the fourth assessment report of the Intergovernmental Panel on Climate Change. M. L. Parry (Ed.). Cambridge University Press. Available at: <http://www.ipcc.ch/ipccreports/tar/wg2/index.php?idp=8> (Accessed 11 June 2013).
- Kelley C. A. (1988). Economic Consequences of Population Change in the Third World. *Journal of Economic Literature*, Vol. 26, No. 4, pp. 1685-1728.
- Kelley C. A. et al., 1999. Economic and Demographic Change: A Synthesis of Models, Findings, and Perspectives.
- Kelley, C. A., Schmidt, R.M. (1995) Aggregate Population and Economic Growth Correlation: The Role of the Components of Demographic Change. *Demography*, Vol.32, No. 4, pp.543-555.

- Kennedy, M.J., Veluchamy, V. (2011). An Assessment of Malthusian Theory of Population in Indian Scenario. Indian Streams Research Journal, Vol. 1, Issue II, pp.73-78.
- Malthus, T.R. (1798). An Essay on the Principle of Population. Courier Corporation.
- Measuring Vulnerability to Natural Hazards: Towards Disaster Resilient Societies (2006). Edited by Jörn Birkman. United Nations University Press.
- Morrow, H. B., (1999). Identifying and Mapping Community Vulnerability, Disaster, Vol. 23, No. 1, pp. 1-18, Overseas Development Institute.
- Sen, A. (1986). Food, Economics and Entitlements. Working paper 1, World Institute for Development Economic Research, United Nations University.
- Siddiqui, A. F., Hussain, N. (2010). Analysis of Micro Level Socio-economic Disparities in Malda District, West Bengal. Asia Pacific Journal of Social Sciences, Vol.II, No.1, pp. 39-61.
- Teller, C.(2011). Are There Mixed Malthusian and Boserupian Consequences of Population Pressure and Food Insecurity? Vulnerability and Demographic Responses in 16 Drought-Prone Districts throughout Ethiopia. The Demographic Transition and Development in Africa. Chapter 12. Springer Netherlands.
- Turvey, R. (2007). Vulnerability Assessment of Developing Countries: The Case of Small-island Developing States. Development Policy Review, Vol.25, No.2, pp.243-264.

The contribution of risk relations to urban planning practices: rethinking floods and other natural disasters of anthropic synergy

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Abstract *Based on interpretative tools from epistemology of risks, an adjustment was made on the typological categories set traditionally used to understand the processes involved on urban flooding risk. A generic brazilian urban system is described through representative diagrams of elements and variables arranged to underline risk relations. The representative models presented in this study highlight an usually neglected aspect on environmental risk management: the structural connections among social and environmental vulnerabilities with the magnitude of natural hazards.*

1. Introduction: The ambiguous nature of urban flooding

The effort to understand risks leads us to the search of typifications that enable practical distinctions in a broad universe of threats. In presenting the theory of risk society, Beck (2010: 362) distinguishes nowadays' uncertainties from the typical dangers of ancient times. Being risk a modern concept, we call the diseases, the wars and the epidemics of the past simply by "threats." For "risks" differently, we assume the involvement of human decisions and humanly produced futures. Therefore, neither natural disasters, attributed to divine will or to the forces of nature (threats) nor the calculated uncertainties, insurable for monetary compensation, reveals the nature of this modern category: the "manufactured uncertainties".

The manufactured uncertainties are the protagonists of the threat landscape in late modernity. They also depend on human decisions, but are imposed collectively, in a way that the individual cannot avoid them. They are not externalizable, calculable, manageable or insurable privately, because they break with the past experience and with the routine responses. Other authors are less rigorous about this historical issue and make use of a timeless taxonomy of risks. Dagnino and Carpi Junior (2007) distinguish four macro classes: natural, technological, environmental and social risks. These categories are not mutually exclusive, on the contrary, are superposed, but virtually prove to be useful to demarcate groups of various kinds.

Natural risks, by definition, encompasses uncertainties whose social construction comes from a physical process sensed, perceived and experienced by a given group. Veyret and Meschinet de Richemond (2007, p.64) subdivide them into risks of *lithospheric origin* and of *hydroclimatic origin*. Earthquakes, landslides and volcanic eruptions identify the physical processes of the first group. The second includes impacts caused by cyclones, storms, intense blizzards, heavy rain and hail or droughts. Rebelo (2003, p. 11) refers directly to tectonic, magmatic, climatic, geomorphic and hydrologic risks, choosing hence for a less

hierarchical treatment. One way or another, the uniqueness of natural risks lies on the physical causes of these events, which are largely beyond human intervention. Sevá Filho (1988: 82) calls them **telluric risks** (relative to Earth) and adds to its description an aspect of globality and uncontrollability which reveals our human fragility front to such fortuities.

Concerning the **social** or **societal risks**, Vieillard-Baron (2007: 276) draws attention to the customary inaccuracies in the use of these concepts. There is a polysemy closely associated with the expression "social risk" that derives from the very notion of risk. If we define risk as the perception of one or more individuals of the occurrence of a threat and vulnerability as a necessary demarcation of the human dimension of risk and the extent of the damage, we can say that all kinds of risk entails human consequences. Such ambiguity also calls into question the category of natural risks, since there is no risk free of social construction. However, these notions have been widely used and to request now a new terminology would mean adding a complicating factor to a scientific field still in consolidation. On the other hand, such redundancies may, nevertheless, be settled from the explanation of the meaning intended to the terms.

As stated, natural risks would be those types which its **causes** escape largely to human control. In this line, social risks are qualified as those which anticipate the probability of a catastrophic event for the human community, with harmful **consequences** for society, whether as a whole or in part. Therefore, we consider society as a whole, whose foundation is solidarity. Social risks in this way are distinguished from others not by their social causes, but by the social consequences of threats from any source. When the living together or the social cohesion are targets, one is dealing with social risks.

Historically, this field of study has focused on the investigation of perceptions of insecurity and of violence, two recurrent threats in urban environments. Thus, it is about delinquency and criminality risks, risks associated with drug use and drug trafficking and those linked to totalitarian ideologies, war and terrorism (Vieillard-Baron, 2007: 275). Put like that, it is understood why scholars of social risks subdivide them into **exogenous** and **endogenous**. Once a social risk is recognized by its consequences, in a sociocentric vision, we perceive the natural causes of a hazard as external factors (exogenous risks) and causes of hazards relating to the functioning of society itself as internal risk factors (endogenous risks).

The diversity of approaches in classification of risks are huge and, in our attempt to conceptual organization, we will horizontally place the categories relevant to this narrative, without, however, preventing them from communicating. The interaction between categories of classification is a prerequisite for the existence of synergy between the risks. This will be our focus further. Pinto (2007) proposes a taxonomic treatment whose subcategories we will allocate under the umbrella of **anthropogenic risks**. Comprise this framework the built, productive and cultural risks (the author refers to social risks, but we will make an adjustment to avoid conflict). Naturally, in a general and imprecise way this macro-class of risk includes threats with causes essentially anthropic: economic and cultural transformations of the landscape.

All kinds of changes and structural human intervention in the natural environment (buildings,

river canalizations and rectifications, paving and sanitary infrastructure installations that offer threats to the inhabitants by locational and technological inadequacies) will be associated to **built risks**. Changes caused by cultural traits that result in damages to the communities (such as burning practices or removal of riparian forests for crops) constitute **cultural risks**. Finally, shall be designated as **productive risks** those related to threats from industrial activities in any stage of the productive chain.

Productive risks, also known as industrial and technological risks, are associated with deleterious effects induced by accidental or chronic pollution events (slow and diffuse) resulting from activities of production, storage and transport of hazardous materials. Veyret and Meschinet de Richemond (2007, p. 70) distinguish a specific group they call *major industrial risks*. Threats sources of these risks are: explosions, toxic leaks and fires. Those are risks of low probability of occurrence but often catastrophic and easily able to rebound on threats to the collectivity (social risks) and to the constituted powers. Although deserving special attention, nuclear risks are a type of what we will name as higher productive risks.

Beside the anthropogenic risks, we will position the **economic risks**. The specificity of this group lies in the perception of consequences related to the management of scarcity. The strategic choices of national economies and companies that commercially explore resources (renewable or not) subject dependent populations of these goods to uncertainties in terms of provision of needs, and the more vital are those resources, the more easily these uncertainties tend to translate into latent or open conflicts. Water, land and oil are examples of resources on which national and international conflicts have historically orbited. Here are also included market risks associated with investment decisions and cutbacks usually motivated by competition. The possibilities of gains and losses involved in these decisions depend on an intricate network of economic agents and price fluctuations that often escape the control of the decision makers. Not rare the economic risks engender social risks too. For example, in agribusiness bad choices can materialize in food insecurity situations and in general, for all sectors, can result in financial insecurities that withdraw credit and consumption, generate unemployment and systemic disturbances.

For the outcome of this classificatory venture, we reserved two meta-categories, which cannot be treated on the same level as the others: the group of **health risks** and **environmental risks** class. Many of the risks presented bring, to some extent, harm to the integrity of individuals and to social groups. Whether material losses, deaths, physical injuries, psychological injuries or illnesses, ultimately, the injuries are reflected in terms of health. Pollutions, responsible for the perception of the productive risks, contamination of food and water sources, multiple insalubrity supported in the workplace; incivilities, war and urban violence in the context of social risks; collapse of constructions and landslides in steep areas on the built risks; and all sorts of human frailty called into question against the disasters associated with natural and telluric risks are examples.

Health risks are the result of a secondary reflection on the risk spectrum compression presented so far across different causes and consequences. As each organism responds in a very unique way, for every situation it will be made the question: which health risks arise from the primary risk considered? Only conducting risk assessments to this last step, we

may take farsighted decisions about the degree of acceptability of threats to which we expose ourselves.

As from this consideration regarding the refinement of possible analysis in terms of impact risks to *buen vivir* and to the quality of life of the communities we present the comprehensive concept of environmental risk. For this category, we rely on the environment concept as conceived by Leff (2007), for whom this entity means, first of all, the space proper to questioning the limitations of disjunctive operations, procedure we did earlier in the didactic understanding effort of the risk categories universe. To Veyret and Meschinet de Richemond (2007, p. 63) environmental risk is the perception of threats associated with natural hazards and risks from natural processes compounded by human action or simply by the occupation of the land. In this paper, we will take this definition in a broader perspective, in which the environmental risk will present itself whenever we notice patterns of interaction between the primary risk categories presented. Afterwards, we will outline some of these possibilities of interaction.

2. Risk relations

A subcategory of natural hazards not shown in the above classification panorama was actually reserved for treatment apart. These are called **natural risks aggravated or caused by human activities**. Veyret and Meschinet de Richemond (2007, p. 67) define them as arising from events whose expected impact becomes more dramatic due to the practiced forms of use and occupation of the territory. In this class, are grouped together risks associated with: susceptibility to erosion, desertification, droughts, fires and pollution.

Fires in urban or rural green areas or in protected forests result of the frequency of activities in the forests and in the surrounding areas. The installation of campsites, vacation homes or even sporadic forays into the woods for hunting or resource extraction, for example, constitute risk factors in these areas. Fire hazards are enhanced when these incursions occur during drought periods, depending on the preventive measures adopted by visitors, the compliance with the safety standards and the types and levels of management of these areas.

Similarly, pollution risks are discussed here from the point of view of injuries resulting from use. In this case, as a result of abrupt variations in the demands imposed on a given support infrastructure. The inadequacy of supply, transportation, sewage, collection, disposal and adequate management of waste systems to high seasonal demands leads them to collapse. The increase in the flow of visits to tourist sites in high season periods or due to traditional major events generally extrapolates the treatment capacity of the wastewater. This then becomes a recurring picture: with the arrival of rains, the effluents conducted in incomplete separation systems easily attain the waterways, polluting them (Veyret & Meschinet de Richemond, 2007: 69).

In turn, the acceleration of erosion, droughts and desertification are seen as naturally occurring processes in arid, semi-arid and dry sub-humid areas, even if induced or exacerbated by human action. The importance of the human contribution to this

phenomenon has grown tremendously with the scenario of uncertainty announced by the ongoing climate change:

Past mistakes, ill-conceived policies and predatory practices have resulted in social and environmental conditions that cannot be easily reversed without substantial and constant development efforts, requiring increasing national and international financial support. The diminishing productivity of natural resources in drylands, the prevalence of poverty and significant inequalities and also institutional weaknesses, should worsen with the increase of variability and climate change. (...)

Extreme weather events in many parts of the world – recent floods in Pakistan, fires in Russia and Indonesia, sandstorms in China, erratic behavior of the Indian monsoon, drought and food deficits in sub-Saharan Africa, prolonged severe droughts and lack of water in northern Mexico and northeast Brazil among other disastrous events elsewhere – underscore the urgency for governments to prepare for an uncertain climate in the future². (Declaração de Fortaleza, 2010).

Drought, as well as specific expressions of erosion, produce effects of desertification, but the phenomenon itself is identified when there are traces of irreversibility in short and medium term on the changes in the landscape. Desertification therefore means an in-depth picture of soil and vegetation cover degradation with sensitive impairment of the biological potential. Common causes are related to poor management of natural resources (e.g., excessive use of pastures, logging and other forest resources beyond the replacement rate or inadequate soil management), mismatch situation between demand and capacity provision, which droughts often only help reveal (Scheffer et al., 2001).

Once presented natural risks aggravated or caused by human action, we can ask ourselves what are risk relations. Well, considering the probabilistic nature of the concept of risk, investigations into interactions between groups of threats placed in different categories should turn to a deeper systemic understanding of interactive expression patterns of crises. The question is now presented differently: to what extent a well-established risk class has its manifestations in crisis aggravated, anticipated, damped, nullified or succeeded (as trigger ignition) by another risk class?

As a pattern of threats, effects, exposure situations and vulnerabilities becomes better understood, naturally is founded around these factors a new risk class and, from then on its constituent elements begin to be perceived according to the operating structure studied. Let's check how this process can interfere with the apprehension and on a farsighted consideration of a risk situation closer to the complex reality and, then, apply this approach on understanding the interactive patterns associated with urban flooding risk.

2.1 A seismic-social risk interaction case

In 1999, the Turkish city of Izmir, 150 km far from Istanbul, witnessed a 7.4 magnitude earthquake. The seismic shock caused between 17 and 30 thousand deaths, required international assistance and exposed the weakness and the lack of mechanisms to prevent the tremors impacts on Turkey. After the disaster, gained momentum in the media a speech contrary to the social effects of earthquakes in order to prevent social and urban risks, since

the previous frame of improvidence would open space for political representation loss in order to riots and risk of autocratic intervention (Vieillard-Baron, 2007: 309).

The measures adopted in the post-crisis revealed a paradox between the hegemonic discourse of restructuring delivered and the level of commitment to confronting the complex nature of urban risks. In general, the poor neighborhoods, whose informal edifications were raised in noncompliance to the paraseismic building standards, were the most affected in Istanbul. These communities, as expected, received the strongest knock of the crisis and were also those who found themselves most deprived of the means to rebuild and compensate their losses. That's how numerous civil protection, support to victims and neighborhood associations appeared or established themselves in the post-crisis (Pérouse, 2002).

Some of these associations were not established spontaneously, they were actually created by the municipal government. It was propagated, in parallel, the idea that the restructuring of Turkey was happening efficiently due to the common endeavor of society and in the name of solidarity that the earthquake would have allowed emerge. In the same year, however, the urban growth vector in Istanbul shifted to the safer outskirts of the city where closed communities were formed. Among the plans of government, stated the construction of pilot plants for 25 thousand inhabitants far from risk areas, with subsidies and attractives to industries and services (Vieillard-Baron 2007: 310).

Locations that were once considered good neighborhoods fell into discredit for being included in the risk boundary rays. In 2002, there were over 220 gated communities in Istanbul and the debate on how to live together in the city had given way to fear speech and to the ostensible confrontation of violence. Other outskirts deepened their stigma and its residents still suffer from social discrimination and from the difficulty of finding jobs.

From this perspective, the expression of seismic risk, the occurrence of the earthquake and the perception of chances of recurrence gave rise to a frenzy response to the improvidence situation that engendered speculation about social and urban risks. In the medium term, actions backed up by this prevention discourse deepened a context of urban segregation and social division already present in Istanbul before the earthquake. From then on, it would assume the contours and proportions of a conflictual state, typical of a major urban risk.

2.2 Disjunctive or integrated analysis

We believe that this exposure on the risk relations was only possible due to a systematic and careful monitoring of the historical developments of the case in Istanbul. Otherwise, inadvertently, the same question could be analyzed in the traditional way, in two parallel and independent fields of study: one on natural risks and other on social and urban risks. Because each dimension has enough components to consider in its strict field, it would be practical to work separately without necessarily taking it as a very complex order problem and therefore worthy of mutual and multiple consideration.

What we would like to highlight in the case of the 1999's earthquake relates to how the

socio-spatial segregation intensifies and, paradoxically, goes to the background as the theme of natural risks is appropriated as a political instrument of moods mediation and to control electorate satisfaction ratings. The same goes for the media emphasis on urban violence as cause and end in itself. In this sense, Vieillard-Baron points out:

The origins of disasters – causes and consequences that are advisable to clarify to better understand the risks incurred by man – are multiple and often interdependent. A first approach shows that the causal chains that produce them become more complex over time and with economic growth, and that the territory is directly affected as a support of risks and as the major place of interactions³. (Vieillard-Baron, 2007: 275).

So, if we accept the complexity of these issues, we must also reject disguised shortcuts solutions which, as a rule, deepens the problems it intends to solve. The city, or rather the urban environment, is the place of excellence of overlapping risk interactions, because they concentrate a wide variety of landscape features, a wide range of land use demands and lots of development projects in dispute, as well as the range of targets and vulnerabilities distributed in space. Following this line, we intend to evaluate the depth of causal chains concerning urban flooding risk and to shift the commonplace of the current treatment within the isolated context of natural risks.

3. Urban flooding: climate, physiographic and socioeconomic structuring

On this section, we characterize the systemic relationships that underlie the problem of urban flooding according to the diagrammatic modeling method proposed by Berçot (2009: 58). The author emphasizes the potential of graphical representations in the exercise of drafting and redrafting research issues about social and environmental systems.

The diagrammatic representation models in this proposal must be built with elements that do not repeat in the system, represented by words or short phrases (nouns, whenever possible, not adjectived). In the conception of diagrams, the elements should be subdivided into common categories and their relationships represented by arrows. Continuous lines symbolize direct relations (positive) and dotted lines represent the inverse relations (negative). Finally, emphasis will be given to the identified feedback loops. Amplification cycles come in blue and stabilization cycles, in red.

As a starting point for the construction of the diagrams were assigned three key processes in the production of urban space: real estate speculation, labor exploitation and urban spoliation. The last concept was coined by Kowarick (2000) and it is about a sum of conditions that concern to the absence or precariousness of collective consumption services socially necessary for the reproduction of workers. The two other concepts we abdicate to explain given the wide usual semantic appropriation of these notions.

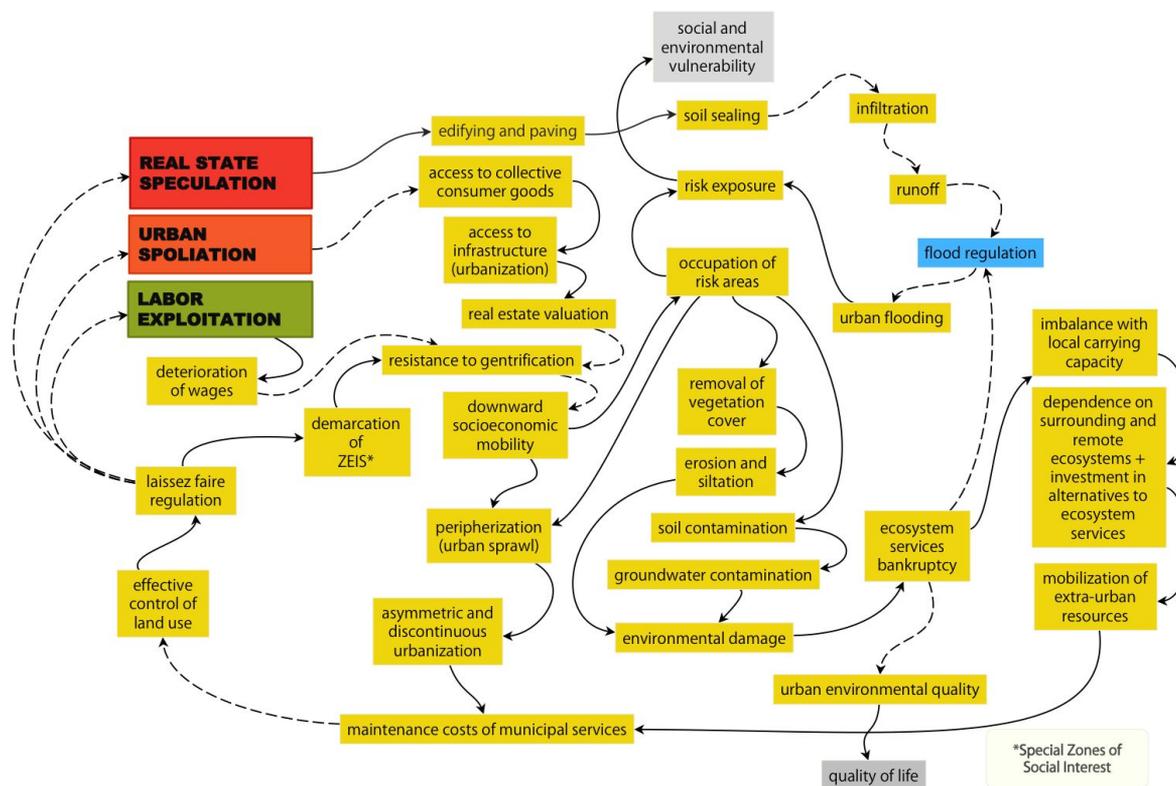


Figure 1. Direct relations (continuous) and reverse (dashed) between components of a generic Brazilian urban system. Font: made by the authors.

The general objective of the drawn diagrams is to generically represent the pattern of formation and expansion of a Brazilian urban system (**Figure 1**) fed by organic growth, so that it permits to link the mosaic of different uses and land occupations to the internal capacity of environmental services provision, namely the surface water drainage service (flood regulation). This dynamic is problematized based on the trend of increasing impervious surface plots of urban land. The more advances the building-paving binomium by removing vegetation cover and compacting the soil, the lower the infiltration capacity of rainwater and bigger and faster the accumulation in estuaries, intensifying floods and favoring waterlogging events and flooding (**Figure 2**).

The occurrence of flooding, such as the seismic risk areas in Istanbul, has dramatic meaning in an intensely disputed urban space. The chaotic growth of Brazilian cities through occupation of problematic areas (hillsides and flood plains on the banks of rivers and lakes) generates vertiginous deterioration of the environment and exposes its residents, low-income groups in general, to several threats. The irregular nature of these occupations and the negligence by the public authorities to the groups living there frequently prints patterns of unhealthy settlements, exposing them to serious environmental risk.

Threatening situations of strong cognitive dependence, as we have reported here, need to break away from the common sense of a security state and be born scientifically. Systemic threats are still dealing with an indeterminacy of responsibilities scenario due to the high differentiation of the division of labor among a multitude of actors, places and conditions. The causes and the culprits are diluted in a complicity and a general unaccountability, as if there were no choice against a natural destination course. Thus, under the veil of systemic complexity and corporate morality, you can do something and continue to do so without having to answer personally for the consequences of these deeds.

Although the forms of social assimilation of a scientific finding largely escape its methodological conception and operate in a very particular dynamic of outreach and mediation with the public opinion, we admit the relevance of the scientific role in dissipating superficialities and simplistic treatments shadowing complex causalities. Even if there is no guarantee of acceptance by society or by scientific peers about these risk relations assumptions, we understand that without it, societies are condemned to cyclical vicissitudes of cosmetic solutions that have proven to increase problems.

Therefore, we performed some adjustment operations and refinement of causalities concerning the factors that contribute to the production of urban flooding risk in Brazilian generic urban systems. It was made in order to facilitate the effective consideration of unacceptable patterns of living and coexistence in Latin America urban areas – especially to the historically vulnerabilized groups (Acsehrad, 2006). Patterns, as shown here, resulting from implementation and reproduction of the traditional model of use and occupation of urban land.

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Endnotes

1. University of Brasília
2. Translated from: Erros passados, políticas mal concebidas e práticas predatórias resultaram em condições ambientais e sociais que não podem ser facilmente revertidas na ausência de esforços de desenvolvimento substanciais e constantes e que requeiram crescente apoio financeiro nacional e internacional. A decrescente produtividade dos recursos naturais nas Regiões Secas, a prevalência de pobreza e as significantes desigualdades, bem como as fraquezas institucionais, devem piorar com o agravamento da variabilidade e da mudança do clima. (...) Eventos climáticos extremos em diversas partes do mundo – recentes enchentes no Paquistão, incêndios na Rússia e na Indonésia, tempestades de areia na China, comportamento errático das monções na Índia, secas e déficits alimentares na África Sub-Sahariana, secas severas prolongadas e falta de água no norte do México e nordeste do Brasil, entre outros eventos desastrosos em outros lugares – enfatizam a urgência para que os governos se preparem para um clima incerto no futuro. (Declaração de Fortaleza, 2010).
3. Translated from: As origens das catástrofes - cujas causas e consequências convêm elucidar para que melhor se conheçam os riscos incorridos pelo homem – são múltiplas e frequentemente

interdependentes. Uma primeira abordagem mostra que as cadeias causais que as produzem se tornam mais complexas com o tempo e com o crescimento econômico, e que o território é diretamente afetado como suporte dos riscos e lugar maior de interações (Vieillard-Baron, 2007).

References

- ACSELRAD, Henri. (2006) "Vulnerabilidade ambiental, processos e relações", Comunicação ao II Encontro Nacional de Produtores e Usuários de Informações Sociais, Econômicas e Territoriais, FIBGE, Rio de Janeiro.
- BECK, Ulrich. (2010) Sociedade de risco: rumo a uma outra modernidade. São Paulo: Ed. 34.
- BERÇOT, Maria de Albuquerque. (2009) Uma questão de perspectiva: os enfoques especialista e local sobre o contexto de saúde e ambiente na região do médio Tapajós, Amazônia brasileira. [s.l.] Universidade de Brasília.
- DAGNINO, Ricardo de Sampaio; CARPI JUNIOR, Salvador. (2007) "Risco ambiental: conceitos e aplicações", Climatologia e Estudos da Paisagem (CLIMEP), v. 2, n. 2.
- DECLARAÇÃO DE FORTALEZA. (2013) Regiões secas: um chamado para ação. Available at: <http://www.icid18.org/?locale=pt&m=conteudo&a=declaration_fortaleza>. Accessed in: 16 sept. 2013.
- KOWARICK, Lúcio. (2000) Escritos urbanos. 2. ed. São Paulo: Ed. 34.
- LEFF, Enrique. (2007) Epistemologia Ambiental. São Paulo: Cortez.
- MARANDOLA JR., Eduardo; HOGAN, Daniel Joseph. (2005) "Vulnerabilidades e riscos: entre geografia e demografia", Revista Brasileira de Estudos Populacionais, v. 22, n. 1, p. 29–53.
- PÉROUSE, Jean-François. (2002) "Istanbul cernée par les cités privées", Urbanisme, n. 324, p. 26-31.
- PINTO, André Luiz; CARVALHO, Elisângela Martins de; SILVA, Priscila Vargas da. (2007) "Riscos naturais e carta de riscos ambientais: us estudo de caso da bacia do córrego Fundo, Aquidauana/MS", Climatologia e Estudos da Paisagem, v. 2, n. 1.
- REBELO, Fernando. (2003) Riscos naturais e ação antrópica: estudos e reflexões. Coimbra: Imprensa da Universidade de Coimbra.
- SEVÁ FILHO, Arsênio Oswaldo. (1988) No limite dos riscos e da dominação: a politização dos investimentos industriais de grande porte. 1988. Tese (Livre-Docência) - Instituto de Geociências, Universidade Estadual de Campinas, Campinas, SP.
- SCHEFFER, M., Carpenter, S., Foley, J. A., Folke, C., & Walker, B. (2001). Catastrophic shifts in ecosystems. *Nature*, 413(6856), 591-596.
- VEYRET, Yvette. (2007) Os riscos: o homem como agressor e vítima do meio ambiente. 1. ed. São Paulo: Contexto.
- VEYRET, Yvette; MESCHINET DE RICHEMOND, Nancy. (2007) Os tipos de risco. In: Os riscos. 1. ed. São Paulo: Contexto.
- VIEILLARD-BARON, Hervé. (2007) Os riscos sociais. In: Os riscos. 1. ed. São Paulo: Contexto.



Track 5 **Intelligent cities for people**



Innovative Space of Metropolitan Area: Types, Patterns and Evolution

—A Case Study of Nanjing Metropolitan Area

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Abstract: With the gradual strengthening pace of regional integration, metropolitan areas of developed regions have become the important spatial units of regional innovation synergy, meanwhile, the patterns of various innovative space have become new types of specialized regional function space. In this paper, accepting Nanjing Metropolitan Area as a case, we presented refined and systematic development process of innovative space from “big space” to specialized space then to the small and micro enterprise space, divided innovative space into “knowledge type” and “industry type” and compared contents of different types of innovative space. In the context of metropolitan area level, we analyzed distribution pattern and interrelation characteristics of innovative space, and then teased out development trends in three aspects of space organization, development direction and action priority and the three corresponding guidance directions. It is hoped to provide case experience for further research on innovative metropolitan area.

Key Words: Metropolitan area; Innovative space; Innovative activity

1. Introduction

In face of new-type urbanization and the new normal, innovation-driven development strategy has become the core of the national strategy. Meanwhile, high-speed rail and regional intercity rail transit network, information system and other modern rapid people and information flow carriers give rise to upgrade of metropolitan area in China. To this end, the new-type metropolitan area, in the context of liquidity, has served as an important basic unit of urban space organization. Configuration of innovative resources, implementation of innovative activities and emergence of innovative connections are gradually jumping out of single city scale and carried out in the context of new-type metropolitan area level supported by high-speed rail etc. Also, distinguished itself from the innovative metropolitan area based on traditional one, the construction and even formation of regional innovation system in metropolitan area (Xie, 2013) are endowed with a more solid foundation than ever. Against this backdrop, the innovative space gradually grows to be significant, integrated and specialized function space in metropolitan area, works as an important spatial platform to prop up regional innovation system with its thriving presence along the coastal areas in China, especially the area encompassing relatively mature high-speed rail web forming and metropolitan area development, and leads and motivates the right regional “Group Innovation Space”. Thus, bearing distinct laws from other types of space in terms of spatial pattern, spatial characteristics and spatial type and spatial connection, innovative space of metropolitan area is worthy of attention as frontier academic and practical research topic.

The domestic relevant research on innovative city and innovation, however, basically focuses on individual city, based on which corresponding innovation development patterns and experience are put forward. This can be found in Wen (2006)’s innovative city construction pattern of Beijing, Hu (2007)’s innovative city construction pattern of Shenzhen and Shanghai

and Wang (2011)'s innovative city construction experience summary on Tangshan and Shijiazhuang of Hebei Province. Compared with innovative city construction pattern exploration emerging one after another, systematic and comprehensive research on innovative development of metropolitan area and even new-type metropolitan area construction, driven by practical development appeal, has not yet been carried out. With regard to research on innovative space of metropolitan area with specific spatial level, the directly corresponding innovative metropolitan area in particular, as its starting time and popularization are lagging behind innovative city, overall, the innovative development research against metropolitan area largely covers association study under the perspective of industry cluster (Wang, 2001; Zhang, 2009) and industry chain (Yu, 2007). In terms of research concerning innovative metropolitan area construction, a relatively systematic research on concept definition by domestic scholars can be dated back to Wang's Preliminary Study on the Basic Characteristics and Development Mechanism of Innovative Metropolitan Area (2014). According to Wang, the innovative metropolitan area refers to the new-type metropolitan area that forms in the context of regional city integration and within daily commuting time interval, composed of several cities, supported by regional rapid transit network, propped up by regional public innovative service system, and characterized by intercity spreading and sharing and mutual coordination of innovative elements within the area. In the process of presenting relevant literature at home and abroad for innovative metropolitan area, Zhu et al (2014) inherited the connotation of the above-mentioned definition for innovative metropolitan area, and on this basis, proposed possible development directions for the research concerned. Nonetheless, academic gap is still found in terms of the specific pattern research on innovative space in metropolitan area under the perspective of space.

Based on practical development situation and research progress above, this paper, accepting Nanjing Metropolitan Area as specific research case and starting from the perspective of "space" that carries innovative activity and supports innovative development of metropolitan area, probes into the development process, classification, distribution and relation characteristics of innovative space within metropolitan area with specific spatial level, presents its existing development trend and teases out direction for future innovative development. It is attempted to provide practical reference for construction of innovative metropolitan area in Nanjing and other similar metropolitan areas while enriching the research perspective on innovative development in metropolitan area.

2. Development Process and Classification of Innovative Space in Metropolitan Area

As a place for gathering innovative activities, innovative space is a spatial system that is led by knowledge-based economy and takes industrial activities as core content (Zeng, 2007). During constant development of all types of innovative spaces formed in diverse historical stages and different locations of metropolitan area, the innovative space of metropolitan area, a spatial system, comes into being through spreading, expansion and interrelation of each urban innovative space in the metropolitan area. Evolving from individual points to system synergy, from single type to pluralistic types and from simple function to combined functions, the innovative space system of metropolitan area has multiple scales and types.

2.1 Development process of innovative space in metropolitan area

R&D activities are constantly carried out in the modern institution of higher education and science that is available in relevant urban space as a specialized R&D innovative space, yet innovative activities featuring marketization, openness and full chain appeared after the reform and opening up. At the beginning of the reform, as market-oriented innovative activities, echoing national development situation, were mostly seen in all kinds of industrial spaces focusing on development zone and high-tech zone, innovative space failed to emerge as independent spatial type. In the early 1990s, with colleges and universities' "elimination of walls" in the process of marketization, each city in the metropolitan area

started to construct open laboratories, R&D centers and scientific and technological innovation service centers, etc. relying on colleges and universities and research institutions, and construction of incubators in hi-tech zones and enterprise R&D institutions were also applied, which witnessed the germination and formation of specialized innovative space. When it comes to Nanjing, its National ASIC System Engineering Research Center founded in 1992 by relying on Southeast University and National Engineering and Technology Research Center of Forest Chemical Industry established in 1993 by depending on Institute of Chemical Industry of Forest Products in Chinese Academy of Forestry are both regarded as specialized urban innovative space. Hereafter, Incubator was in its infancy, such as Jiangsu Hi-tech Innovation Service Center founded in 1996 followed by Yangzhou, Zhenjiang, Wuhu and Ma'anshan in succession at the end of 1990s, making urban innovative space more multidimensional.

With 21st century witnessing quickening pace of enterprises-universities-researches cooperation and vigorous involvement of scientific research institutions represented by colleges and universities, university science park, among various specialized innovative entrepreneurship carriers and platforms constructed and led by the government, stood out in terms of construction results. Examples include Southeast University Science Park and Gulou Science Park of Nanjing University both established in 2001, the following national university science parks founded by Nanjing University of Science and Technology, Jiangsu University of Science and Technology and other universities one after another, National University Science of Zhenjiang founded in 2008 by relying on Jiangsu University and Jiangsu University of Science and Technology, and University Science Park of Huai'an founded in 2014 by Huai'an through depending on Huaiyin Institute of Technology. During the same period, several science and technology incubators were set up concurrently by cities within Nanjing Metropolitan Area through relying on carriers like newly built university science parks and existing hi-tech zones.

Since 2008, China has showed more concern to independent innovative activities of enterprises, and successively rolled out specific qualification check standard concerning hi-tech enterprises and innovative pilot enterprises etc. As for hi-tech enterprises and with regard to its quantity in each city of Nanjing Metropolitan Area, Nanjing becomes the highlight, with Zhenjiang, Yangzhou and Wuhu falling into the second tier and the rest cities belonging to the third tier (Table 1). This stage also witnessed the rapid development of R&D centers of engineering technology, academician workstations and key laboratories of enterprises.

Table 1: National Hi-Tech Enterprise Quantity in Nanjing Metropolitan Area (Qualified between 2008 and 2013) (Unit: Nos.)

Year	2008	2009	2010	2011	2012	2013	Total
Nanjing	234	182	95	138	168	157	974
Zhenjiang	40	82	44	60	75	100	401
Yangzhou	52	88	71	84	109	95	499
Huai'an	18	15	9	7	43	57	149
Chuzhou	9	11	17	31	28	32	128
Wuhu	145	52	67	55	61	58	438
Ma'anshan	62	21	19	29	35	44	210
Xuancheng	47	15	14	22	22	27	147

Source: the data is organized as per relevant documents on website for the administration of the recognition of hi-tech enterprises in Jiangsu and website for the administration of the recognition of hi-tech enterprises/hi-tech products in Anhui.

To sum up, the innovative space of Nanjing Metropolitan Area roughly undergoes three stages (Figure 1): firstly, the “big space” such as development zone and hi-tech zone took the leadership; secondly, specialized innovative space represented by science parks and incubators was widely spread; in the present stage, small and micro space taking enterprise as innovative activity unit is thriving in cities and regions.

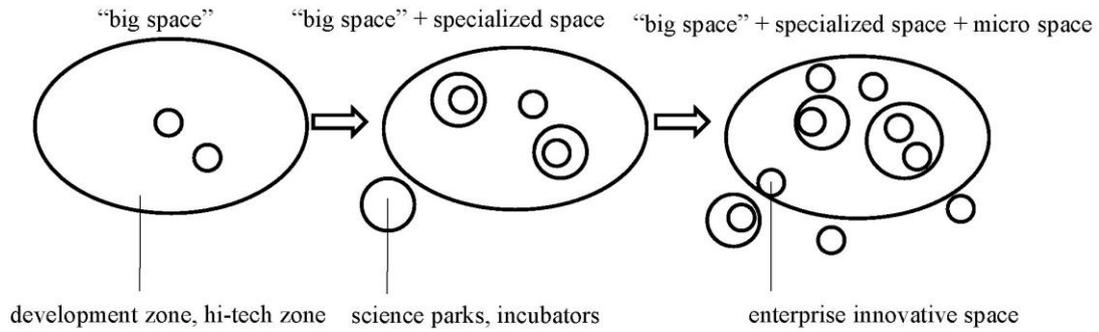


Figure 1: Evolution Schematic of Innovative Space

Source: drawn by the author

2.2 Classification of innovative space in metropolitan area

The innovative space of metropolitan area can be divided into two types by function. One is the “knowledge type” focusing on specialized research, such as academy, institute and key laboratory relying on colleges and universities, major research and development institutions, independent research and development institutions and other units and institutions. The other is the “industry type” highlighting hi-tech industry or innovative enterprise, such as innovative carriers including hi-tech zones, science parks and incubators, and hi-tech enterprises of diverse cities in the metropolitan area (Figure 2).

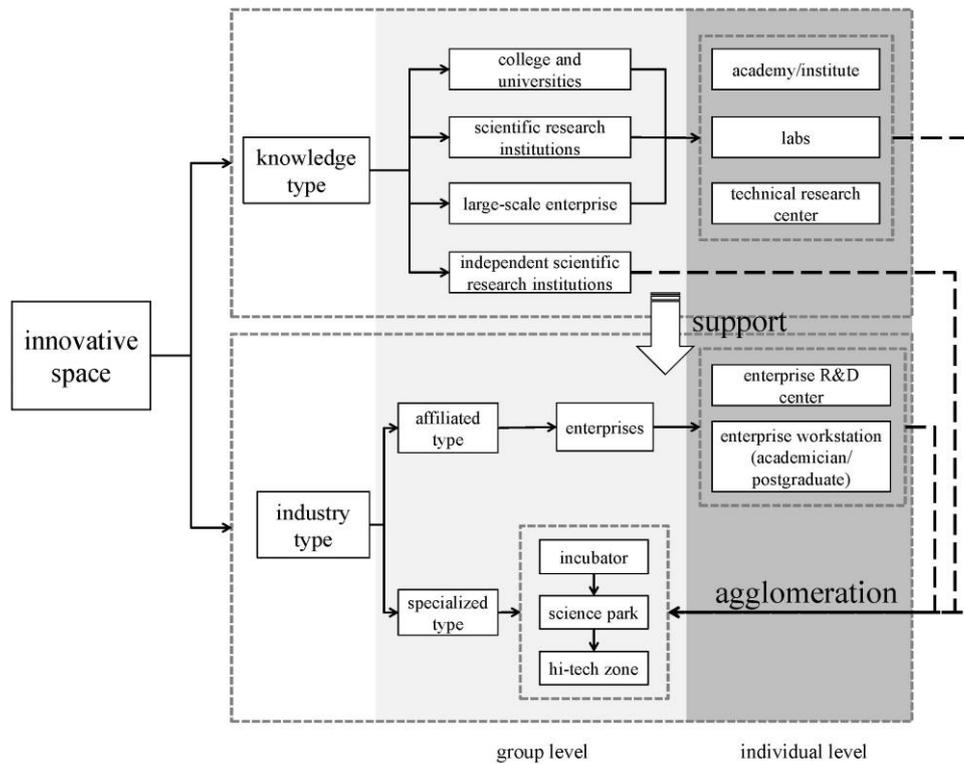


Figure 2: Classification of Innovative Space

Source: drawn by the author

In the aspect of relationship between the two types, “knowledge type” innovation space generally serves as important source of technology for the other type and provides innovative talents and intellectual support necessary to its development. “industry type” innovative space, virtually a specific industrial space, is characterized by the research and production integration with its research directly aiming at specific production activities and market demand.

Based on dimension and distribution pattern of innovative space, “industry type” can be divided into “affiliated type” and “specialized type” organization forms. The former type mainly refers to enterprise R&D centers that have decentralized development and are attached within the enterprise, as well as enterprise-supported various workstations, such as academician workstation and graduate workstation. While the latter type basically refers to industrial parks (including science park, hi-tech zone and science and technology city, etc.) formed by hi-tech enterprises and innovative enterprises that gather within a certain space, or incubators that are independently constructed to promote the progress of innovative enterprises. Meanwhile, the “knowledge type” innovative space, due to its association with the “industry type”, also has the above two organization forms.

As the utilization of internal subspace of the innovative space of Nanjing Metropolitan Area reveals, the content of innovative space varies with type and on the whole, can be divided into R&D, service, infrastructure and ecology, etc., which in turn correspond to diverse subspaces of innovative space, namely R&D space, service space, facility space, ecological space and other spaces (Figure 3). Among them, R&D space constructs the core of the innovative space.

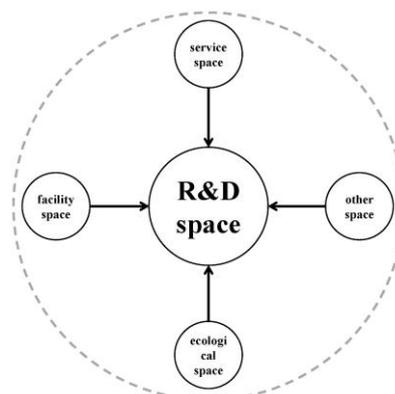


Figure 3: Major Subspaces of Innovative Space

Source: drawn by the author

Here content discrepancy of diverse innovative spaces is discussed (Table 2). As for R&D space, the core space, as main participants differ, the “knowledge type” innovative space basically bears technological innovation function; the “specialized” “industry type” innovative space bears multiple functions covering scientific innovation, production and management and “affiliated” one mainly assumes the R&D function for manufacturing supplies. When supporting space is concerned, “knowledge type” innovative space possesses living supplies & services function such as catering, leisure, education and training; the “specialized” “industry type” innovative space undertakes a series of manufacturing supplies & services function besides living supplies & services function, with partial innovative space equipped with settlement function and incubators having specialization function such as

entrepreneurship nursery, accelerator and pilot plant; the “affiliated” “industry type” innovative space, attached within enterprise, has no specialized supporting service space. In terms of the content for infrastructure space and ecological space, each type of innovative space is basically the same.

Table 2: Main Content Undertaken by Subspaces within Innovative Space

Space Type	R&D space	Supporting space			
		Service space	Infantries space	Ecological space	Other spaces
Knowledge type	Mainly for technological innovation function	Mainly for living supplies & services function, such as catering, leisure, education and training, etc.			Partially equipped with settlement function
	Specialized type	Integration of scientific innovation, production and management	living supplies & services functions such as catering, shopping, leisure, education and training, and manufacturing supplies & services function such as investment attraction, entrepreneur services, investment credit and legal consulting.	Supporting facilities such as road, parking, municipal engineering and demanding information network infrastructure	Green space and water system, etc. Concurrently bearing specialization function such as entrepreneurship nursery, accelerator and pilot plant, and partially equipped with settlement function
Affiliated type	Mainly for R&D function of manufacturing supplies	Being relatively independent, relevant supporting service is offered by the supporting enterprise			

Source: organized by the author

3. Distribution Pattern and Relation Characteristics of Innovative Space in Metropolitan Space

Along with the speeding up of integration process of metropolitan area and reinforcement of spatial relation, each type of innovative space above emerging and developing in diverse cities within metropolitan area gradually grows to be a regional specialized innovative space system enjoying close interrelation. This system, in the aspect of overall spatial pattern and spatial interrelation, presents its unique characteristics that are distinguished itself from innovative space of single city and other types of function spaces in metropolitan area.

3.1 Distribution pattern of the innovative space in metropolitan area

The research divides the innovative space of cities in Nanjing Metropolitan Area into “affiliated type” and “specialized type” and holds independent data collection. The analysis object of former type basically involves key laboratory, engineering technology research center, enterprise R&D center represented by high-tech enterprises and innovative pilot enterprises and academician workstation; the latter type mainly selects colleges and universities, incubators and hi-tech zones as object. Relevant basic data is obtained from statistics issued on official websites by the end of 2013 (incubator data by the middle of 2014) such as statistical bureaus, science and technology agencies and the administration of the

recognition of hi-tech enterprises in Jiangsu and Anhui Provinces, Jiangsu Technology Business Incubation Association and Jiangsu Scientific and Technological Innovations Platform.

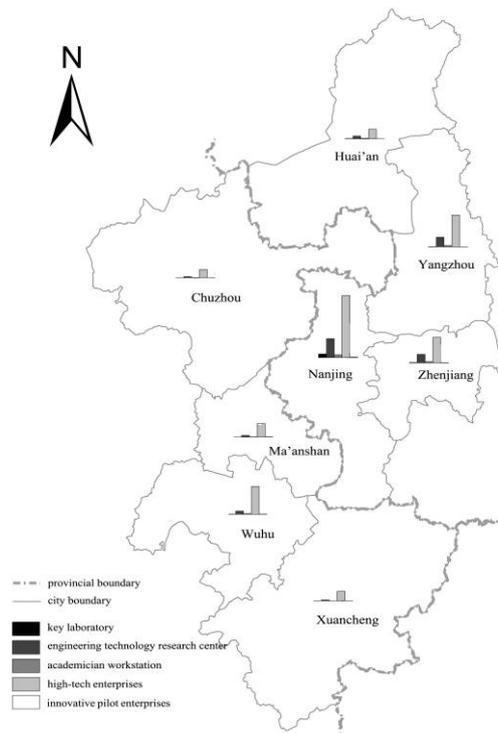


Figure 4: Quantity and Distribution of Innovative Space at Individual Level

Source: drawn by the author as per relevant data

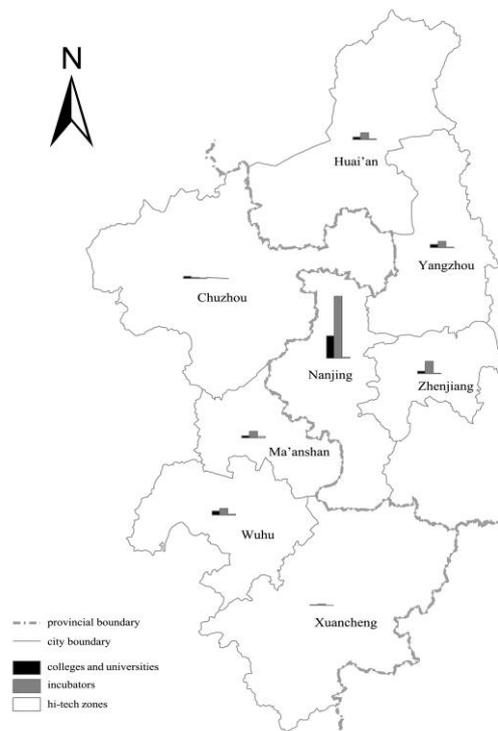


Figure 5: Quantity and Distribution of Innovative Space at Group Level

Source: drawn by the author as per relevant data

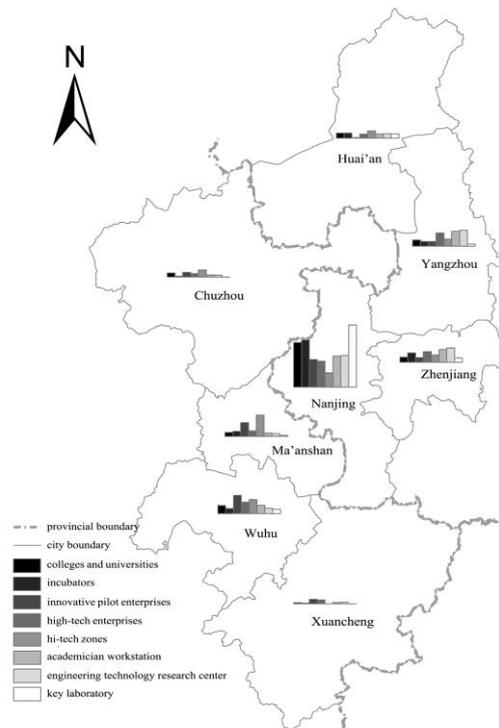


Figure 6: Innovative Space Percentage of Respective Total

Source: drawn by the author as per relevant data

In combination with the current distribution status of innovative space in Nanjing Metropolitan Area (Figures 4~6), two characteristics are found in terms of the distribution pattern:

1) The distribution pattern of innovative space is basically consistent with the general spatial structure described in metropolitan area planning. The innovative space of Nanjing Metropolitan Area, mainly lying along five riverside cities, forms a innovative space distribution zone of metropolitan area with Nanjing as the core and Nanjing-Zhenjiang-Yangzhou as the main part. The total quantity of innovative space in Nanjing, Zhenjiang, Yangzhou, Ma'anshan and Wuhu accounts for 86.9% of the whole metropolitan area, among which Nanjing, the core city, dominates the other cities in terms of innovative space quantity percentage of the total, both individual and group levels. Chuzhou, Xuancheng and Huai'an to the north and south wings of Nanjing Metropolitan Area have relatively fewer innovative spaces. Besides, in this metropolitan area, cities in Jiangsu Province exceed cities in Anhui Province concerning innovative space quantity. The distribution characteristics peculiar to Nanjing Metropolitan Area is generally the same as the general spatial structure of "one core, one belt, one area and four districts" described in regional planning of Nanjing Metropolitan Area.

2) The distinct difference in innovative space quantity among provinces and cities somewhat resembles the economic and social development level pattern. Inside Nanjing Metropolitan Area, cities with higher economic and social development level have larger quantity and more complete types of innovative space, as can be seen in its core city-Nanjing, which boasts of the highest economic and social development level, abundant innovative development resources, largest innovative space quantity with partial type of innovative space presenting highly concentrated status, such as incubators and key labs. Thus it can be seen that Nanjing serves as the core of both Nanjing Metropolitan Area development and innovative space concentration in the area; Yangzhou and Zhenjiang follow, along with Nanjing accounting for 67.8% of the total innovative space quantity in the whole metropolitan area; Wuhu and Ma'anshan stand next, reaching 12.8% and 6.4% of the total respectively.

Judged from the quantity and scale comparison of diverse innovative space objects in Nanjing Metropolitan Area, the quantity and scale advantage is obvious in incubator development for “specialized type” of “industry type” innovative space, engineering and technical research center for “knowledge type” innovative space, and hi-tech enterprises for “affiliated type” of “industry type” innovative space.

3.2 Relation characteristics of innovative space in metropolitan area

In metropolitan area, the relation and interaction of innovative space lay the foundation of its integration pattern. During the analysis on innovative space relation within Nanjing Metropolitan Area, the research, based on survey results of main business partners' location of 150 hi-tech enterprises in Nanjing, presents the innovative space relation within Nanjing and inter-city innovative relation between Nanjing and other cities in the metropolitan area, and spots the following laws:

In Nanjing Metropolitan Area, innovative relation inside the city is relatively closer than that among cities; with riverside cities standing out, the inter-city innovative relation can be roughly divided into three grades that exactly resemble the characteristics of innovative space distribution pattern within Nanjing Metropolitan Area. Zhenjiang and Yangzhou fall into the first grade and along with Nanjing form the concentrated innovative space zone of the metropolitan area, Wuhu, Ma'anshan, Huai'an belong to the second grade, and Chuzhou and Xuancheng stand in the third grade (Figure 7).

Meanwhile, among main factors (each enterprise chooses three most important factors) considered when selecting partners by the surveyed enterprises, location and policy conditions win the greatest concern, while traditional factors such as spatial distance and traffic exert very limited influence (Figure 8). The value of soft environment concerning relevant supporting policies is thus highlighted in terms of correlation and interaction of innovation space in metropolitan area.

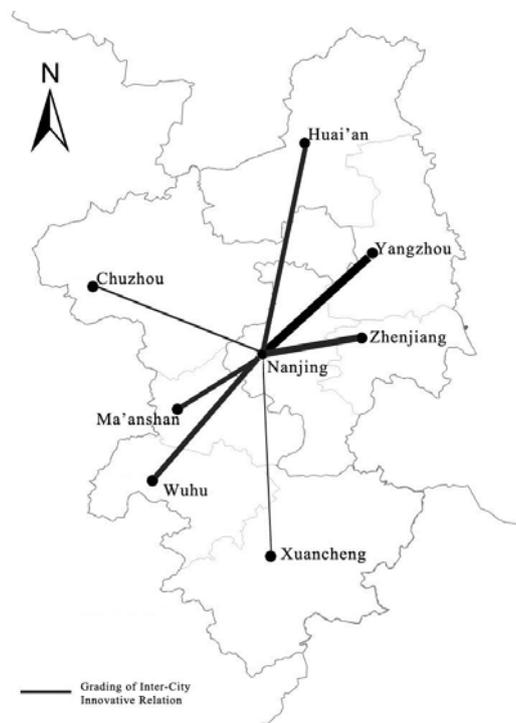


Figure 7: Grading of Inter-City Innovative Relation

Note: drawn by the author; the line thickness shows the degree of innovative relation.

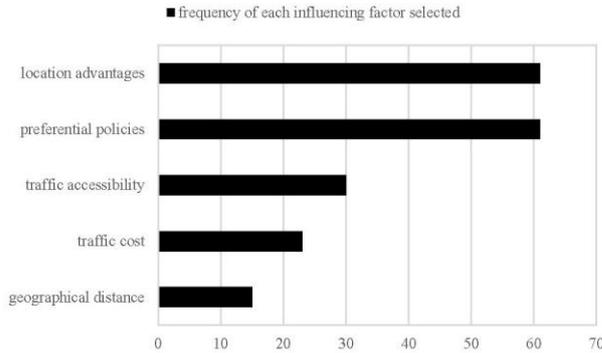


Figure 8: Factors Affecting Inter-City Innovative Relation

Source: drawn by the author as per relevant data

4. Development Trend and Direction of Innovative Space in Metropolitan Area

While presenting its unique distribution pattern and relation characteristics, the innovative space of Nanjing Metropolitan Area takes new development trends on space organization, development direction and action priority, which points out significant directions for pattern and function optimization of innovative space in metropolitan area as well.

4.1 Ring-structured network of space organization

Compared with other cities inside the metropolitan area, the core city bears the innovative development elements with maximum quantity and most complete variety, among which the innovative talents, the key element in urban and regional innovation development, is of particular concern. Relying on specific space, the innovative talents agglomeration gives rise to abundant innovative carriers, leading to the development pattern that taking core city as innovative “center” at metropolitan area level. In this pattern, the non-core cities in the metropolitan area largely depend on the agglomeration effect of their own innovative elements and innovative talents and their activities, meanwhile, the spillover effect of the core city also mobilizes the non-core cities’ innovative development (Figure 9).

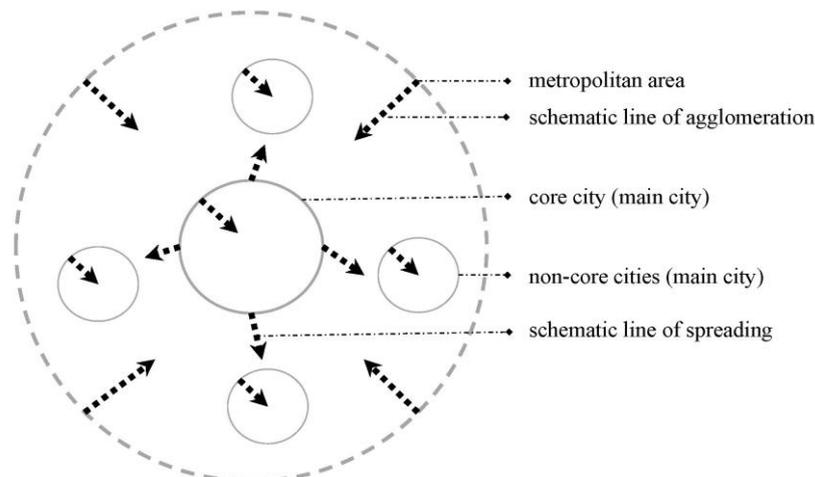


Figure 9: Agglomeration and Spreading Effect Schematic for Innovative Elements & Talents and Their Activities of Cities Within Metropolitan Area

Source: drawn by the author

In the metropolitan area, as the innovative carrier supporting agglomeration and spreading of innovative elements & innovative talents and their activities, its “network” organization can be seen from two aspects (Figure 10). Firstly, the innovative carrier presents ring structure

spreading and integration from downtown area of core city toward sub-cities and even peripheral suburbs. Currently, as for the innovative carrier that gathers innovative talents such as hi-tech enterprises and innovative pilot enterprises in Nanjing, its distribution density assumes a center-periphery decline trend, with the highest enterprise distribution density seen in main city, the old town in particular and the relatively lower density in peripheral suburbs. Meanwhile, responding to the advocacy of park and zone urban enterprises, new increasing enterprises in Nanjing gradually start to spread from main city to production zone like development zone and hi-tech zone, enabling surrounding Jiangning District, Pukou District and Luhe District to enjoy dense distribution of new hi-tech and innovative pilot enterprises based on the zone carrier. Besides, accompanying the constantly consolidated relation and integration of innovative activities between the core region and surrounding area, the systematic process of innovative space at metropolitan area level unceasingly quickens its space. Secondly, at the metropolitan level, thanks to the increasingly perfect inter-city highspeed line construction and increasingly strong urban integration appeal, innovative talents, the key element in urban and regional innovative progress, lead other innovative elements, making “Self-Innovation” of cities within metropolitan area evolve into “Multi-Joint Innovation” of several cities at metropolitan area level. This constructs the important content of guiding the innovative elements & innovative talents and their activities of core city, and planning innovative space as a whole.

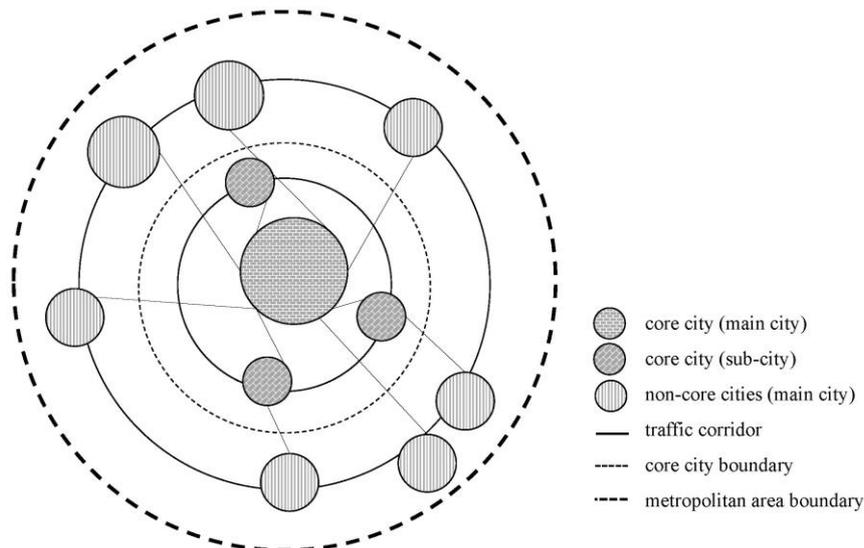


Figure 10: Schematic for Ring-Structured “Network” Organization of Innovative Activity Unit and Its Carrier Space in Metropolitan Area

Source: drawn by the author

4.2 Hierarchical complementarity of element configuration

The “network” organization guidance of innovative space paves spatial bearing foundation for the spreading mode of promoting and boosting innovative elements in metropolitan area by taking core city as innovative core. Yet to address the present situation of unbalanced agglomeration of internal innovative elements and innovative capability, and unsystematic innovative space in metropolitan area, it is crucial to create a function-space interconnected innovative carrier network, and to determine the reciprocal role and development direction of the core city and non-core cities in metropolitan area.

Although the core city in Nanjing Metropolitan Area holds overwhelming superiority in quantity of innovative talents, innovative enterprises and innovative carriers, it is noted that non-core cities keep rapid and continuous follow-up pace and ascending trend in relative quantity despite of its inferior position in absolute quantity. Taking hi-tech enterprises as

instance, the 2008-2012 development trend between the core city-Nanjing and non-core cities-Zhenjiang, Yangzhou and Huai'an in metropolitan area shows, compared with the core city-Nanjing, hi-tech enterprise quantity of non-core cities enjoys a higher growth rate (Figure 11) and increasing proportion trend. This trend thus indicates the development direction of internal cities of Nanjing Metropolitan Area for future innovative space and its innovative talents and activities. That is to highlight the radiation effect of the core city on innovative progress of non-core cities in addition to its leading position in metropolitan area, and capitalize on the trend by bringing out core city's strengths to make up for non-core cities' weaknesses, helping innovative element mobility and innovative activity at metropolitan area level to form an integrated development pattern with hierarchical complementarity between core city and non-core cities.

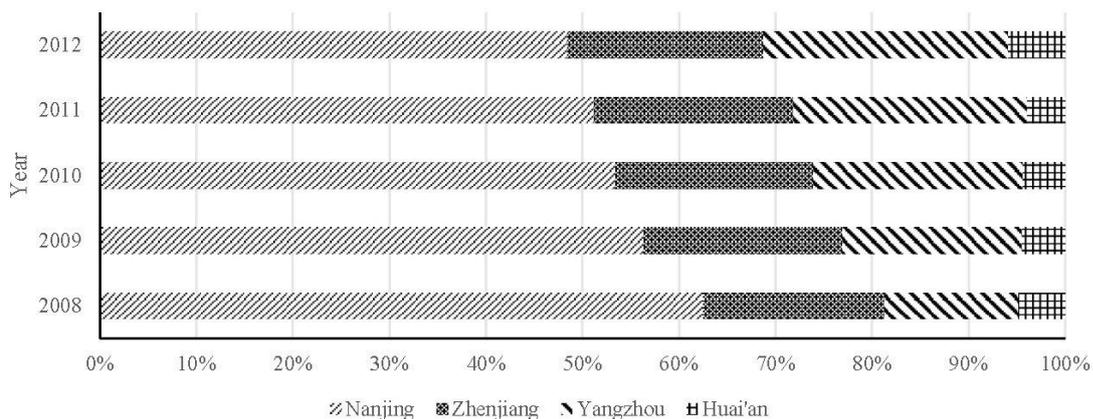


Figure 11: Relative Proportion Changes of Hi-Tech Enterprises in Some Internal Cities of Nanjing Metropolitan Area

Source: drawn by the author as per relevant data

4.3 Substantial innovation of “two-innovation” platforms

The agglomeration in innovative carrier form for innovative elements & innovative talents and their activities in specific location within cities lay the foundation for formation of innovative carrier network of innovative metropolitan area. It is also noted that, innovative carrier development of cities within Nanjing Metropolitan Area is fruitful as mentioned above, and partial innovative spaces bear the intention of carrying innovative activities, yet the intention is hard to realize due to relevant conditions' limit. One innovation park (Figure 12), for example, is founded for attracting university graduates by preferential policies of the government such as cheap factory rent, venture fund and social insurance subsidies. But the overall low-end industry category and immature infrastructure and public service construction fail to exert the agglomeration effect of innovative talents and enterprises. This kind of phenomenon is more common in county unit of metropolitan area. As for development level and basic conditions in the county unit of Nanjing Metropolitan Area, the attraction and agglomeration capacity for innovative elements, especially the core element-human resources represented by innovative talents, are quite limited, thus, several carriers named after innovation park or scientific research center are virtually plants or workshops engaged in processing and manufacturing, such as Quanjiao Shizi Town Phoenix Nest Pioneer Park (Figure 13).



Figure 12: Chuzhou Innovation Park for University Students

Source: photo taken by the author



Figure 13: View of Quanjiao Shizi Town Phoenix Nest Pioneer Park

Source: photos taken by the author

In allusion to the partial misplacement state of current innovative carrier construction in Nanjing Metropolitan Area, the government, as the guidance subject of innovative space and its innovative element and innovative activity, needs to hold systematic survey and sorting for internal innovative carrier construction situation. For one thing, based on development conditions, effects and significance, apply optional removal or transformation and upgrading guide for carrier space without virtual innovative content; for another, set up grading, classification guide standards and specifications for innovative carriers to enable information intercommunication at metropolitan area level and gradient hierarchy. Things worthy of particular concern is that, based on reality of marginal and low-hierarchy nodes in metropolitan area, the government shall promote the development of its innovative function and mutual fusion with the core innovative space of metropolitan area, attempting to realize “two innovation” platforms interaction within metropolitan area, lead entrepreneurial space toward innovative entrepreneurial space in real sense, and boost perfection of the whole innovative space system in metropolitan area.

5. Conclusion

As integrated innovative space at metropolitan area level currently takes shape, this functional space type, under the impetus of regional integration, urban transformation development and innovation-driven development strategy, may gradually evolve into a symbolic space presenting development level and comprehensive competitiveness of new-type metropolitan area. Based on pragmatic survey, the paper summarizes and proposes relevant laws, types and models, and trends, etc., initially exhibiting the developing state of

the space as such. With in-depth research by expanding case study and research scope and depending on systematic data subsequently, it is hoped to explore more universal and stable inherent development law and mechanism and provide scientific support for the integral space research on innovative metropolitan area, as well as scientific basis for planning of innovative space system.

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References:

- Hu, Yu. (2007), Connotation, “Experiences and Ways of Constructing Innovative City”, China Soft Science, No.4 (4)
- Wang, Jici. (2001), Innovative Spaces: Enterprise Clusters and Regional Development, Beijing: Beijing University Press
- Wang, Wei, Deng, Xuelai. (2001), “Hebei Innovative City Construction Theory and Practice Research”, Proceedings of the Sixth Conference on Technology and Management, Beijing
- Wang, Xingping. (2014), “Preliminary Study on the Basic Characteristics and Development Mechanism of Innovative Metropolitan Area”, Social Sciences in Nanjing, No.4 (4)
- Wen, Xiaoling. (2006), “Exploration on Construction of Domestic Innovative Cities”, Qian Xian, No.2 (2)
- Xie, Xuemei. Liu, Siyu. (2013), “Evolution of Synergic Innovation Under Middle-perspective for Metropolitan Region”, Editorial Committee of Economic Geography, No.2 (2)
- Yu, Bin, Zeng, Juxin, Luo, Jing. (2007), “Regional Competitive Advantage and Spatial Organization Innovation of Specific Industry—Take the Wuhan City Encloses as Example”, Journal of Huazhong Normal University, No.2 (2)
- Zeng, Peng. (2007), The Research of Urban Innovation Space Theory and the Development Mode, Tianjin: Tianjin University
- Zhang, Hong. (2009), “Study on Rigorous Relationship of Innovative Urban Agglomeration Coupling with Industry Cluster”, Journal of Xiangtan Normal University, No.1(1)
- Zhu, Kai. Hu, Pan. Wang, Xingping. Li, Yingcheng. (2014), “Innovative Metropolitan Area Development Orientation and Research Attainments in China—Improvement of Innovative City and Transformation of Traditional Metropolitan Area”, Economic Geography, No.6(6)

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The Research of Spatial Form in Xinjiang Vernacular Settlement

Focuses on Water Resources

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This article selects several typical vernacular settlements in Xinjiang as research subjects, focuses on the use of water resources in the settlement. This research has studied the impact and interaction of the location, spatial form, functional layout and other aspects in the vernacular settlements, which are caused by the water resources, discuss the conventional wisdom in the country-construction. Finally summarizes the relationship between water resources and settlement construction, to give further guidance on how to use water resources in future, and maximize the effectiveness of resources using. This research may create contemporary reference and make reference to recommendations in the settlement construction of arid regions.

Key words: Spatial form; water resources; vernacular settlement; arid regions

I. Related Concept

1. Concept of Arid Region

Arid region is a kind of land area where ordinary crops or plants can't normally grow up and desertification is potential due to dry climate. However, there are still no uniform cognitions on the range and limit of arid region in the world. In 1955, UNESCO classified the area where rainfall amount is under 10 in (about 250 mm) to be "arid" and the area where rainfall amount is between 10 to 20 in (about 250-500 mm) to "semiarid".

China mainly adopts method of dividing annual precipitation, which usually zones the area with annual precipitation under 200 mm as arid region and the area with annual precipitation between 200 to 500 mm as semiarid. The arid and semiarid regions of China occupy 52.5% of land throughout the country.

2. Concept of Vernacular Settlement

Settlement, "聚落", this word has already appeared in Han Dynasty in China. The settlement in the ancient book of Han Dynasty refers to one of human inhabitation's spatial scale unit—village, which is different from "county" and "city". In the contemporary era, researches on settlement involve multiply subjects: geography, ethnology, archaeology and sociology and etc., as the emphasis on definition of settlement varies from subject to subject.

Chinese scholar Song Jinping pointed out that "settlement originally refers to the place where people live. Settlement is the center of human activities, as it is not only a place where people dwell, rest and conduct various kinds of activities, but also a place for them carrying out labor production." Kuo Chaolee, a professor of Taipei University, put forward that settlement is a community of human life, including four parts: firstly, the communication relationship established by the people living there; secondly, the essential physical space for this community; thirdly, the balance between the above physical space and ecological environment; fourthly, the meaning of values of entirety and culture. The concept of settlement in this paper is generalized, including three aspects: town cluster, village and individual building.

The vernacular settlement in this paper refers to the indigenous farming settlement after long-term development in vernacular environment. The features of vernacular settlement are as follows:

- 1) Especially refers to the traditional farming settlement in villages outside of cities—corresponding to the characteristic of traditional settlement;
- 2) Local and regional settlements—corresponding to foreign and exotic one;
- 3) Vernacular settlement is traditional with a long history—corresponding to rising and new-style settlement;
- 4) Settlement with a certain closure depends quite much on regional resources—corresponding to internationally open settlement;
- 5) The users, founders and investors of the vernacular settlement are all residents in the settlement as an organic whole.

4. Concept of Settlement Pattern

In researches of human geography, settlement pattern “refers to plane modality and organization structure form of settlement. It can reflect the intimate connection between settlement and environment, that is, different environmental conditions generate different settlement forms.” As for the settlement pattern in archaeology, the most famous definition is given by Gordon R. Willey, an American scholar, in the discourse at the beginning of the book *Prehistoric Settlement Patterns in the Viru Valley*: “settlement pattern’ this phrase can be explained as the method how human beings settle themselves in places where they live. It includes the arrangement of buildings, nature and processing modes of other buildings related to group life. These settlements reflect natural environments, technological levels of builders and all social interaction and control system possessed by this culture.”

II. Summary of the research about related theories

The research on the vernacular settlement of Xinjiang began in the 1980s in China. Totally, former research on settlement-construction of arid regions in China involves four respects: The research of arid region in northwest and oasis settlement on macro-level, the research of Xinjiang vernacular settlements or characteristics of local traditional buildings on micro-level, the research of constitution patterns of the Oasis Settlement in Xinjiang from the perspective of local resources constraints, and comparative study of Xinjiang vernacular settlements. The research above bases on different perspective, and the study on the influences of the area’s most scarce resource –water, is throughout all levels of the research of constitution patterns. But the relationship between water resources and spatial form of settlement needs more detailed, in-depth study.

Han Delin, professor of Xinjiang Institute of Ecology and Chinese academy of sciences, has research on Arid Land Geography for years. He has finished research about the advantages and disadvantages of the arid region and local resources in Xinjiang, studied on the climate, soil, water, flora, fauna, mineral resources respectively, and proposed methods for rational use of these resource. He also put other resources such as Human resources, characteristics of agricultural products, industrial products into the category of resource development, that provided new ideas for the development of region.

Oasis is the material space carrier of settlement in arid region. The research of arid region in Northwest China are mostly concentrated in the study of arid area of oasis settlements related issues.

III. Spatial Distribution Evolution of Vernacular Settlement

1. Xinjiang—the representative of arid regions in China

The Xinjiang Uygur Autonomous Region, in the middle part of Eurasia, as the area is about 1660 thousand square kilometers, which is 1/6 of Chinese territory and the biggest province in China. It is about 7 times the Britain's national territorial area and triple that of France.

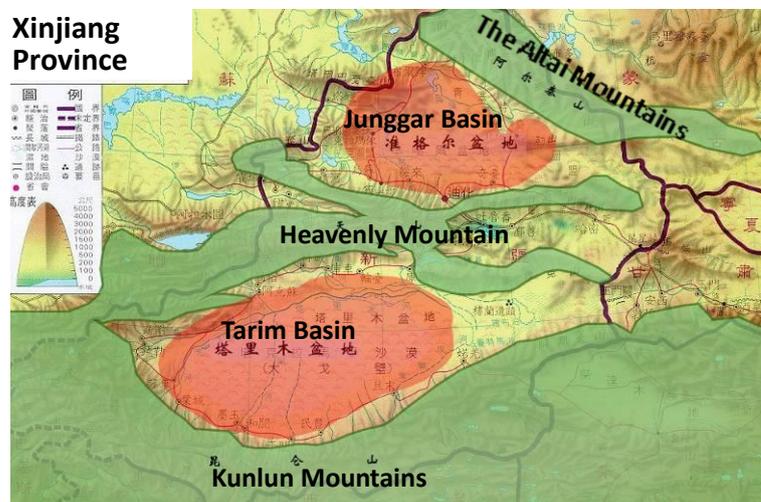
Xinjiang's droughty natural environment has to be traced back to the geological evolution process lasting billions of years. From the simian period which is 2.5 billion years before to now, continent of Xinjiang has gone through the alternation of sea and land, till Heavenly Mountain, the Altai Mountains and Kunlun Mountains folded, which blocked the Tarim Basin and Junggar Basin at south and north respectively with them, forming the famous geographical pattern of "two basins in between three mountains" of Xinjiang. Besides the two big basins, intermountain basins, valleys and open terrains at the mouth of valleys in different sizes and shapes also took shape in the mountain system, as the ice and snow on mountains melted and threw themselves into runoffs, forming an appreciable quantity of river valleys and alluvial fans in Xinjiang.

Since Xinjiang, far from ocean and surrounded by mountains, becomes the most arid region in China and Tarim Basin is one of the extremely arid regions which are rare in the world. However, because the two basins are surrounded by mountainous regions, some moisture in the atmosphere can be taken in to make them wet islands in desert and headstream of various rivers in Xinjiang,

becoming conditions human, agriculture, forestry, animal husbandry and fishery industry depend on in this arid basin. Under the combined action of elements like arid climate and geomorphology, the geographical landscape of "wet islands within high mountainous regions, irrigation agriculture of oasis in dry desert" and unique utilization of land are combined.



Location of Xinjiang Uygur Autonomous Region

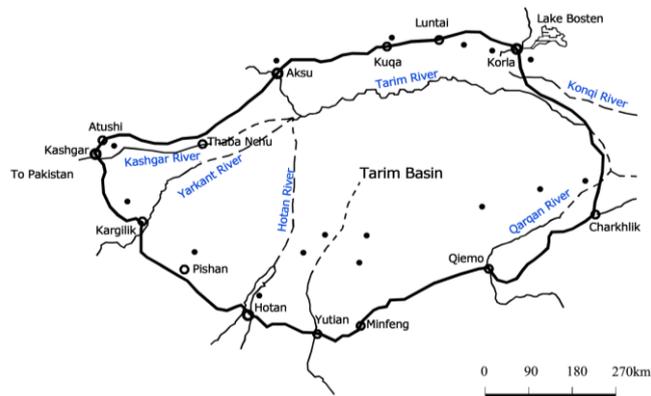


The "three mountains & two basins" of Xinjiang

1. Morphological Evolution of Xinjiang's Vernacular Settlement Space on Macroscopic Level

(1) The formation of ancient villages in primitive period

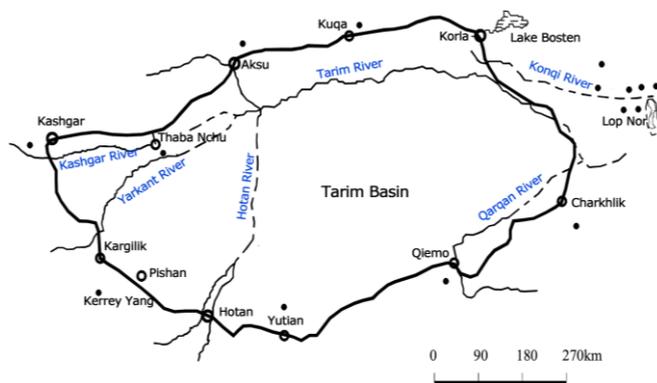
In the Neolithic age, about six or seven thousand years before, Xinjiang (which was called the western regions then) was in the stage of matriarchal society; men's status in production didn't change and patriarchal society neither formed till 5000 years ago. Faced with bad natural environment and attack of beasts, people voluntarily lived together in communities, forming the original social groups. They began either to flow or select settlement areas semi-sedentarily, as the human settlements formed by social groups symbolize the budding settlement and also the most original villages. About 3000 years, agricultural production, land development and settlement construction combining husbandry appeared in some areas at south of Heavenly Mountain and clans settled here; while people at north side of Heavenly Mountain still led a nomadic life.



Settlements of "countries with walls" in the period of Han dynasty

(2) Settlements of "countries with walls" in the period of Han dynasties

In the western Han Dynasty, "countries with walls" taking thirty-six countries in the Western Regions as principal had already taken shape in south Xinjiang, as the central government set governors for the area. In the famous period of "thirty-six countries in the Western Regions", the Western Regions also reinforced their connection with Han Dynasty's central government. According to historical data, travel notes and archaeology on relics, the thirty-six countries in the Western Han Dynasty are cities of a certain scale, as their names specifically recorded in the Annotation of Han Shu Commentaries on the Western Regions by Xu Song (Qing Dynasty); it is recorded that: "the regimes in the Western Regions are led by aborigines with city walls, outer walls, farmlands and livestock", as the countries mentioned here are basis of settlements in cities and towns at modern times in Xinjiang.



Distribution of the original settlements in Tarim Basin

(3) Confirmation of the settlement system development from Tang and Song dynasties to Qing dynasty

In Tang dynasty, the system of prefectures and counties was implemented in the eastern Xinjiang; in the medium stage of Tang Dynasty, Anxi and North Court supervision offices were

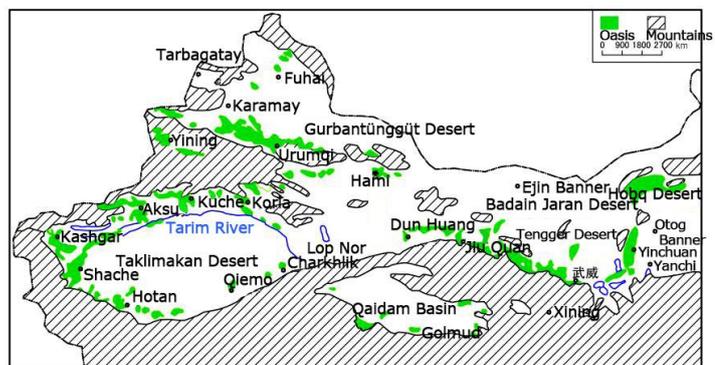
founded respectively in Guici and Tingzhou, as the urban system was differentiated hierarchically. Till Emperor Kangxi in Qing Dynasty, Xinjiang was united and a general's office was established in Yili; meanwhile, "Nine Cities in Yili" (Huiyuan, Ningyuan, Huining, Xichun, Suining, Guangren, Zhande, Gongchen and Taleqi) were built; provincial commander-in-chief in Urumchi which was named as Dihua and set in the middle part of Xinjiang, gradually establishing the economically and politically dominating status in Xinjiang, realizing the transfer of the original core of Xinjiang settlements from south to north Xinjiang.

Besides the establishment of the dominating city, the trade between towns in Xinjiang in Qing Dynasty was also rapidly developed, as a large amount of trade centers and logistic distributing centers sprung up and Xinjiang at this time also became a rich land desired by people living in central China. Till then, the urban system in Xinjiang region has already basically taken shape, and cities and towns are different in functions with a clear hierarchy.

(4) Spatial distribution of Xinjiang's vernacular settlements in modern times

Up to now, the settlement system in Xinjiang has already taken shape and settlements of all levels scatter in those oases.

As vernacular settlements are native-born farming settlements after long-term development in vernacular environment, they are different from modern cities and towns in oases. After a long history, vernacular settlements are rare to be seen now and treasures integrating traditional construction wisdom in building construction of dwellings.

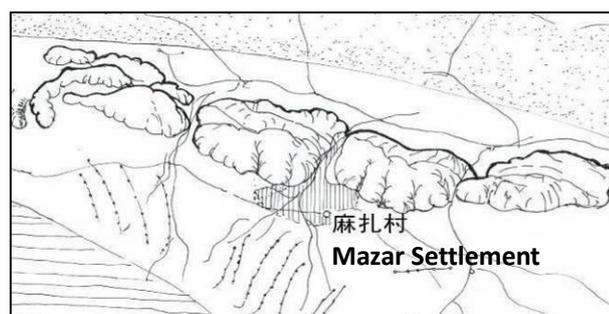


Distribution of oasis in China

IV. Morphological Characteristics of Settlement Space Influenced by Water Resource

1. Vernacular Settlements in Eastern Xinjiang

Turpan-Hami region is a representative area of eastern Xinjiang and the vernacular settlements in Turpan oasis are outstanding ones in eastern Xinjiang. When it comes to the settlements in Turpan area, the Mountain of Flames has to be mentioned. The reason why the Mountain of Flames which is 50 kilometers long and 2 to 4 kilometers wide is known to people is because its mystery and romance rendered in the literature Pilgrimage to the West. In the story, an eminent monk in Tang Dynasty went on a pilgrimage westwards for Buddhist scriptures and was hindered by a mountain of flames, which burning along day long and was too hot for grass to grow.



the location of Tuyugou Canyon

Tuyugou Great Canyon is the most famous gullies among mountain chains in the Mountain of Flames and the middle one among those gullies. At the south mouth of the gully, there is a stream formed by mountain spring, which is exactly the water to nourish oases in valleys. Mazar Village settlement is located at the oases of alluvial-diluvial fan formed out of river system washing the Mountain of Flames at the gully mouth.

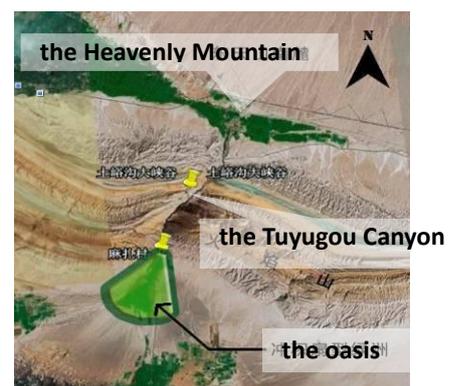
From the water resource of settlement, Mazar Settlement, located at the south entry of Tuyugou Great Canyon of the Mountain of Flames, lies in the alluvial-diluvial fan formed by Ertanggou river water system's action on the Mountain of Flames. Ertanggou River is stream of subsurface flow in the Heavenly Mountain; it meets with the Mountain of Flames on its way to the south and then ascends to be surface water near the north of the mountain and incises the Mountain of Flames at middle of it, forming the Tuyugou Great Canyon, which is 8 km long, 1 km wide on average and more than 100 meters deep. The villages in the whole Tuyugou oasis depend on branch river system of Ertanggou Channel in Heavenly Mountain' river system, and develop into typical oasis-type villages feeding on Heavenly Mountain' and the Mountain of Flames' river systems.

The only natural river system in Mazar Village is a river mainly formed by underground water supplied by ice and snow melting water and fountains in Gobi, while the name of the river has no way to be studied and is simply "great river" by local people. Its annual runoff is about 8000 to 9000 m³ and it is the main water source for agricultural irrigation in the whole village . As a traditional farming settlement, Mazar Village's agriculture depends much on water resource when it retains the traditional oasis farming, which can be seen from river system of settlement and spatial distribution of farming land. Corresponding to the scarce water resource in arid regions, people there mainly plant industrial crops with lower water consumption rate, like grape, watermelon and cotton.

2. Water and Site Selection of Settlement

Gullies of the Mountain of Flames with beautiful sceneries are selected to be the site for settlement, as villages surrounded by peaks are protected by natural shields. To some extent, baking-hot air from the outside in summer is blocked by terrain of gully and settlements there are just like being cooled down by a natural air-conditioner. The wind energy resource at the foot of the Mountain of Flames is abundant and it was mostly windy there. Mountains can block gales and form natural airflow by means of the long and narrow gully terrain, making the air in the settlement smooth and circulated. On account of the appropriate response of site selection to climatic features, when you go into the villages in hot summer, you can see pleasant scenes of trees shading the streets beside rivers and mountain foot.

When the river flows into the wide desert and Gobi district after the south mouth of gully, the gradient of riverbed immediately decreases and flow velocity declines, so that massive fragmentary materials contained in it heap up at the mountain exit position, forming a fan-shaped alluvial fan landform with gully mouth as a summit. There is a distinct distribution



The oasis at the alluvial fan

rule in the composition materials in alluvial fan, divided into fanhead, middle part and edge of fan three parts from up to down on geomorphology.



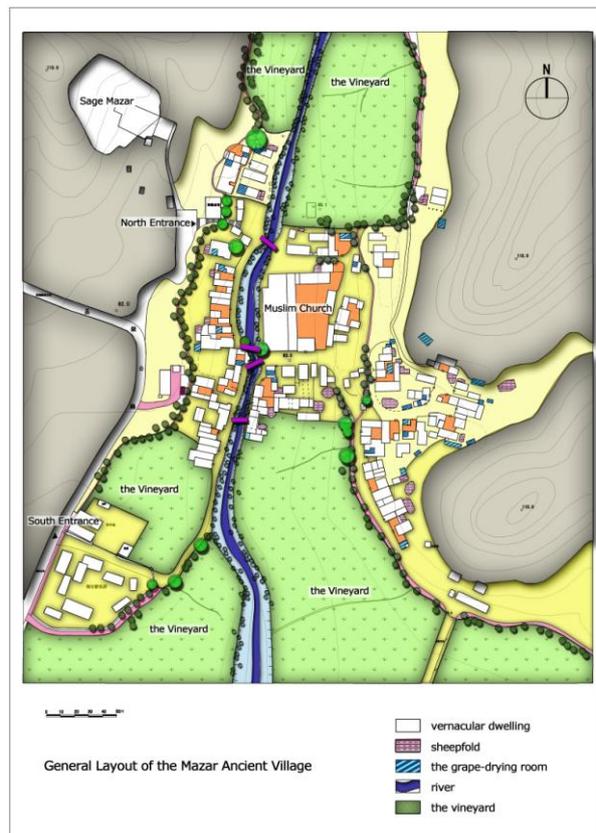
the settlement is at the head of alluvial fan

The edge of fan is excellent for the water and land resources there due to the flat grade, thick soil layer and overflowing underground water, gradually forming patches of alluvial-fan oases. The ancient Mazar Village was at the head of alluvial fan.

2. Water and Settlement's Plane Modality

The plane modality of Mazar Village's settlement is parallel to the contour lines of mountains and the nest-like form of river system in valley on the whole. On the basis of rational selection of sites, the plane layout form of villages is especially important. The integrated layout of settlements in Mazar Village should be integrated with the mountain terrain of gullies to the best, as the buildings along with flow and mountain in the narrow river valley are located along with contour line, presenting the relationship complying with mountains and water system on north-south direction. The "Great River" flows through the village from south to north, dividing the settlements to be two approximately equal parts at east and west sides.

On the direction of river flow, the settlements can generally divided into three sections from the north to south, as the upstream and downstream of the rivers covers vast vinelands, and the middle part is for building groups. They are arranged on lands at two sides of the river, trying to spare more flat land for farming. The agriculture of Mazar Village is mainly for grape, so that melons and fruits can be seen everywhere in the village in summer. In this kind of plane modality, residents live at the two sides of the river, fronting water and with hills on the back, as the north and south parts are connected with cultivated land. That dwelling districts distributed in ribbon pattern along river system guarantees the

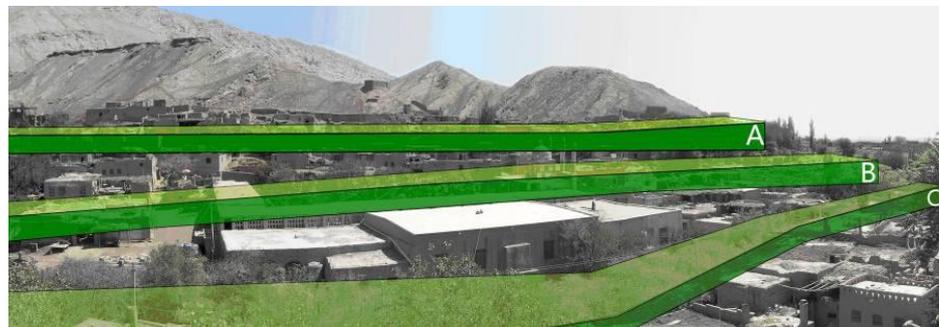


Plan of Mazar village

maximized amount of residences on waterfront. And China's traditional concept of "living where there is water and grass" is also fully reflected here. On the other hand, the settlements' overall layout paralleling to contour line along with mountains perfectly avoid the difficult situation of building houses on mountains with different altitudes. This method is similar to the mountainous settlement layout method in southwest mountains in China, which seeks a relatively flat tableland for inhabitation with the altitude difference of mountains, as this method is safer than the one establishing settlements on sloping fields.

4. Water and Settlement Space Landscape

Settlement space landscape is almost completely oriented by water resource and distributed spatially. This is because the settlements are at extremely arid region and trees and vegetation are treasure for the local people. Trees like mulberries and aspens are regarded as treasure of the village and even taken as family legacy to be inherited, from which the importance of trees in local people's life can be seen. In the burning-hot summer, the surface temperature is very high while you can feel cool once you step in the tree shade. Water is the lifeblood of vegetation growth and plants can never survive without water source. At the two sides of the main channel in Mazar Village, there full of trees and the landscape feature of settlements being surrounded by shades of trees also take shape, forming the landscape system of "distributing along with water" of "川" (stream) type river system. The landscape of settlement in Mazar Village is composed of green vegetation. There are three types on its form: point-like, linear and planar, as the linear ones are totally coincided with the river system distribution, forming three green axes: axis A—vegetation on the east bank is distributed along with trunk canal at the east bank; axis B—vegetational zone nourished by natural water; axis C—vegetation at the west bank is distributed along with the trunk canal at the west bank.



space landscape of settlement that oriented by water

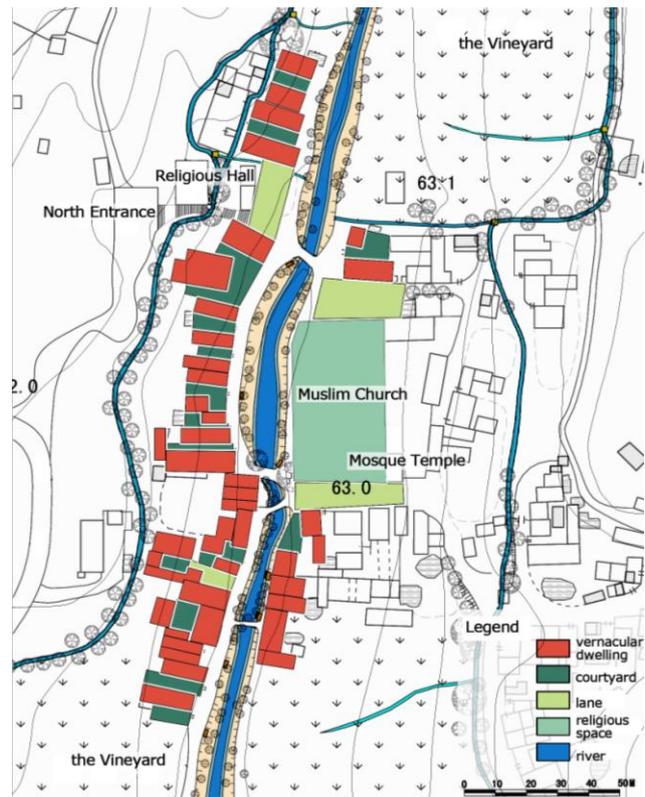
5. Water and Residential Courtyard

Most dwellings in Xinjiang have their own courtyards, as their layout is closely connected with living habits. They generally include the passageways from yard gate to the residence, open space before the residence, outdoor kitchen, garden, vegetable field, storage yard for sundries, toilets, corral and parking lot and so on. However, in vernacular settlements, the content of courtyard is relatively simple, as many functional spaces are in mixed layout without a clear partition. They just have to meet the standard of satisfying the basic living needs.

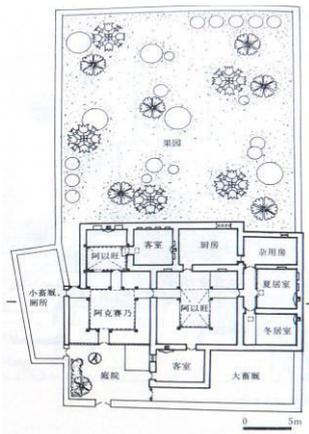
The courtyard's plate form of residence is flexible and it can be rectangle or L-shaped as

there is no fixed requirement. The most prominent feature of Mazar Village's courtyard is the deep and narrow garth. The deep and narrow garth can extend the shaded area under the blazing sun furthest, providing shady and cool area for residents in the courtyard.

The narrow courtyard is mainly in the building group alongside the river. Since the settlements are located at the extremely arid region, confronted with the problem of short water supply, the settlements there have to reasonably distribute the water resource to the largest extent. To increase the residents alongside river as much as possible, the courtyards distributed between it are all voluntarily adjusted for their direction by owners, that is, letting the broadside of courtyard face the river and long side vertical to the running water direction, in which way the courtyard space is considered to be tall and slender. The buildings in the yard are also vertical to the river's water front and arranged closely. The direction of every house opening door is towards the water, forming a "narrow courtyard" shape vertical to river bank, as the length-to-width ratio of some courtyards even reach 7:1.



the relationship between the river and courtyard

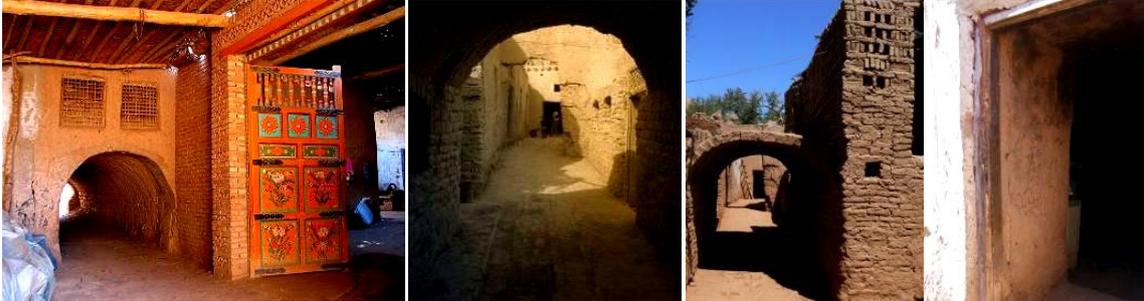


the diagrammatic sketch of courtyard

Almost every dwelling is equipped with a garden of variant scale, and there are cases that most space of courtyard occupied by garden, forming a kind of courtyard with garden as the center. Some families' gardens even extend outside and connected with the core field behind the courtyard. Many families are used to build grape trellis between the garden and their houses, so as to shade the space in courtyard and build a green, shady and cool space.

6. Water and Architecture

The relationship between single building of dwellings in Xinjiang and water resource is mainly reflected in the application of local materials like immature soil and plants. Due to the shortage of water, trees are precious and are not easily chopped to construct houses. Local residents then take full use of the local vegetation and crop materials to build houses.



the soil arching and wall

The soil in Turban is quite viscous and local people creatively build various kinds of buildings with regional resource. Building houses here is also called “planting walls”. When people build houses, they water fields first and then dig clays with Kantuman to build thick walls and then houses. The dirt house can be repaired at any time no matter where it breaks. Given the spiritual level, the immature soil material for building houses is also particular, as the immature soil for manufacturing adobe and mud wall should be from clean land.



two kinds of roofs :multi-ribbed and soil-arch structures

The amount of precipitation determines the size and usage mode of roof pitch. Since it is dry there, with little amount of precipitation and rare accumulated snow in summer, there is no need to consider the drainage problem in buildings and terrace roof of cob roof is adopted. Compared with slope roof, the space on this kind of terrace roof is spared to be an important place for production and living. Local people add air-curing barn on it to dry grape or put up shed frame to build an “indoor terrace”, which is a place for people to camp in summer night with simple beds; crops like cotton stalks, rattans and dried vegetables can also be air-cured on the roof, which becomes a place for production and processing.

There are two kinds of roofs in Turban: multi-ribbed and soil-arch structures. The former kind needs several thinner beams and rafters racked on the wall without pillars usually. When wood is insufficient, local plants can be taken full advantage of, as the practice is to thickly pave half-round wood rafter on joists, then a layer of rush mat; and the reed, wheat straw hood or straw are taken as heat preservation and insulation layer; finally, the cob is applied as a waterproof roofing. Multi-ribbed (that is, beam and rafter) one is generally 5 to 15 cm for the

diameter and 3 to 5 meters for the length, demanding low for the wood, which can be drawn from local trees and don't have to be transported from other regions.

V. Conclusion

Due to the geographical position in the Western Regions and circumstance of multiply national minorities living in a compact community, Xinjiang is an "exotic land" for people living in inner provinces of China. The studies on settlement in Xinjiang are usually conducted from the differences between Xinjiang and inland areas from the angle of seeking novelty. However, like other vernacular settlements in China and even other places in the world, the one in Xinjiang is also an inevitable result of human group's upgrading settlement after a certain stage of development.

From relations between water resource and settlement space form, it is seen that settlement follows the principle of living by water in site selection. But in internal arrangement, no matter single building or courtyard keeps close distance with water resource. Although the water channels in front of citizen houses in some places of Xinjiang have almost been dried, villages keep persistently the custom of water channel passing around the house and they also insist on living near the water for courtyard layout. It shows it is unrelated to water resource quantity, but emphasis of water by citizens is deeply reflected in settlement. Water resource plays a significant role in settlement organization, which is permeated into all aspects such as traffic system, landscape system and overall settlement layout.

Another precious treasure given by water to citizens in arid regions is vegetation. For coping with severe ecological conditions, settlement plays its maximum subjective initiative in construction process, and wood and plants are used as building materials. Abundant courtyard plants provide fragrant fruit as well as cool, refreshing and pleasant environment for citizens. No matter arbor, shrub, vegetables, fruit trees or grape trellis are the important supplies for citizens to survive in arid regions.

In settlement construction process, Xinjiang citizens do all of their efforts to overcome disadvantage of water resource shortage, take full advantage of existing resources and create a series of settlement landscapes with local characteristics when meeting requirements of settlement functions, which is the model of construction for Chinese traditional settlements. The paper summarizes mutual relations between water resource and settlement construction, which has profound meanings for how to use reasonably water resource and maximize resources' utilization benefits in future settlement construction in arid regions.

References

- [1] Han Delin, Gao Zhigang, 2003, Resources Utilization and Development of Xinjiang, Beijing: The commercial Press.
- [2] Han Delin, 2000, Artificial Oasis in Xinjiang, Beijing: China Environmental Science Press.
- [3] Zhang Shengyi, Wang Xiaodong, 1998, National Building in China, Nanjing: Jiangsu Science and Technology Press.
- [4] Kuo Chaolee, 1998, The Settlement and Science, Taipei: Garden City Press.
- [5] Song Jinping, 2001, Settlement Geography Topics, Beijing: Beijing Normal University Press.
- [6] Yan Dachun, 1995, Residential Dwelling in Xinjiang, Beijing: China Building Industry Press.
- [7] Rahmutulla Adilla, Tashkin Jappar, 2004, Xinjiang Institute of Ecological and Geography, Urumqi: Chinese Academy of Sciences.

- [8] Yue Bangrui. Wang Jun, 2007, Oasis Architecture Foundation and Concept, Xi'an: School of Arch., Xi'an Univ. of Arch. & Tech.
- [9] Zhang Xiaolei, 1993, Regional Evolution of the cities in Tarim Basin. Urumqi: Arid Land Geography
- [10] Wang Yongxing. Li Xin, 1997, Study on sustainable utilization of water resources in Turpan Basin, Urumqi: JOURNAL OF ARID LAND RESOURCES AND ENVIRONMENT
- [11] Yang Xiaofeng, Zhou Ruoqi, 2007, The Traditional Residential House and Environment of Mazar Village, Beijing: Architectural Journal.
- [12] Yue Bangrui, 2010, Constitution Patterns of the Oasis Settlement in Xinjiang from the Perspective of Local Resources Constraints, Xi'an: Xi'an Univ. of Arch. & Tech.

Eco-Smart Research Parks: Shanxi Science and Technology City Case study

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SYNOPSIS:

China recently started building its third generation of research parks: eco-smart research parks. This paper analyzes and compares the key characteristics of the three generations and takes Shanxi Science and Technology City as the research object, to study the eco-smart connected strategies for research parks.

1. Brief Introduction of Research Parks in China and Shanxi Science and Technology City

Despite starting much later than developed countries, China has formulated its own pattern for research park development after more than 30 years' practice. Suzhou Industrial Park is an example of the first generation of research parks, while Wuhan Donghu High-Tech Development Zone is typical of the second generation.

As information and technology flourishes and the environment gains more importance in China's long term planning, China has started building its third generation of research parks: eco-smart connected cities with a balanced mix of research, high value added production, residential, and entertainment. Shanxi Science and Technology City (SXSTC for short), located in Shanxi Province in China, is a typical example for "generation 3.0" research parks.

SXSTC encompasses about 20 square kilometers in area. It is located in between of Taiyuan City and Yuci City, and plays an important role on the integrating of the two closely located cities. SXSTC's coordination region is 510 square kilometers, including scientific research institutions, industrial parks, higher education parks, and regional transportation pivots. Based on the high level of science and technology research and production capacity in these districts, SXSTC is able to develop as an eco-smart research park with livable environment, capacity for high innovation and eco-smart infrastructure.

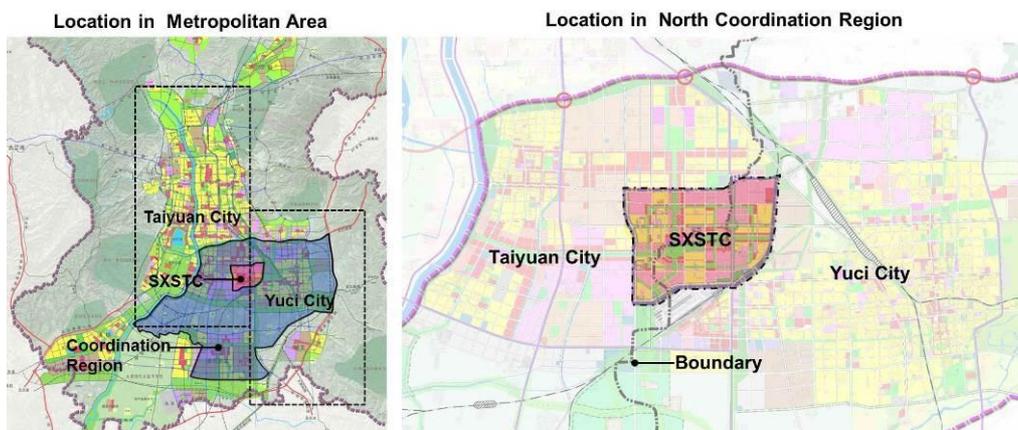


Figure: Location of SXSTC

Source: Master Plan of Taiyuan City and Master Plan of Jinzhong City

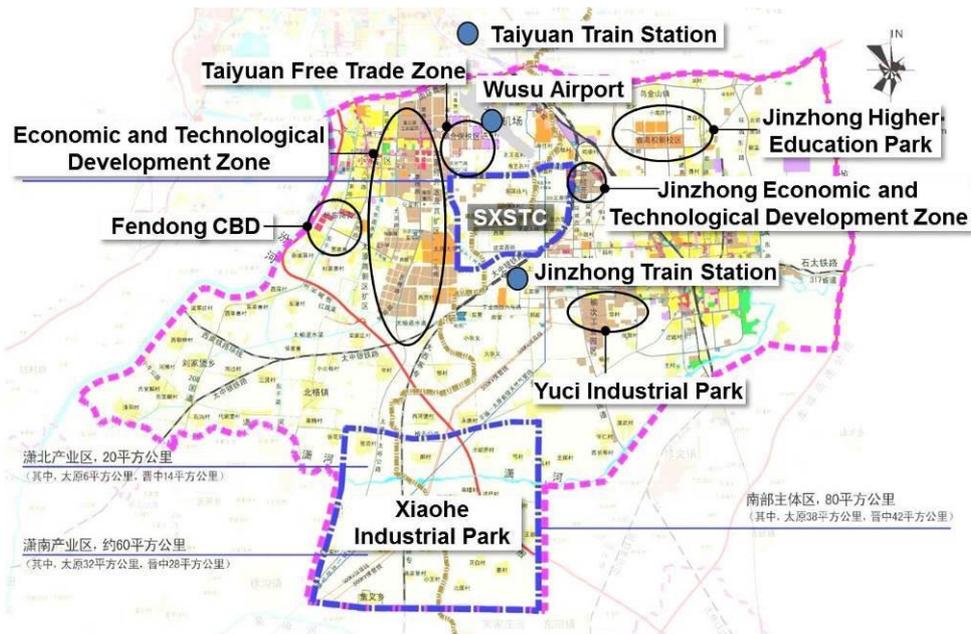


Figure: Function Layout in Coordination Region

Source: SXSTC Master Plan Project

2. Research method

The author participated in the SXSTC Master Plan Project in 2012 and the SXSTC Comprehensive Urban Design Project in 2013, and currently oversees Regulatory Plan Project of SXSTC City Center. On the basis of the above projects, this paper takes SXSTC as the research object, to study the eco-smart connected strategies for research parks.

This paper first analyses the development and features of the first two generations and the development tendency of the third generation. Data from administrative committees of Suzhou Industrial Park, and Wuhan Donghu High-Tech Development Zone is used for economic, administrative, and spatial comparative analysis. In particular, lessons learned from the first two generations of research parks in China are dissected for application to SXSTC in spatial conception, innovation value chain, R&D public service system, land use, management methods, and eco-smart techniques.

3. Development Process and Features of First Two Generations

China has built many research parks since 1980's, including more than 70 National Economic and Technical Development Zones, 8 National Innovation Demonstration Zones, and many other forms of regional research parks founded by local municipal governments. Among them, Suzhou Industrial Park (SZIP for short) is an example of the first generation of research parks, and Wuhan Donghu High-Tech Development Zone (Donghu for short) is typical of the second generation. The two generations have different features in economic, administrative, and spatial aspects. However, it does not mean that Donghu is more advanced than SZIP. As each research park is still in the process of development, the SZIP continues to change with the times and gain more characteristics of the second generation, or even transform into the third generation.

3.1 First Generation of Research Parks: Suzhou Industrial Park

Suzhou Industrial Park was cofounded in 1994 by China and Singapore and administered by China-Singapore Suzhou Industrial Park Development Corporation Limited (CSSD). The area of SZIP is 70 square kilometers, while the coordination region is 288 square kilometers. High and new technology industries aggregate here. With electronic information, precision machinery, biotech/pharmaceutical, and advanced material manufacturing as the leading industries, SZIP focuses on the manufacturing portion of the value chain and developed a complete industry chain of integrated research, application and production. Secondary industrial land occupies the highest proportion there. Tertiary industry, such as service business is less developed. Living and recreation consumption is little.

In general, the first generation of research park attaches great importance to the combination of science and technology, and the transformation of science and technology to production. Policies are made to support the leading industries to form a complete industry chain of research, application and production. Secondary industry is the main spatial function, while the space for living is completely separate with the space for manufacturing.

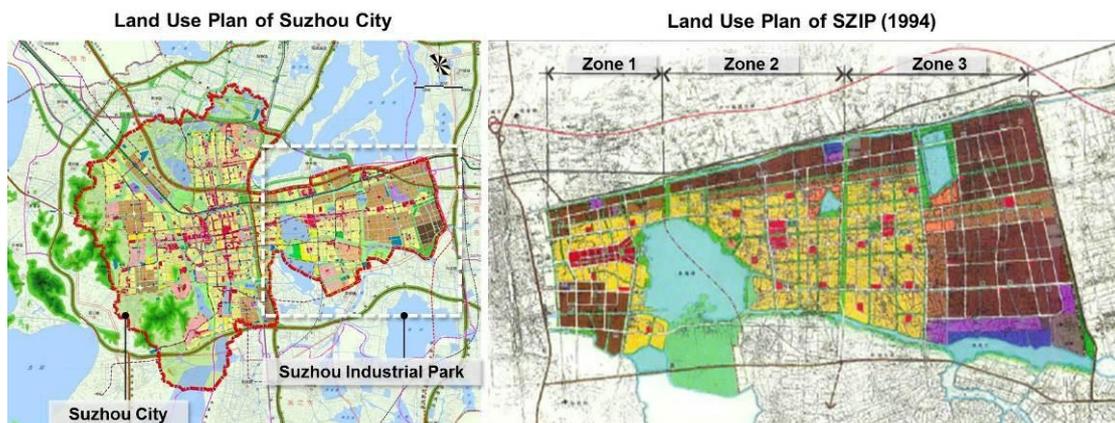


Figure: Location and Function Layout of SZIP

Source: Suzhou City Master Plan (2007-2020) and Suzhou Industrial Park Master Plan (1994)

3.2 Second Generation of Research Parks: Wuhan Donghu High-Tech Development Zone

Donghu was founded firstly in 1988, and became National Innovation Demonstration Zone in 2010. At the beginning, it is also an industrial park with laser technology, optical fiber communication, microelectronic technique, and bioengineering as the leading industries. Donghu promotes the cooperation of nearby enterprises, universities and scientific research institutions and encourages independent innovation and its integration with economy. It focuses on offering support to active information environment instead of a certain technology. As the information industry grew rapidly, Donghu was named an National Innovation Demonstration Zone and became representative of second generation.

Generally, the second generation of research parks has well developed information industry. Administrative policy pays close attention to the formation of active innovation atmosphere. The second generation led the way for attention to urban environment. Research and manufacturing space in beautiful and favorable environment is the main spatial type.

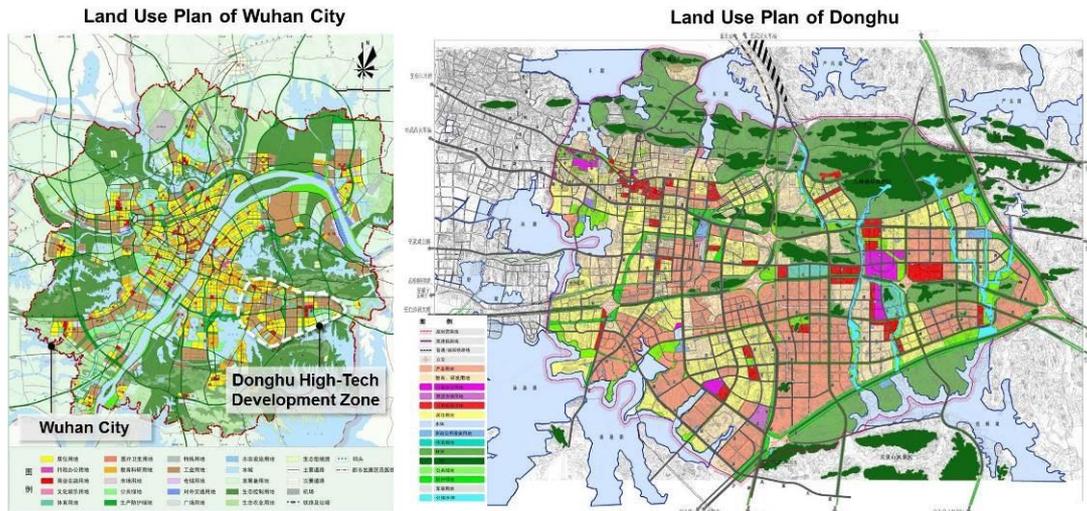


Figure: Location and Land Use Plan of Donghu

Source: Wuhan City Master Plan (2010-2020) and Donghu High-Tech Development Zone Master Plan (2010-2020)

4. Trend of the Third Generation “Eco-Smart Research Park”: Lessons Learned from the First Two Generations

Internet and knowledge-based economy is developing rapidly. Ecological environment gained more and more attention due to climate change and environmental deterioration. Thus began the concept of Eco-Smart Research Park in China.

People-centered sustainable innovation is important for smart cities (Song G, Cornford T. 2006). Li Xinyang and Ma Xiaojing (2012) analyzed two problems of research parks in the era of information economy: incomplete production chains of innovation economy and the lack of creative milieu. The author analyzes and compares the key characteristics of the three generations of research parks in China, and holds that eco-smart research park is a people-oriented livable city with a complete industry chain of efficiently integrated research, application and production, with a balanced mix of work, residence and entertainment, with high innovation ability, smart technology and high-tech public service systems.

Research Park	First Generation	Second Generation	Third Generation
Administrative Policy	Supervise to form a complete industry chain of research, application and production; offer support to certain technologies	Encourage independent innovation and its integration with economy; offer support to active information environment instead of a certain technology	Create vibrant community environment and provide communication platform to encourage knowledge sharing and stimulate innovation
Economy	Traditional Industry	Information Industry	Knowledge-based Industry

Space	Secondary industrial land occupies the highest proportion	Research and manufacturing space in favorable environment is the main type	Varies communities integrating knowledge learning and sharing, production and life, as well as entertainment
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*Table: Development Process, Features and Trend of three generations
Source: Drawn by Author*

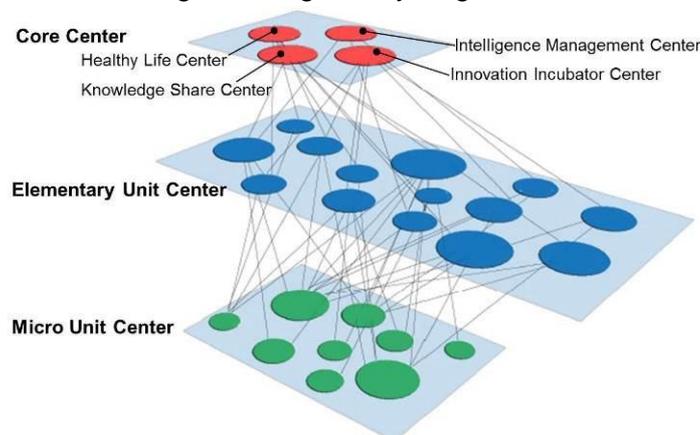
5. Suggestions to SXSTC’s Development Strategies

From the experience learned from the first two generations, suggestions to SXSTC’s development strategies were given for spatial conception, land use and public service system, management methods, innovation chain, and eco-smart techniques.

5.1 Spatial Conceptions

The spatial design and organization of SXSTC is under four main principles, using intelligent life as analogy: “Smart Brain System”, “Slow Traffic Net”, “Low Carbon Cell”, and “Shared Neuron”.

“Smart Brain System” refers to establishing a core center to provide public service to guide whole city to work smoothly, just like a brain. The core center consists of four sections: innovation incubator, intelligence management, knowledge sharing, and healthy lifestyle. Public service is implemented through three grades: core center, elementary unit, micro unit. Among these, micro unit is a complete and mixed function block with micro unit center in the middle. Its standard size is determined according to the service radius and ecological effect. Eco-smart technologies are applied in micro unit to ensure conformance to low carbon requirements. Thus, a micro unit is analogous to a “Low Carbon Cell”. A certain number of micro units make up an elementary unit. The high flexibility of cell space could adapt to the uncertain development of eco-smart research parks. Service center of elementary unit provides variety kinds of public services. It is a “Shared Neuron”, and plays an important role on connecting the “Smart Brain System” with “Low Carbon Cell”. Furthermore, compound circle corridor and pedestrian greenway go through the elementary and micro unit, and form the “Slow Traffic Net” to encourage walking and cycling.



*Figure: “Smart Brain System”
Source: Drawn By the Author*

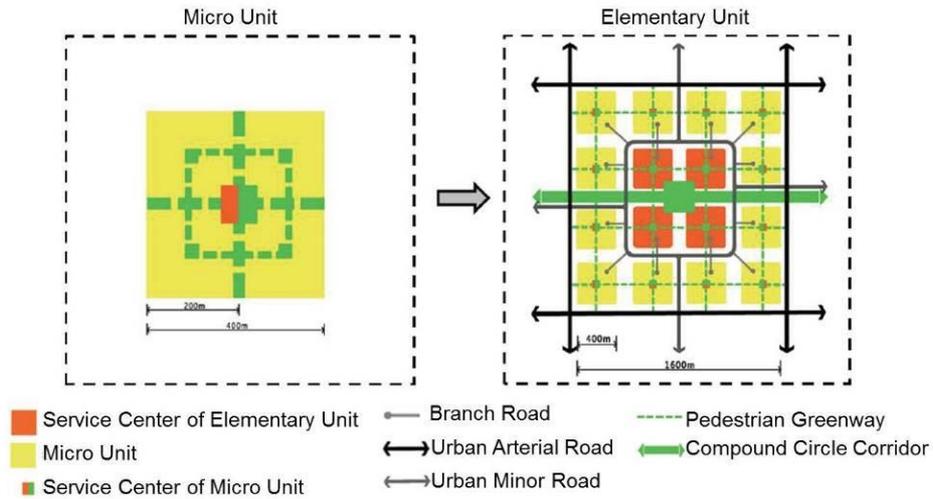


Figure: "Low Carbon Cell"
Source: SXSTC Master Plan Project

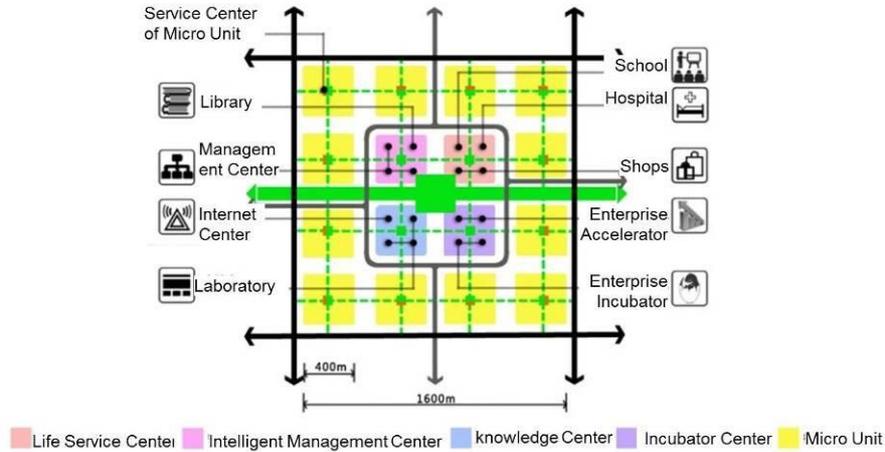


Figure: "Shared Neuron"
Source: SXSTC Master Plan Project

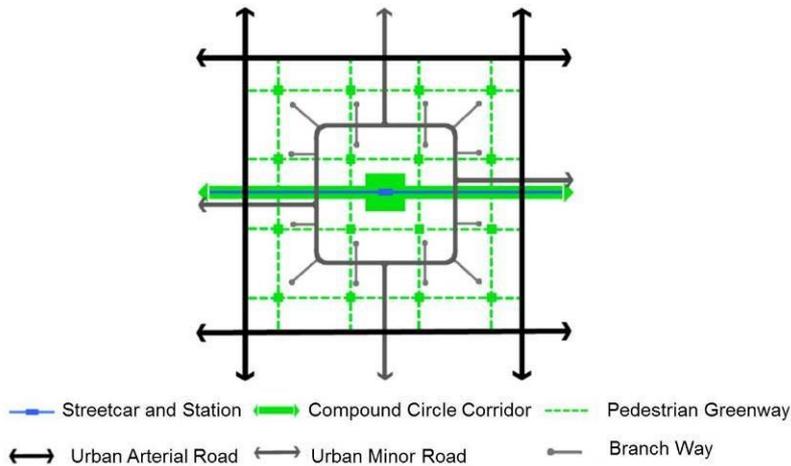


Figure: "Slow Traffic Net"
Source: SXSTC Master Plan Project

5.2 Three Administrative Levels of Innovation Space and Public Service

The above concepts are fully implemented in land use, space organization, and administrative management. SXSTC has three administrative levels of innovation space: City

Center, Sub-District, and Neighborhood Unit, equivalent to Core Center, Elementary Unit, and Micro Unit in above spatial conception. Accordingly, relevant public services are divided into three levels of city, district, and neighborhood to increase the accessibility for researchers and inhabitants.

City Center has compound public functions, with Innovation Incubator Center, Intelligence Management Center, Knowledge Share Center, and Healthy Life Center surrounding the City Central Park. Some areas of City Center are low-lying, and wetland landscape is charming. These are designed to be important parts of the City Central Park and supply citizens with nice ecological environment for leisure and entertainment. These four parts of City Center mentioned above provide abundant municipal public service, and lead the whole city to a virtuous cycle of livable environment and efficient innovation. It is the “Core Center” in “Smart Brain System”.

SXSTC has six independent City Sub-Districts, each comprising of its own research, manufacturing, and residential spaces. The average area is 2-3 square kilometers. Innovation value chain is complete inside of each one. They are “Elementary Units”. Each Sub-District has its own service center next to the Sub-District Central Park and provides various kinds of public services, such as library, internet center, laboratory, enterprise accelerator and incubator, community hospital and school, shops, and management center. It is the Shared Neuron, connecting the Smart Brain System with Low Carbon Cell. Compound Circle Corridor, connecting six Sub-Districts, plays composite role in low-carbon traffic and municipal facilities, information exhibition and exchange, as well as leisure and entertainment. It is a kind of green open space with streetcar, walking and cycling ways on the ground, and utility tunnel underground. There are also cultural exhibition pavilions, sports facilities, science and technology information cabinet. With plenty of trees, ecological leisure environment of Compound Circle Corridor is attractive.

As “Micro Unit”, Neighborhood Unit is the basic governance and administrative unit with complete functions and independency. Each one has its own neighborhood service center. A certain number of Neighborhood Units constitute a Sub-District. Development and construction on basis of Neighborhood Unit could easily adapt to any changes of eco-smart research parks.

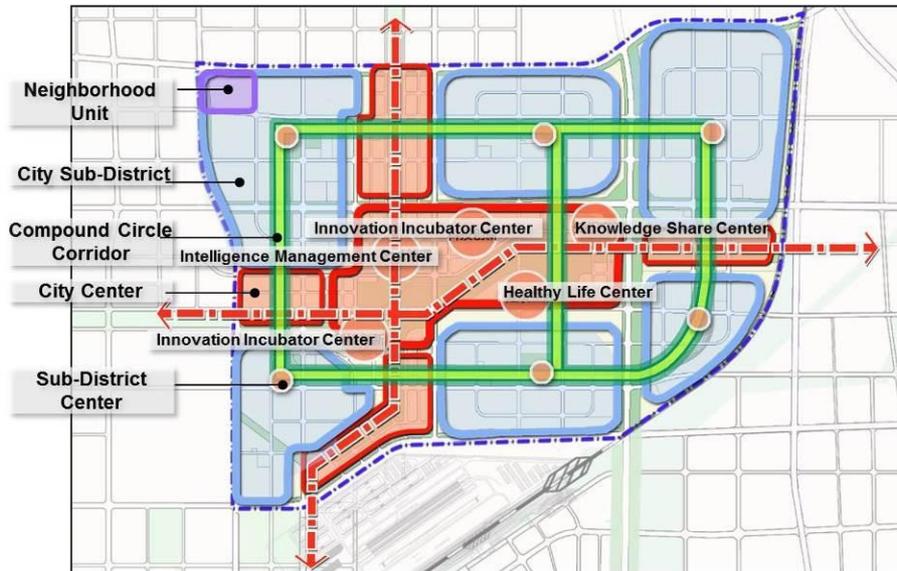


Figure: Functional Structure of SXSTC

Source: SXSTC Master Plan Project



Figure: Compound circle corridor

Source: SXSTC Master Plan Project

5.3 Neighborhood Unit as the Basic Governance and Administrative Unit

Taking Neighborhood Unit as Low Carbon Cell is the main feature of SXSTC. There are three kinds of Neighborhood Unit: Scientific Research Neighborhood, Living Neighborhood, and Public Service Neighborhood. Most of them have a Neighborhood Center and a Neighborhood Central Park to provide knowledge exchange, community services and leisure sport facilities. According to the service radius and ecological effect, the area of 400x400 meters is applied as the standard size for each Neighborhood Unit. Eco-smart technologies such as green buildings, low impact development strategies, intelligent monitoring system, and distributed energy systems are applied. Inside the neighborhood unit, pedestrians and vehicles are completely separated. Vehicular roads and parking garages are all underground. Greenways on the ground provide walking and bicycling path as well as comfortable and safe green environment.

Neighborhood Unit is the basic development unit. It has to be designed, constructed and supervised as an integral whole. Research Park grows organically on the basis of Neighborhood Unit. Since Eco-Smart Research Park is still finding its way forward, administrative governance in this way could easily adapt to any changes.

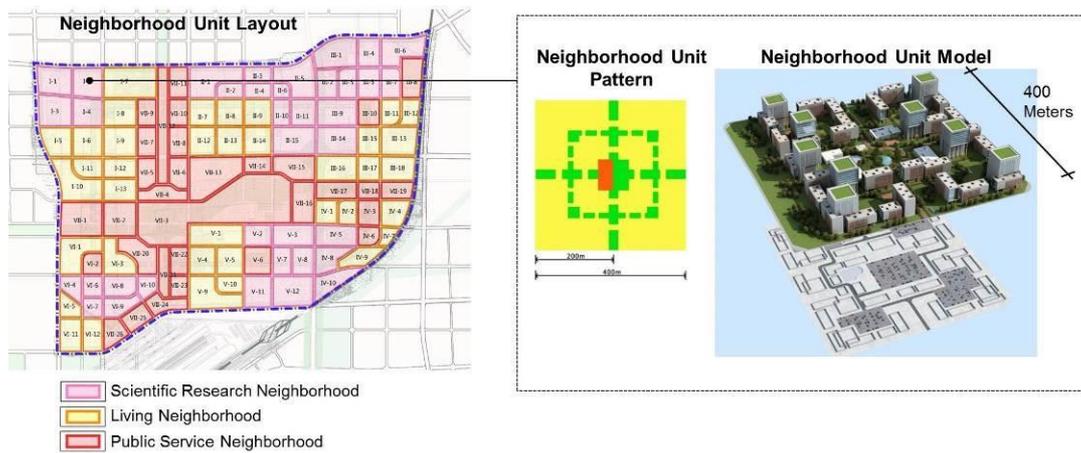


Figure: Neighbourhood Unit Layout and Size

Source: SXSTC Master Plan Project



Figure: Eco-Smart Technologies in Neighbourhood Unit

Source: SXSTC Master Plan Project

5.4 Eco-Smart Traffic System and Infrastructure

Low carbon traffic system contains non-motorized traffic system and vehicular circulation system. Each of them is completely separate from the other, but with convenient transfer between them. Non-motorized traffic system consists of walking, cycling, streetcar, and metro, in forms of Greenway, Neighborhood Central Park, Compound Circle Corridor, Sub-District Central Park, and City Central Park. Non-motorized traffic in these green spaces could help to inspire scientific and technological talents with their research and enterprise innovation.

SXSTC develops eco-smart infrastructure including low carbon energy supply system, new energy promotion strategy, green buildings, low impact development technology, and smart city data platform. Implementation of green energy (solar energy, geothermal energy, IGCC, etc.), new energy automobile, green building and sponge city measures contribute to energy conservation, water cyclic utilization and ecological remediation. In addition, smart city data platform is set up to gather information and supervise SXSTC running in a sustainable eco-smart way.

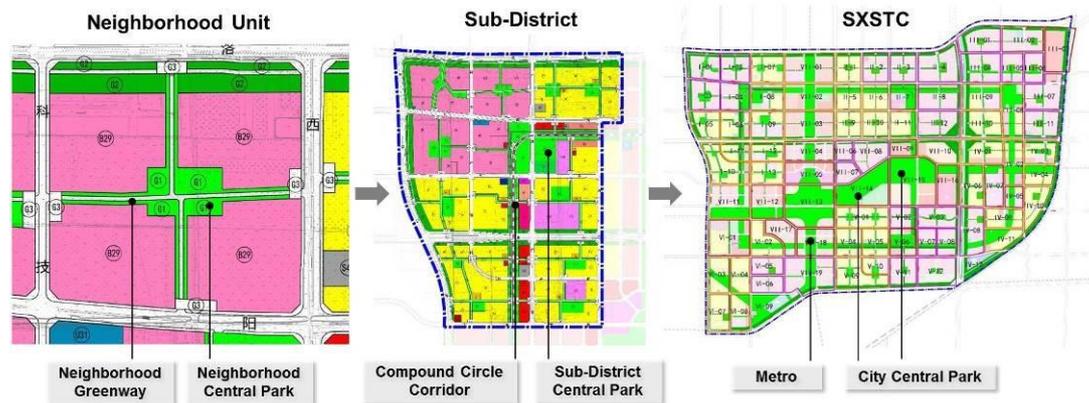


Figure: Eco-Smart Technologies in Neighborhood Unit

Source: SXSTC Master Plan Project

5.5 Innovation Value Chain Promotion Strategies

Shanxi province has historically been a major energy industry producer, with advanced energy/power related technology. Taiyuan City, as the provincial capital, has high science and technology capacity as well as strong innovation ability. Research and manufacturing industry in Yuci City is well developed. Combining these capabilities, SXSTC is able to promote a well-integrated chain of research, application and production. Measures are also in place to stimulate business incubation, venture capital, research and technology trading, technical consulting, and intellectual property evaluation to form vibrant innovation milieu. With the help of internet and urban smart technology, the communication and sharing platform is in place to propel the cooperation of universities, research institutes, and upstream and downstream enterprises. SXSTC management committee has formulated a series of supporting policies to guide the development.

As related eco-smart regulations and policies are not finalized, planning for SXSTC is an ongoing process to adapt to any changes. This research is applicable to development and planning for future research parks as well as new government supported developments.

References:

1. XIONG Guoping, 2003, Research on the Development Plan of Suzhou Industrial Park, Urban Planning Forum, Vol. 144 No. 2
2. Monck, C.S.P., Porter, R.B., Quintas, P., Storey, D.J., Wynarczyk, P., 1988, Science Parks and the Growth of High Technology Firms, Croom Helm, London.
3. Innovation Capability Comparative Study of National Innovation Demonstration Zone: Zhongguancun, Wuhan Donghu, Shanghai Zhangjiang. Science & Technology Progress and Policy, Vol.32 No.22
4. MOU Jun, SUN Ting, WAN Yanhua, 2014, Study on the Concept of City Development Under the Background of New Urbanization State Plan, Urban Development Studies, Vol.21 Add.2
5. YUAN Xiaohui, 2014, Research on the Planning of Innovation-Driven Science and Technology City, Tsinghua University, Beijing
6. LUO Xiaolong, ZHENG Huanyou, YIN Jie, 2011, "Third Transition" of Development Zones: From Industrial Zone to New Urban District, Resources and Environment in the Yangtze Basin, Vol.20 No.7

RESTORATION OF KOTATUA JAKARTA OF INDONESIA IN TERMS OF RURALITY IN THE MANHATTAN OF ASIA

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background

In light of Jayakarta city's history established upon Fatahillah's order with the development in 1619 thus Jayakarta city was attacked into demolition by VOC. In 1620 Batavia city was established upon J.P. Coen's order with his city center lying in the east of *Kali Besar* (name of big river).

As in similar custom of towns built in that period by The Dutch government in their colony such as; Manhattan island located in the corner south of river Hudson. That island was settled by the Dutch in 1624, established to follow-up pattern of Amsterdam city then dubbed in name of *New Amsterdam* (in Dutch: *Nieuw Amsterdam*). At the time of World War 1 between Netherland and England, Netherland there was an agreement of exchange between *New Amsterdam* and island *Run* that was part Banda's islands in Maluku.

The content of agreement was *New Amsterdam* previously powered by Netherland then released to power of the England. Name of *New Amsterdam* was converted into *New York* for honour of British nobleman, Duke of York, finally becoming a British King of Catholic James II, whose name also was used for city and state of New York. On the other side, England surrendered an island of *Run* as part of Banda's islands in Maluku to Netherland as well as concession of trade of various spices. Today Manhattan grows to be a big independent city of American pride.

In 1808 due to disease contamination thus Dutch ruler at that time Daendels moved the city to the south. And the city was then left. In 1905 Batavia city had been left and rebuilt upon City Council's order. Recently old city enters into 2 municipal districts, West Jakarta and North Jakarta. Based on *PERGUB* (Governor Regulation) no 34 of 2005 there was conversion from name of old city of Jakarta to *Kotatua* Jakarta, holding a potency as Queen of the East" as a commerce center with 23 ports all around the earth in the east, from Darwin to Banda.

Moreover revitalization implementation has started since the year of 2006 by referring to *Kotatua* as *brand image*. Once undergoing several revitalization in 2015 *Kotatua* had been enacted by Governor of DKI Jakarta to be Cultural Conservation region of National level and is on the way for effort of admittance of world cultural conservation (World Heritage List from UNESCO). As a matter of fact, this *Kotatua* as dubbed today is not yet able to be an

independent city as in Mantattan or New York. The latter is due to problems at hand not solved out .



Figure 1. Map of Kotatua's border (Source: Candriyan, 2015)



Figure 2. Overview of Region (Source: Candriyan, 2015)



Figure 3. Kotatua Existing (Source: Candriyan, 2015)



Figure 4. Building of Dasaat (Source: Candriyan, 2015)

Problem

Problems coming-up are *image* a little bit unfortunate, lacking of vitality in the region, infrastructure condition not supporting, thus there are irregular traffics, decrease in significant environment quality, policy not yet integrated aministrative border divided, and institution not yet on-target, some buildings belong to the private and state-owned entity not belonging to government. There is no particular regulation on arrangement of handling Kotatua. Dwelling society multy ethnic and fully worried of dispute if there will be power exchange.

The Method to Use

Research done is qualitatively interpretative with natural approach in learning phenomenom at hand for interpretation and comprehension (Norman Denzin, Yvonne Lincoln, 2002:176). Data search is done with observation, interviews to informants pertaining

to research object. Data then is compared to notes and articles related to problems. Then the latter is analyzed to obtain a conclusion.

Field Data

Kotatua holds potency such as; 1). an international port town in the past time becoming a prospective for establishing a Jakarta city and mixed communities, 2). heterogeneity of society, it is due to establishment of mixed cultures between several ethnics (Tionghoa or chinese, Arabian, Dutch, British, and Malayan), 3). city structure already established previously on river bank resembles to cities in Netherland with river Ciliwung as economic activity center, 4). maritime tourism activity center in the past time taking an important role in numerous aspects of regional development, 5). infrastructure support of road transportation and canal to districts of Glodok and Pasar Baru, 6). remnants of European architectural building of seventeenth century. 7). port of Sunda Kelapa is one of ports with Phinisi ship up to present still on the operation. 8). having a museum displaying past time maritime greatness.

Kotatua has been experiencing several revitalization for instance; Revitalization stage 1 was implemented with reason about establishing city renovated totally, execution years started during 1905-1929 upon idea of City Council, area width revitalized was 105 ha, by establishing a new structure in region of river *Kali Jelakeng* and river *Kali Semut*, during those years also Beos railway station was officially inaugurated. Transportation mode during that period was; trem, two wheeled-buggy or delman and boat. Revitalization stage 2, executed with reason of economic revitalization of President Soekarno's era, started from 1950 to 1962, marked with inauguration of building BNI 46, Bank of China and so forth, by central Government. Transportation mode of that period was; trem, bus, opelet. Revitalization stage 3 was executed with reason of advanced destination creation made by Governor Ali Sadikin, from years 1971-1974, revitalization area contained 20 hectare including; garden of Fatahillah and *Kali Besar*, identifying the infrastructure and creating new function. To-do list as target expected in order to welcome Inauguration of PATA conference. The latter was managed by DKI Jakarta administration. Transportation mode at that time was bus, opelet, bemo. Revitalization stage 4, executed with reason about rescuing revitalization stage two by Governor Sutiyoso. Started from 2005 and its plan will head to the year 2030. Width of 846 hectare, started from National Archive building up to region of Outside Batang (*Luar Batang*). Activities done by pedestrians (is to make pedestrian road) by giving industry's creative function. Groundbreaking of revitalization as a mark from complete program of Regional Spatiality Order Blueprint or RTRW (*Rencana Tata Ruang Wilayah*). Managed by the institution itself. Transportation mode at hand is KRL, Trans Jakarta, small bus named Angkot (Candriyan, 2011).

As in fact today in 2016 revitalization implementation is still wobbly. Old building condition has been derelict and in general has been wrecked on the top of roof or building without roof or the roof was wrecked, affecting wreckage at other parts since there were no protection of rain and heat of sun then it affected to building structure wreckage. This derelict buildings were utilized by seekers of second-hand goods as a place for residence and goods piling. In years of 2008-2016 there were about 6 derelict buildings at wreckage, without any attempt of renovation up to present recently, just left-behind to let it go as derelict. The expensive cost of renovation and dispute of the ownership become causes of too many buildings at derelict ion.

REVITALISASI

	REVITALISASI -1	REVITALISASI-2	REVITALISASI-3	REVITALISASI-4
A	Membangun kota yg dibongkar	Revitalisasi ekonomi	menciptakan destinasi unggulan	menyelamatkan Rev-2
B	?	Soekarno	Ali Sudikin	Sutiyoso
C	1905	1950	1971	2005
D	1912	1950	1973	2006
E	1929	1962	1974	2080
F	25 tahun	12 tahun	4 tahun	?
G	105 hektar	?	20 hektar	846 hektar
H	wilayah yang diapit kali Jolangkong dan kali Semut	bukan kawasan	Taman Fatmahlillah dan Kalibesar	dari Gedung Arsip hingga Luar Batang
	Membangun struktur baru		Beautifikasi infrastruktur dan memberi fungsi baru	Pedestrianisasi dan memberi fungsi kreatif industri
I	Beroperasi STA Beos	perseman BNI 1946	Konperensi PATA	Akhir RTRW
J	Kotapradja Batavia	Pemerintah Pusat RI	Pemerintah DKI Jakarta	Kelembagaan tersendiri
K	Trem, Delman, Prahau	Trem, Bus, opelet	Bus, Oplet, Bemo	Busway, KRL, Angkot

A: Alasan B: Gagasan C: Launching D: Pelaksanaan E: Rampung F: Waktu pelaksanaan G: Luas H: Batas I: Persemanian J: Pengelola K: Moda Trans

Figure 5. Table of Revitalization
(Source: Candriyan, 2011)

Conclusion of Field Data

Effort of renovation is still not yet done toward building at dereliction simultaneously, by Central Government or Province of DKI Jakarta's government. Central government is not capable fully, since the ownership had been surrendered directly to State Entities. Party of BUMN or state entities responsible on the renovation. Yet most of state entities (BUMN) are not able to finance renovation due to economical crisis since 1998, as a matter of fact it has not yet been 100 percent recovery up to present, therefore in order to finance renovation is not still a main priority scale order. Also provincial administration has not yet assisted in overall, since they think that the assets are not theirs. In 2016 there were also private businesses in attempt to provide revitalization toward Building of OLVEH (Onderlinge Levensverzkering Van Eigen Hulp) inaugurated officially on date of 19 March 2016. The building belonged to Pieter Peereboom Voller as functioned as office up to year 1959. In 1960 once nationalization occurred toward foreigners-owned buildings thus building of OLVEH was functioned as building of Jiwasraya insurance. Recently that building is functioned as a gathering place of creative worker's community.

Solution

Based on legal standing in Indonesia except Law No 11 of 2010, Cultural Conservation is supposed to be catalization for developer/development of tourism industry whose authority in guidance is under control of Minister of Tourism and Creative Industry.

Referring to a book; Economic Perspective of Heritage Management (Rizzo, 1997) said that, to fulfill target on result thus a regional revitalization needs an inovative and integrated thinking on how *Kotatua* Jakarta can be thought as: 1. Cultural Model, 2. Economical Model, 3. Technology Model.

Ad 1. Kotatua as Cultural Model

Batavia Community Order is multi-ethnic, and there were ample buildings well-kown and unique. Batavia as a “fire remain” and city important for art life and knowledge life that carried out city architectural heritage holding enchantment for world onservation development. Art, culture, cultivation, and history are key words in biography depiction of human being and human society inherited from the past-time generation to future generation.

Sophistication of art and culture as well as human cultivation are in the form of *tangible heritage* and intangible heritage. In case both of them are combined, in fact both can be sold out as an enchantment providing additional value toward environment and building o cultural conservation or *heritage tourism*. An approach is “*community based actions* thus it is supposed to occur in implementation of renovation or conservation of environment and cultural conservation building, as indeed suggested by UNESCO.

In terms of increasing societal awareness in global and all around the age, UNESCO held champaigns love of cultural heritage with program through schools from Kindergarten to Colleges, entitled: *Heritage In Young Hands*. The UNESCO also gave message to politician/decision maker/district adminstration, that in cultural conservation implementation then society in vicinity is supposed to get involved with the project as joint project with society in vicinity so far the project is willing to get success. Maintenance of renovation and utilization of cultural conservation consistently in fact can be seen in Manhattan.

Ad. 2 Kotatua of Economy Model

Old buildings in region of *Kotatua* Jakarta as cultural conservation building in form of past time arhitecture is frequently appraised or valued by the owner as *non marketed good*, but in addition there is one in perspective of marketable asset after done via concervation process. From perspective of *stake holders* thus classified as holder and cost bearer for maintenance thus economy perspective becomes the only determinant.

In light of the latter, ICOMOS-UNESCO in 1993 (re-reviewed in 1998) had produced recommendation about *Cost Benefit Analysis for the Cultural Built Heritage* by taking four possibilities of case in relation of environment and cultural conservation building with the owner as well as visitors. The four possibilities in original terminology are called as:

a. Basic Model Maximizing Welfare

It is a condition where a cultural conservation owner does not depend on visitors, either from side of number or gain of visit, even the visitors are not cost-incurred.

b. Profit-maximizing Supply of Cultural Heritage

In this case visitor has *willingness to pay* to visit that cultural conservation. But willingness to pay is balanced with a certain utility at hand from that cultural conservation owner.

c. Supply Under a Zero-profit Restriction

Owner can ask for subsidy from other parties, whilst entry cost of visitors is determined by other parties. If there are profit surplus from visit result exceeding the subsidy received by owner, thus the surplus becomes the possession of subsidy provider.

d. Supply with a Fixed Cost Subsidy

In this case there is differentiation between physical maintenance cost from the owner by himself and subsidy received from other sources. Also cost allocated to give service toward visitor based on their willingness to pay on the visit. This has close relation to economy value increment target in renovation/conservation works. There is theoretical system regarding *willingness to pay, selling place, marketing cultural heritage management and policing*.

Ad. 2 Kotatua as Technology Model

Technology advance in present time gives chance in order technically to apply whatever the best or sophisticated in work, rehabilitation, restoration, renovation or revitalization. Technology capital is usually related to economy or cost if in developed country it is a point very important and as prerequisite in renovation process.

A format proposed by ICOMOS-UNESCO to calculate expense or cost in renovation implementation particularly on attentive focus of architects, designers or consultants on *check-list* regarding spatial element and building element relevant to cost in renovation design,

- a. *Spatial element*, namely all expenses related to or in accordance with spatial establishment.
- b. *Building element*, namely all expenses related to or in accordance with building cost necessity in physic.

c. *Building element*, in relation to space and having impact on particularly building cost.

Another side in technology capital interest is a need to conduct archeological research and information data search in the past time and to produce documentation for the future. This becomes part inseparable in event of renovation. Notion of independent management is to achieve a *self supporting operation*.

Conclusion

Successful restoration of *Kotatua* Jakarta Indonesia much depends on; economy stability and security, for instance, revitalization of 1971-1974 underwent deadlock discontinuation since the event of Malari of 1974. In 1996 there was re-groundbreaking of revitalization, but the fate is similar since there was disputes of monetary crisis of 1998-1999, however both revitalization has shown infrastructure improvement. Trauma of disputes recently has left-behind sample building derelict. besides there is necessary an existing "Trust of Investor".

This is seen as a matter of fact as one of background of today's revitalization namely re-generating rust of investor through pedestrianization improvement in region of garden Fatahillah and its vicinity. The result is sufficiently shocking almost five thousand persons a day visiting this region. But queerly no any investor opening new business in the region. Even investor already at hand, was brankrup. It means effort of government of DKI Jakarta in ordering and utilizing the old derelict buildings has a longer time. Perhaps this condition can be a threaten of failing revitalization.

Future Hope

1. Needs to build; 1. Art District, 2. Financial District, 3. MICE Activity, 4. Creative Industry District, 5. Food, SME & Traditional Comercial Center, 6. Education. With complete equipment at hand therefore expectantly *Kotatua* Jakarta comes a main destination with its possession named International Port of Sukarno Hatta, as well as direct highway heading direct to *Kotatua*. It must be a "Single Destination and Single Management". Therefore it takes *New Branding*, one of which is proper to see from preliminary establishment of its city "Manhattan of Asia".
2. Needs to have Presidential Enactment on Restoration of *Kotatua* and establishment of Authority Council for *Kotatua*, as conducted likewise in Borobudur, Toba Lake, and so forth. Partner making with UNESCO is necesasry in responsibility of restoration and marketing. Result to expect: target for 5 years in future from 150 thousands of tourists to 150 thousand foreigners, and 5 million domestic tourists, thus income target will be 10 billion/year achievable.

3. Realizing region of *Kotatua* Jakarta complete with historical nodes of Heritage Patist Path in terms of Indonesian Independence of 100th or 500 years-old Jakarta in next 2045 supported by numerous parties.

From the three, expectantly it can increase safety of *Kotatua* having positive impact on Jakarta of Indonesia positively and independently, as set forth in Manhattan and New York.



Figure 6. Hope in Building Arrangement
(Sumber: Ella Ubaidi, 2011)



Figure 7. Hope in Environmental Arrangement
(Source: Ella Ubaidi, 2011)

lossary

Creswell, John W, 1968. *Qualitative Inquiry and Research Design, Choosing Among Five Traditions*. California: Sage Publication.

Denzin, Norman K. Lincoln, Yvonna S. 1997. *“Handbook of Qualitative Research”*. Yogyakarta: Pustaka Pelajar.

Groat, Linda and Wang, David, 2002. *Architectural Research Methods*. USA: John Wiley & Sons, Inc

Groeneveldt, W.P. 2009. *“Indonesian archipelago in Chinese Notes*. Jakarta: Komunitas Bambu.

- Hanan. Himasari. (2001). *Revitalization of Kota Lama Region, in Dissemination and Seminar: Strategic Region Arrangement Toward future City*. 7 November 2001. Banjarmasin.
- Hutter. M, I. Rizzo, 1997. *Economic perspective on cultural heritage*, Macmillan Press, Ltd.
- Heuken SJ, Adolf, (1982). *Historical Sites of Jakarta*. Jakarta: Cipta Loka Caraka.
- Mann. Richard. (1998). *The Old City of Jakarta-Today*. Jakarta: Gateway Books.
- Ritzer. George. Smart. Barry. 2001. *Handbook. Social Theory*. London: SAGE Publications.
- Scott. Merriless. (2000). *Batavia: in Nineteenth Century Photographs*. Singapore: Archipelago.
- Strauss, Anselm. Corbin, Juliet. 1990. *Basics of Qualitative Research: Grounded Theory Procedures and Techniques*. USA: Sage Publications.
- Yuwono, Martono (2015). *Soul Improvement of Local Genus of Nusantara cities. A Revolution in City Development or Ruwatan Jiwa Kearifan Lokal Kota Nusantara. Suatu Revolusi dalam Pembangunan Kota*. Jakarta: Yayasan Pusaka Nusantara Raya.

URBIS Decision Support for Integrated Urban Governance

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Abstract

The challenges for the management of cities and city-regions in addressing the economic and societal dynamics facing Europe and Europe's cities today is evident in the complexity and interconnectedness of the global and pan-European drivers of change and their associated socio-economic, environmental and territorial impacts for urban environments. Integrated urban management processes emphasising horizontal integration across the sectoral agencies at the local level, and vertical integration between government agencies from city to EU level is identified as critical to the management of the city-region in relation to the key political objectives defined at both local and EU levels.

The clear need for enhanced intelligence to support inter-agency collaboration and decision-making on territorial development as a central feature of integrated management is identified as a prime opportunity for URBIS solutions. Accordingly this paper presents an overview of the EU funded URBIS project (ICT PSP 2014–17) investigation of vacant land potential in urban areas, and the opportunities for previously developed land or brownfield to support urban regeneration safeguarding greenfield sites. URBIS delivers assessment methodologies and tools to provide accurate up-to-date intelligence on urban vacant land opportunities that is comparable across European cities to support the definition and implementation of sustainable planning and governance strategies in cities and city-regions throughout Europe.

The background to this innovative research and city pilot development are growing pan-European concerns with land taken for urban use, which annually converts almost 1000 km² of agricultural or natural land into artificial areas, as part of a wider European land degradation process. This land take process is driven by urban sprawl and infrastructure development, for example when new urban industrial or commercial areas are built on highly fertile agricultural land, rather than recycling abandoned or underused artificial sites. Land use efficiency is today a prime political objective at both European as well as city level, and the EU Land Communication aims to establish “zero net land take” across the EU by 2050. Central to the delivery of this policy is accurate intelligence on the availability and supply of previously developed “brownfield” land, as a key component of land-use decision making, maximising the net socio-economic benefits from land-use without degrading natural capital.

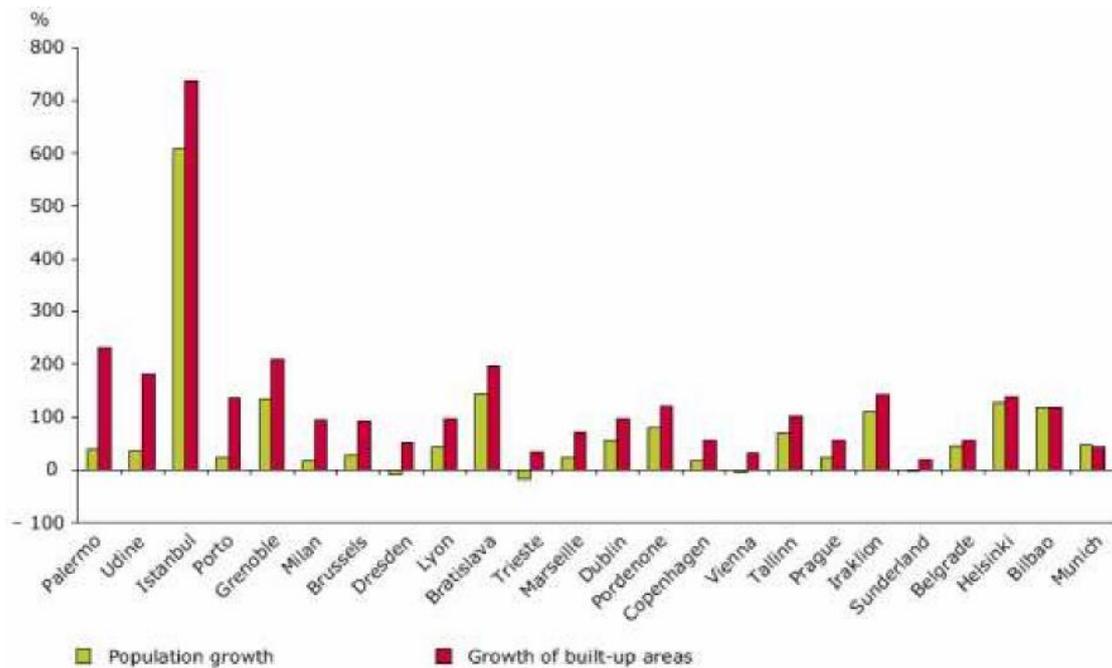
The core objectives of URBIS presented in this paper aims to deliver this intelligence via urban planning decision support tools methodologies and assessments to realise the development potential of vacant and underused land in urban areas.

Keywords: urban sprawl, previously developed land, EU Land Communication, integrated urban management, planning decision support tools

1. Urban Sprawl in Europe

European urban and regional planning on all levels is increasingly being challenged by economic globalisation and this will continue to intensify over the coming decades. Traditional European cities have developed into regional agglomerations, but planning methods and the associated management tools have not progressed and these are still applied within a “traditional” model of land use planning and non-integrated environmental management. In addition, poorly integrated and unsystematic approaches in land use policies with limited linkage to environmental quality will further impact on the environmental problems seen in many European cities. It could also be claimed that this may increase land-related conflicts in densely urbanised regions and in turn seriously threaten the social function and competitiveness of all European cities and regions, including those in the new Member States. Moreover the current financial and economic crisis has the potential to enlarge land related problems due to the reluctance of financial institutions to take higher risks for projects in the existing urban context.

The never ending extension of built-up areas and migration of the population from rural to urban areas across Europe has been recognised as a long term trend as most of the economic activities are concentrated around major urban areas. A more recent trend is the migration of population and some economic activities from city centres to the urban fringe and neighbouring rural areas encroaching onto “greenfield” land, i.e. land that has not previously been developed. This phenomenon is referred to as urban sprawl and has been recognised as one of the most significant land use changes in the last two decades across Europe (EEA 2006). Urban sprawl is accompanied by the conversion of land to artificial surfaces resulting in soil sealing, thus further increasing the environmental consequences of urban sprawl. Indeed over this period, the extent of built-up areas in many western and eastern European countries has increased by 20 % while the population has increased by only 6 % (cf. Figure 1). Even in shrinking regions, the consumption of land remains on a high level. This poses a very serious threat to the existing nature of European landscapes with significant environmental problems linked to increasing transport distances and volume of traffic, and the increasing use of private modes of transport exacerbating greenhouse gas emissions and climate change. Moreover, these trends endanger the achievement of European environmental goals in areas such as biodiversity protection and water management and also hinder the effectiveness of instruments in these areas, including the Natura 2000 network and the Water Framework Directive.



Source: MOLAND (JRC) and Kasanko et al., 2006.

The land and property market across Europe is a multi-billion Euro business. It is difficult to separate the land market from the overall real estate market, but a recent study undertaken by the EPF NPdC (Etablissement Public Foncier Nord Pas-de-Calais, France) shows that in the Nord Pas de Calais region alone, the land property market amounted to 850 million Euros between 2000 and 2002, a 6% increase on the previous period 1997-99. The annual average land area developed represented around 1,000 ha. However, vacant land represents less than 1% of the total of land developed, despite an estimated 1,800 ha of vacant land available for redevelopment in 2006. Moreover, in another report linking urban sprawl and recycling of land, EPF NPdC estimated that if all 1,800 ha of vacant land located within the urban area was recycled it would save an equivalent of 8000ha of mostly agricultural land in the periphery of urban areas. This is possible because vacant land is already close to transport and utilities infrastructure, and so not requiring the construction of new infrastructure.

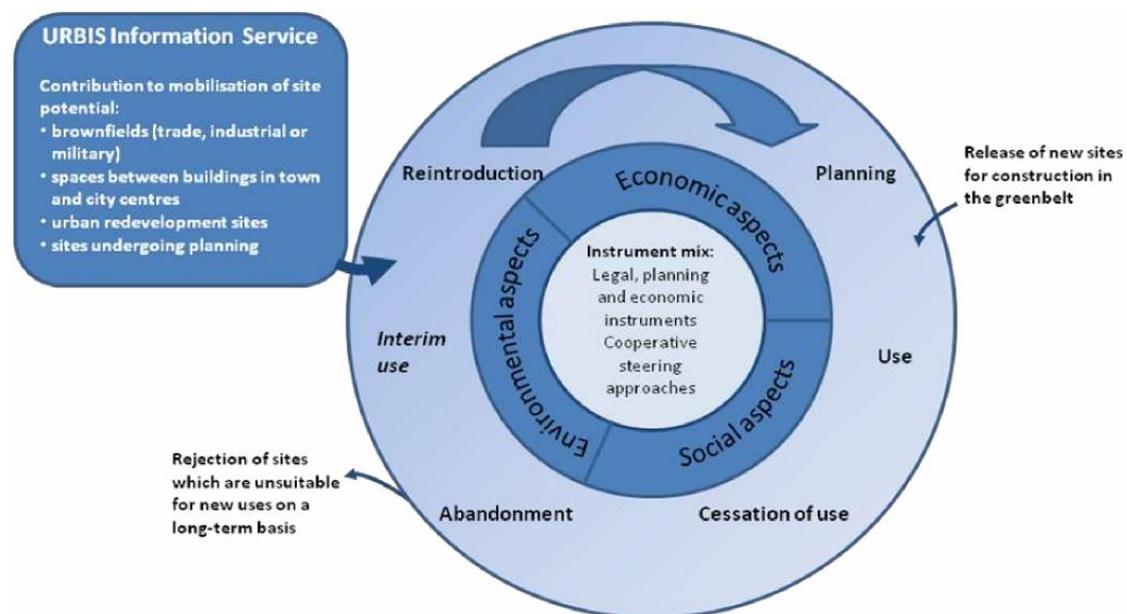
Unbalanced and uncontrolled development puts high risks on competing market led developments in the redevelopment of urban land and brownfield projects, and could lead to market failure as illustrated in several American cities (e.g. Detroit). These risks are also highlighted in a report by the RICS Foundation (RICS 2012) on the development of land and property markets in central and Eastern Europe where the Czech Republic and Poland are respectively ranked second and third in a combined growth and stability/risk indicator in the region. However, the authors of the report stress the importance of reliable market data and transparency.

At the same time, a significant proportion of artificial areas is not actively used and could potentially be redeveloped instead of encroaching on non-urbanised land. In this context, vacant sites are defined as previously developed land or derelict and vacant land and building sites. This includes any form of development, e.g. former housing estates as well as disused industrial or military sites as well as disused social or technical infrastructures. The term "vacant sites" is preferred to brownfields which are often associated with previous industrial or commercial sites that are

potentially contaminated. In some cases, vacant sites can also include agricultural or natural areas surrounded by urban areas. Vacant sites are a natural reservoir of land that can potentially be redeveloped.

One important key to unlocking the vacant site potential is the provision of accurate and up to date land cover/use information. The implementation, validation and wide European adoption of specific inventory, typology and decision support services for vacant lands provide the basis for a system aiming at mitigating urban sprawl. URBIS services enable consideration of the land reuse strategies in the context of ecosystem services whereby the supporting, regulation, provisioning and ecosystem services provided by the vacant sites could be identified to inform future planning policy and decisions to foster a more holistic planning approach critical to sustainable urban development.

The concept of URBIS services is presented in Figure 2 below and is conceptually linked with the circular flow land use management ("Fläche im Kreis", 2005). Circular flow land use management aims to provide an integrated political and governance approach which includes the whole spectrum of policy areas and fields of activity. It is developed in relation to both local and regional levels and combines planning considerations at both levels in an integrated urban and regional land development policy. The cycle relies on the interplay between strategies and instruments in different fields of activity, and on a suitably comprehensive deployment of tools (instrument mix) in these areas, which includes, land information (the key-focus of URBIS), planning cooperation, organisation and management, investment and support programmes, marketing and legislation.



"Fläche im Kreis", 2005)

2. Role of Copernicus Land Monitoring Core Services (LMCS)

Vacant urban land can present very different characteristics depending on the level of development and previous use of the land. As a result, depending on size, location and previous use, vacant land may be redeveloped with minimum inputs (for example development of a green park from land with no previous use) or at the other

extreme require substantial remediation work (for example development of a housing estate on potentially contaminated land). However, lack of knowledge about site conditions and characteristics typically hampers redevelopment, whatever its readiness for redevelopment. Although information exists locally, it is often patchy, incomplete and distributed between different organisations. Moreover, there is a lack of consistent information at the European level making it difficult to exchange and compare data. However, opportunities exist to overcome these constraints via the development of a methodology to develop a European information service on vacant land with the deployment of Copernicus LMCS. In particular, the Fast Track Services (FTS) on Land Monitoring developed by a number of EU research projects including geoland (1 and 2), and the follow-up GIO Land pan-European and local components (Urban Atlas 2012, High Resolution layers) introduce new more detailed layers of information focused on urban areas essential for the development of an information service aimed at identifying and characterising vacant and derelict urban sites. The development of such an information service will play a major role in the promotion of the recycling of existing urban sites, thereby directly addressing the reduction of urban sprawl.

Such an information service currently does not exist or is incomplete. In addition, the various initiatives that exist are locally based and lack a common methodology making it difficult to exchange and compare data. The availability of Copernicus LMCS open data makes it possible to develop new EO services for urban planning. In particular, availability of the GIO Land five High Resolution layers (Imperviousness degree for 2006, 2009 and 2012, tree density, grassland, water bodies and wetlands for 2012) and the Urban Atlas (2006 and 2012) combined with outputs from geoland2 regional and local Core Mapping Services (CMS) and Spatial Planning Core Information Services (CIS) concerning spatial planning provide realistic data to explore and build such a service. The Urban Atlas in particular with its characterisation of "land without current use" facilitates the development of the URBIS proposed vacant land inventory and typology information service. Furthermore, EO data acquired for LMCS services can be easily re-used to tailor the proposed URBIS service to the specific thematic needs of the users. Without it, the development of such a service would be very costly and time consuming, and the level of sustainability on the data supply side would be questionable.

The Urban Atlas and other core services are primarily for use at European level, but URBIS is also focused on providing an information service relevant at the local level. In addition, other land cover/use data sources can be used as a basis for URBIS should they be available from user organisations.

3. Open data and IS

URBIS services will be built upon various sources of open geographical information data from local, regional, national and European level. According to the a recent communication paper from the European Commission (Com 2011) the market size and growth of the geographic information sector shows the potential of public data as an engine for job creation. The German market for geo-information in 2007 was estimated at 1.4 billion euro, a 50 % increase since 2003. In the Netherlands, the geo-sector accounted for 15 000 full time employees in 2008.

Recently, a number of initiatives have made it possible to open up the access to geographical information. At institutional level, these initiatives are encouraged globally notably through the GEO. The aim of GEO is to build a GEOSS whereby the duplication of data and initiatives is minimised through the development of a system of systems. In Europe, the GEO initiative is supported through Copernicus and

INSPIRE. INSPIRE fosters interoperability between information services whilst Copernicus provides core information services on which to build value added services. The fact that most of the Copernicus core services adopt an open data policy facilitates the development of downstream services.

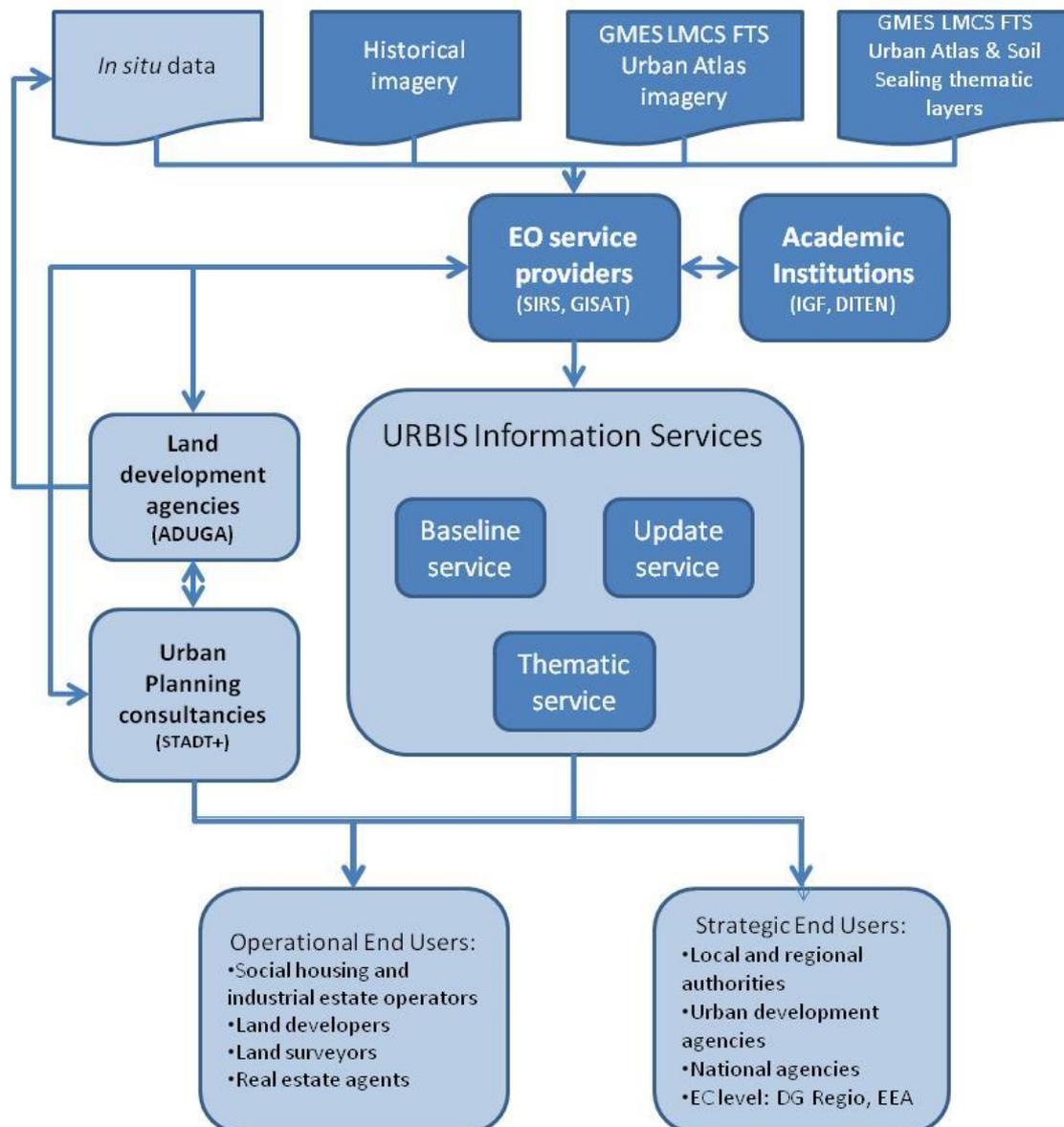
Crowd sourcing initiatives such as Open Street Map will also contribute to the development of URBIS services. Worth noting is that Copernicus core services were initially integrated in Open Street Map for areas where precise field observations were lacking such as in some Eastern European countries.

4. UR IS Objectives, Services, Users

The URBIS project aims to develop, implement and validate in real environment innovative information services related to urban vacant land, based on open geospatial data, to support planning of European Large Urban Zone's (LUZs) in a sustainable way.

The specific objectives of the project are:

- **Objective 1:** To assess the potential reuse strategies of vacant urban land based on its past uses and characteristics and through wide involvement of end-user organisations, to establish common ground for the development of URBIS services.
- **Objective 2:** To develop a methodology for an inventory and typology of European vacant urban land based on Copernicus LMCS FTS Urban Atlas and soil sealing layers and the analysis of multi-temporal imagery to determine potential constraints to redevelopment.
- **Objective 3:** To develop, implement and validate interoperable services on a number of representative LUZs across Europe under operational conditions in collaboration with key European stakeholders/practitioners.
- **Objective 4:** To develop a sustainable operational and business model for the URBIS information services
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- The proposed service architecture is illustrated in Figure 3 below and shows the main sources of data for the planned URBIS services and linkages between EO based service providers, land development agencies, land use planning consultancies and end user organisations.
- URBIS will rely primarily on the Copernicus LMCS FTS Urban Atlas, soil sealing layers and their associated source image data. In particular, the 'Land without current use' category of the Urban Atlas will be further investigated in combination with historical imagery to determine past use. In situ data when available will be sourced from land development agency partners and stakeholders and used to provide local knowledge and contribute to the development of a validation data set.



The project will develop and implement three main categories of URBIS services:

1. **Baseline services:** initial inventory and typology of urban land, not only to identify sites that can be used for re-development, but also to identify sites that should be preserved and not used for further development (e.g. high ecological value). The inventory will be based on data from the Urban Atlas.
2. **Update services:** an update service, with the regular update of the vacant urban land inventory synchronized with the planned Urban Atlas updates.
3. **Thematic services:** a set of added-value services tailored to end-users (local authorities, policy makers).

1. Baseline Services

This service will be in line with the Urban Atlas reference year 2006 and will include the analysis of historical imagery for at least 3 reference years in the last 30 years (e.g. 1975, 1985 and 1995). The 2006 URBIS vacant site inventory product will be based on the analysis of the Urban Atlas vector layer combined with the original Urban Atlas imagery and historical imagery. It should be stressed that the purpose of the inventory and typology of vacant sites is not just to identify sites that can be used for redevelopment, but also to identify sites that should be preserved and not used for further development (e.g. high ecological value).

This will be achieved in two steps:

First, by reducing the Minimum Mapping Unit of the 2006 Urban Atlas vector layer for all the potential vacant urban sites to include non-built and derelict building parcels. This will focus on the following Urban Atlas Classes:

- o Green areas greater than 500m² included within classes 12210, 12220 and 12230 (associated land with roads and railways)
- o Mineral extraction and dump sites (class 13100)
- o Land without current use (class 13400)
- o Green urban areas (class 14100)
- o Sports and leisure facilities (class 14200)
- o Agricultural (class 20000), Forest (class 30000) and Water (class 50000) features adjacent to artificial areas

Secondly, a change detection analysis based on the historical imagery. The output of this process will be twofold:

- It will result in a series of enhanced (500m² Minimum Mapping Unit for the classes listed above instead of 2500m² for the original Urban Atlas vector layer) historical Urban Atlas layers
- This information will be used to characterize potential vacant sites using the following attributes (table 1.1)

Besides the land-use and land-cover results already available in the Urban Atlas, state-of-the-art processing techniques for land-cover classification and multi-temporal analysis will be applied to the related source satellite data to optimize the classification accuracy especially in the case of very-high spatial resolutions.

2. Update Services

During the course of the project it is envisaged that an update product based on the same characteristics as the baseline product for the reference year 2013 (+/- 1 year) will be provided.

3. Thematic Services

URBIS baseline and update products will be used to derive a series of thematic services. The type and detailed characteristics of these thematic services will be defined and developed in collaboration with end user organizations, but are likely to include the following:

- Potential sites for development: housing, shopping centres, industry

- Establishment of green corridors
- Development of potential sites for renewable energy production

The definition and content of thematic services will be enriched based on the implementation of the pilot studies foreseen in during project, when the baseline and update services will be developed. However, a set of specific added value services, targeting private sectors, is already envisaged to be tested during the project:

- Support the establishment of new business activities: logistic platforms, tertiary and commercial activities areas;
- Allow sites identification for housing construction;
- Allow sites identification to assist shrinking cities strategies (demolition/Interim Use concepts);
- Inventory of sites with conversion potential into green spaces;
- Identification of sites for requalification into natural environment (protection of species, blue and green corridor).

One main activity of the URBIS project is the implementation, test and validation of the above mentioned services in real environment within 3 already selected Large Urban Zone (LUZ), geographically coherent with regards to partner's location, and which encompass a various set of specific criteria's and requirements in the field of vacant land reuse.

The 3 selected LUZs which will participate to the pilot studies are:

- Greater Amiens (France)
- City of Osnabruck (Germany)
- Moravian-Silesian Region (Czech Republic)

The first priority users of URBIS services are local and regional planners. In more general terms, end users in the URBIS context can be separated in terms of operational and strategic users.

- **Strategic users:** such as local and regional authorities, European and national agencies in charge of urban planning, would directly benefit from URBIS services as for the monitoring of the implementation of particular territory planning policy (e.g. the 30 ha goal on reduced land consumption in Germany). Furthermore, URBIS services may be used to support the allocation, monitoring and evaluation of ERDF funds in urban areas, or to assess to which extent urban development is meeting targets for the redevelopment of vacant sites.
- **Operational users:** such as industrial estates operators or private land developers are likely to require the URBIS services for meeting the requirements of a specific need such as a to know where suitable vacant sites are located within metropolitan areas greater than a certain size for the construction of supermarkets, or a local authority in charge of social housing looking for suitable sites for the construction of a new project. Financial institutions might be interested in general land data to improve project business plans. Sites from developers are also required to place renewable energy production. Regional and local planners also need information on the different vacant land development options as a critical component of urban and regional planning in relation to the management of urban sprawl, and more generally in relation to the creation of

green belts, nature conservation and leisure areas and their connectivity .

URBIS will contribute to the development of a new market for EO derived information (vacant land inventory and typology) led by EO service providers, SME's based on Copernicus products (LMCS FTS Urban Atlas and Soil Sealing layers) and addressing the needs of various stakeholders involved in land development at an operational and strategic levels

U Dimension

This project is in line with the strategy proposed by the Commission to improve land use planning and management. Many reporting obligations in relation to international conventions (UNFCCC, UNCCD, Agenda 21, UNCBD, Ramsar convention) require land use/cover spatial data. Up until now, most of these reporting obligations were fulfilled by Corine Land Cover. However, new European legislation and policies such as the Water Framework Directive, the Soil Thematic Strategy, the Urban Environmental Management and the Thematic Strategy, European Spatial Development Perspective and the Biodiversity strategy, now require more detailed spatial information.

Reconciling land use with environmental concerns is a challenge that involves all governance levels and sectorial agencies. Monitoring and mediating the negative environmental consequences of land use while sustaining the production of essential resources is a major priority of policy-makers around the world.

In 1999, the European Spatial Development Perspective (ESDP) developed European policy orientations for territorial balance and cohesion, improved competitiveness, access to markets and knowledge, as well as the sustainable management of natural and cultural resources. More recently, integrated spatial development has been addressed by the Territorial Agenda of the EU that aims at mobilising the potential of European regions and cities for sustainable economic growth and job creation.

Efforts to modify land use practices to reduce non-point pollution of air and water include integrated river basin management and, in particular, the Nitrates Directive. Flooding caused by the construction of impervious surfaces (e.g. buildings and roads) and provoked by extreme weather events is addressed by a new European Floods Directive. The cross-cutting nature of land use is also emphasised by the EU rural development and regional policies.

Furthermore, the UNFCCC (UNFCCC 1997) Kyoto Protocol promotes among other practices the reduction of emissions of methane and nitrous oxide from agricultural land. EU policies on climate change adaptation are directly relevant to current and future land use practices and economic sectors depending on this.

The European Environment Agency report demonstrated that urban sprawl is a serious environmental threat evident in city regions throughout Europe. Each country has its own specificities in terms of land and urban characteristics and in terms of indicators and policies as well. Therefore, specific sets of expertise from individual regions are required to develop the URBIS information service based on a common, consistent and up to date Europe wide inventory and typology of vacant urban sites.

References

EEA Report (2006), Urban Sprawl - the Ignored Challenge, European Environment Agency, http://www.eea.europa.eu/publications/eea_report_2006_10

Royal Institution of Chartered Surveyors (2012), Development of land and property markets in central and Eastern Europe, <http://www.rics.org/uk/knowledge/research/research-reports/land-leverage-dynamics-in-property-markets/>

COM (2011) 882 final - Open data: an engine for innovation, growth and transparent governance

United Nations Framework Convention on Climate Change (1997) Kyoto Protocol, https://unfccc.int/kyoto_protocol/items/2830.php

Smart Specialisation Strategies for Supporting Europe 2020 Vision. Looking at the American Experience: the Case of the Boston Area

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Synopsis: *These reflections aim to highlight the crucial challenge that European Regions are called to face applying the 'Research and Innovation Strategies for Smart Specialization' policy for pursuing the virtuous implementation of EU Cohesion Policy and 'Europe 2020' Agenda. The original cultural style of the 'US Smart Specialization model', supported by the 'cluster theory' and the 'innovation paradigm', represents a significant lesson in Boston area.*

1. Introduction

Since the beginning of the global economic crisis, Europe has been facing its major challenge of the last decades for pursuing a new season of prosperity and sustainable urban and territorial development. The ambitious Cohesion Policy has been conceived for tackling a persistent 'Research & Innovation gap' among European Union (EU) Regions. The privileged strategy for pursuing the vision of Europe 2020 is the virtuous integration of three fundamental vectors: the 'Smart Specialisation' concept enhanced by the so-called cluster policy, the high tech issue and the 'place based' approach.

These reflections aim at highlighting the original interpretation and evolution of the 'Smart Specialization' concept in US and its on-going process in the Europe 2020 Agenda. As it is physiologic for EU to look at the Smart Strategy 'American model', it has been investigated the successful case of the Boston urban area and the significant diversities that its cultural 'styles' suggest for Europe.

The idea of studying US cases for rethinking effective strategies in the European context seems particularly appropriate as the origin of the 'Smart Specialisation' concept is embedded in the 'transatlantic productivity gap' issue (McCann and Ortega-Argilés, 2015), due to the weak condition of the 'Old Continent' in the new technologies supporting the strategic economic sectors.

The section two of the paper briefly reconstructs the pivotal EU demand of tackling this gap leading to the origin of the 'Research and Innovation Strategy for Smart Specialisation' (RIS3), conceived by a high profile expert group coordinated by Dominique Foray (EC 'Knowledge for Growth', 2009) and adopted in the Europe 2020 Agenda within its privileged goals of 'Smart, Sustainable and Inclusive growth'.

The following paragraph discusses the RIS3 connection with the US entrepreneurship and innovation policies, which are strongly related to the widespread application of the 'cluster theory', as it was re-conceived by Michael Porter in the early '90s, after the original Marshall's districts (1920) and the interesting experience of the Italian industrial districts of the '70s. The recent best practices in US have highlighted the evolution of cluster benefits in terms of economies of scale for urban agglomerations, stakeholder networks and increase of local exchange knowledge.

The fourth part explores a significant fragment of policy and planning initiatives implementing the principles of Research and Innovation Strategies in the Boston area through the analysis of three case studies related to a complex cluster entanglement. The last part develops some preliminary findings, discussing virtuous and critical issues related to the 'Boston lesson' and

reflecting on emerging hints for the implementation of RIS3 framework in EU Regions and specific territorial and urban domains.

2. The origin of Smart Specialisation Strategies

The Smart Specialisation concept appears originally in the literature examining the so called '*transatlantic productivity gap*'. A first analysis discovered that the Information and Communication Technology sector (ICT) boosted the US productivity growth more than in Europe where the support of new technologies for innovation was scarce. The worse European performance in comparison to the US has been explained by multiple reasons, as the lower level of R&D investments (Falk, 2006), the differences in the industrial structure, and the pace of dissemination of new technologies across the economy (O'Mahony and Vecchi, 2005).

Therefore, in order to tackle the productivity gap and launch a model of knowledge-intensive growth (Camagni and Capello, 2013), the EU designed, within its *Europe 2020 Agenda*, the flagship initiative called 'Innovation Union', which aims to 'create an innovation friendly environment that makes it easier for great ideas to be turned into products and services that bring growth and jobs' (ec.europa.eu). The Innovation Union is part of the EU Regional Policy concerning 'Research and Innovation Strategies for Smart Specialisation' (RIS3) [EC, COM(2010)553], which aims to promote local innovation processes in particular sectors and technological domains through a bottom-up identification of specific 'innovation patterns' (Capello et al., 2012).

Ultimately, the Smart Specialization policy is based on four principles. First, economic development is knowledge and innovation-driven, and in the long run is about 'true economic regeneration' which is not possible to plan *ex ante*; for this reason, it refuses the '*picking-the-winner policy*'. Second, history matters, meaning that Regions have different potentials, institutional effectiveness, industrial specialization and knowledge level and an analysis of the Region environment is indispensable. Third, the perspective of economic growth embraces the bottom-up approach. Fourth, this policy is demand-driven, as it is derived from local potentials and local needs.

Therefore, the RIS3 policy has joined the 'place-based' approach (Barca, 2009) in order to identify the specificities that each Region can utilize for a successful innovation process. This approach implies collaboration and sharing of information between local actors and all levels of government in order to enhance the 'grassroots' factors which create knowledge and transform it in sustainable innovation.

In this context, local policymakers, universities and private entrepreneurship are the key actors for promoting knowledge and innovation as the principal features for Regional growth (Capello, 2014), whereas governments perform a strategic role in the productive sphere, giving great importance to the involvement of local stakeholders and public-private coordination (Iacobucci, 2014).

On one hand, the public policies are based on the concept that Regions have their own specific industrial and institutional history, and that the local stakeholders – entrepreneurial agents, policy makers and the society – should be made part of the implementation of Regional development (Coffano and Foray, 2014). In this approach local stakeholders have a great role in defining the main strengths, weaknesses, potentials and bottlenecks in a Region and it is their duty to analyse the technological and market opportunities, to find possible strategies and articulate a pattern of economic growth. The policy process should be inclusive and allow for a large number of stakeholders to participate in order to acquire specific needs by using available resources.

On the other hand, it is pursued the process of 'entrepreneurial discovery' (Foray et al., 2011), which consists in selecting and prioritising fields and sectors where a cluster should be developed and where the entrepreneurial activity unveils new domains for the future specialization. In the self-discovery process (Hausmann and Rodrik, 2003) public and private sectors have to collaborate strategically, evaluating costs and opportunities and reducing the impact of the imperfect information. Therefore, governments have a prominent role, more important than safeguard property right, to avoid corruption and guarantee economic stability.

3. The cluster concept and its relationship with the RIS3 policy

The cluster idea has enjoyed a surge in popularity over the last two decades largely thanks to the work of Michael Porter (1990, 1996), although early theorisations of the concept of 'cluster' date back to the last century (Marshall, 1920). Challenging the dominant narrative of internal economies of scale as main sources of specialisation advantages, the later known 'Marshallian economies' basically entail that a firm can remain small and still capable to be highly specialised and competitive, as far as it interweaves with other firms an extensive network of direct and indirect intra-industry relationships. Despite their potential, Marshall's speculations have long struggled to find their way within the mainstream economic theory. A resurgence of the idea of industrial district occurred on a pervasive scale only many decades later, when scholars started taking a renewed interest in the dynamics occurring within Regional agglomerations of SMEs. Indeed, many Regions in central-northern Italy, the so-called 'Third Italy' (Bagnasco, 1977), were traditionally home to a large variety of local socio-economic systems characterised by 'the active presence of both a community of people and a population of firms in one naturally and historically bounded area' (Becattini, 1990, p. 39). Eventually, cluster theory went through a more structured systematisation within Porter's theory (Porter, 1990, 1996), where clusters were defined as '*geographic concentrations of interconnected companies, specialised suppliers, service producers, firms in related industries, and associated institutions (for example, universities, standard agencies, and trade associations) in particular fields that compete but also cooperate*' (*ibidem*, p. 197). Among the many credits of Porter's theory, three at least deserve to be mentioned here: firstly, his emphasis on the critical duality between collaboration and rivalry, which concurrently create pressure to innovate and upgrade competitiveness in the system. Secondly, his general definition of cluster allows encompassing a broader range of Regional agglomerations, beyond the traditional Marshallian industrial district. Finally, and most notably, Porter has 'not only promoted the idea of 'clusters' as an analytical concept, but also as a key policy tool' (Martin and Sunley, 2003, p. 6), by explicitly including policy-makers as key actors in fostering local economies.

Indeed, since the work of Porter, policymakers have long made their way to seize the notion of 'cluster' as a tool for promoting Regional growth and competitiveness, and this has led to 'a proliferation of policies that seek to nurture and support cooperative relationships among firms and with other production-related agents' (Aranguren and Wilson, 2013, p. 7).

The European regions have long established cluster policies within their regional systems in order to facilitate relationships of cooperation between firms and institutions, emulating the US policy framework, which substantially grounds upon the concept of 'cluster' as a specific target and strategic tool to enhance sub-national economic systems.

These networking policies aim at building a territorial 'platform' of local stakeholders, firms, institutions, public and private organisations, universities, technology transfer offices, civil society, who are encouraged to interact together in formal and informal relationships in order

to create, use and disseminate knowledge, enhance social trust, elaborate a harmonized vision for the future of the region. They operates below 'macro-level' policies with the aim to improve the ecosystem for all firms through 'setting the table' activities (Lerner, 2009), and above 'micro-level' policies, tailored to the need of individual firms (Porter, 2007).

It is quite straightforward, by these means, that the domain of cluster policies shares much common ground with the underlying principles of RIS3, thus requiring an overarching consideration in terms of their complementarities and contradictions. Foray himself acknowledges that 'vibrant innovative clusters' should be considered as a 'classic outcome' or an 'emergent priority' of a RIS3 strategy, but also warns that Smart Specialization is not the same thing as a cluster policy (Foray et al., 2011). In fact, two main distinctions can be made (Aranguren and Wilson, 2013) both in terms of target and focus. Cluster policies, indeed, are tailored to the specific needs of cluster agents and do not deal with the broader scope of gaining competitive advantages for the regional economy as a whole. Moreover, they seek to promote the competitiveness of the cluster among a broad range of areas (internationalisation, quality standards, training, R&D, innovation, etc.), while RIS3 strategies specifically target the allocation of regional investments for the enhancement of the innovation processes and the valorisation of human capital. Nevertheless, both cluster policies and RIS3 can be considered as 'systemic policies' (Sudgen et al, 2006) insofar as they set up new forms of governance and institutions in order to promote cooperation among a wide range of industrial and non-industrial actors within a specific sub-national economic system. Moreover, both policies are considerably place-dependent, since they root in that bundle of assets and capabilities that are already present in the territory, both in terms of constraints and opportunities.

Finally, while RIS3 policies have been sized accordingly with the geographic and political reach of the European Regional governments, cluster policies or, broadly speaking, public initiatives aiming at fostering entrepreneurship in specific contexts, can be activated at the national, regional or municipal level, but they usually are narrowly place-specific (Chatterji et al., 2014), favouring a very specific local area, as it is showed in the case of Boston Innovation District (§4.1). The rationales of this geographic concentration can be ascribed to the broad objective of generating positive externalities in a designated area, which usually occur at a micro-scale level (Rauch, 1993) and can be fostered by the coordination of a governmental entity that connects different firms. Cities provide a natural and preferential testing ground for these policies thanks to a vast array of favourable conditions that can be found in the urban area, among which the presence of an educated and 'creative' workforce (Florida, 2002), the 'local supply' of entrepreneurs (Glaeser et al., 2010), the high concentration of private venture capital (Samila and Sorenson, 2011), the more diversified business environment (Glaeser and Kerr, 2009), and the provision of public infrastructures (Chatterji et al., 2014) are undoubtedly the most relevant. This is why, for the purpose of this study, the analysis of US industrial and entrepreneurship policies will be anchored to a specific urban context.

The paper deals in the following with two specific elements of the RIS3 strategies that are largely shared by cluster-oriented policies: the process of entrepreneurial discovery and the engagement of stakeholders in the evaluation of RIS3 potential, which can both be framed within the first two of the six steps selected by Foray (European Commission, 2012) for S3 design: (1) 'Analysis of the regional context and potential for innovation: a wide view of innovation' and (2) 'Governance: ensuring participation and ownership'. While the scope and the boundaries of the public actor is quite well stated in both policies, very little is known in terms of effective diagnostic processes of the regional contexts, which should be capable of

fully recognise the role of local entrepreneurs and their grassroots organizations. Moreover, the way market and civil society (the 'quadruple helix') should be included in order to foster a 'Collaborative leadership' (*ibidem*, p. 17) is not well specified in the RIS3 guidelines, while a long-lasting tradition of successful Public-Private Partnerships (PPP) and territorial-oriented initiatives can be recognised in the US policy framework. Finally, the way RIS3 policies deal with a broader range of objectives, not only specifically oriented to the enhancement of the 'business realm' (Lorenzen, 2007), but also affecting territorial dynamics (spanning from local development to urban regeneration) is largely overlooked.

4. The Boston case: what to learn

Nowadays, the Greater Boston area is one of the most innovative realities within the U.S. scenario. Thanks to its high agglomeration of educational institutions and industries, as well as its physical and infrastructural system, the whole metropolitan region has been able to attract an increasing interest of main investors and venture capitalists. This flourishing environment has positively impacted on the economic growth of the Metropolitan area, showing the highest rate of growth across the US (Kahn et al., 2012). Specifically, in the last thirty years the Cities of Boston and Cambridge have implemented economic and urban policies that have turned it in one of the most prosperous and vibrant settlement of the nation. Therefore, public and private investments have been carried on to spur sectors such as education, financial services, life science and high-tech, that today represent the main clusters sustaining the urban economy by generating a significant rise in job creation, also in other cross-sectors.

Apparently, the effects of these economic policies are experienced on the territory by the spread of new development and renewal projects that are changing the urban geography of the city by supporting the settlement of innovation hubs within the neighbourhoods. The emerging model that embodies the idea of recreate an innovative urban ecosystem is well represented by the concept of 'Innovation District', a 'geographic area where leading-edge anchor institutions and companies cluster and connect with start-ups, business incubators, and accelerators' (Katz and Wagner, 2014).

4.1 *LifeTech Boston*

The '*LifeTech Boston*' (LTB) was launched by the public agency 'Boston Redevelopment Authority' (BRA) in 2004 and it was absorbed in the Business Development Division of the same agency in 2013. The original mission was to foster the growth of Boston's life sciences and high technology sectors by nurturing the incumbent companies in the City and attracting national and international businesses. It targeted three different domains: Biopharmaceutical, Information Communication Technology and Medical Device.

The '*LifeTech Boston*' initiative assisted companies looking for a new localisation, providing city services, and identifying financial resources. In this activity they built a network of partnership as consulates, trade and investment organisations, non-profits and public agencies. In particular, they worked with two stable partners: *MassBio*, a not-for-profit organization that represents and provides services and support for the life science sector, and the *Massachusetts Life Science Center* (MLSC), a quasi-public agency of Massachusetts tasked with implementing the Massachusetts Life Sciences Act.

LTB identified and promoted 5 areas of possible localisation two of which deserve to be mentioned here.

The first area is the Boston Innovation District (BID), a component of the '*Innovation Boston Strategy*', that aims to create a neighbourhood able to attract financiers, resources, and talent

mimicking the success of *22@Barcelona*, considered the most virtuous prodromal experience of the innovation district model. The BID project was conceived to redevelop the South Boston Waterfront, a 1000 acres underutilized area that hosted industrial activities, transforming the area into a thriving hub of innovation and entrepreneurship together with new residential, commercial and retail surfaces within a mixed use configuration.

The BRA managed the project and provided partial funding for constructing new public spaces, building a network with private companies and using financial and planning tools within the PPP 'architecture' in order to guarantee the progressive implementation and ease the burden of the costs of the project on the City's budget. The centrepiece of BID is the District Hall, a large public space where innovators can meet, aggregate, exchange ideas, explore potential synergies, finalize their creativity, find concrete agreements. The building, opened in 2013, offers 12,000 square feet of meeting space, and it is the result of a PPP between the BRA and private investors. The City plans to add 1.2 million square feet to the Massachusetts Convention Centre, the major anchor in the district, with a project of 1 billion dollars and to implement the project with the construction of new private housing units.

In this area the LTB initiative worked to attract both start-ups and more established companies as Vertex Pharmaceutical that has set up its new headquarter in the District.

The second one, the Longwood Medical Area, is characterised by research, health care and academia territorially dense activities hosting several key players (Brigham & Women's Hospital, Children's Hospital, Dana-Faber Cancer Institute, Harvard Medical School, Harvard School of Public Health, Harvard School of Dental Medicine, Merck) and 43,000 people including scientist, researchers and staff and 19,000 students. Thus, the LTB initiative worked especially with *Kowa Pharmaceuticals* and *Pfizer* helping these companies to find a space for their offices. The main activity was the assistance during the administrative process for licences and permissions.

4.2 Greentown Labs (Somerville)

Greentown Labs (GTL) is a PPP initiative with the aim to become the largest incubator for clean-tech start-ups in the USA. The initiative is characterised by a high localisation mobility, determining a path within the already existing 'Innovation Districts' of Boston and Cambridge. It originally stemmed from the Cambridge area, then moved to Boston, and at last it ended up in Somerville municipality following criteria such as space availability, rent prices, and public funds. Although its second location within the BID was highly strategic, given the knowledge spillovers with other business ventures and the provision of public infrastructures, the area was no longer affordable in terms of rents. Eventually, the City of Somerville managed to attract GTL's localisation by linking it to its 20-year plan called 'Somervision', whose overall mission is to attract innovative business activities in the area in order to generate new employment opportunities and positive externalities for the community as a whole. The Future Economies Commission of this Municipality eased the Lab through a working capital loan, to be secured to some general requirements in terms of new job creation for low-income citizens. The Commonwealth of Massachusetts as well contributed to Greentown's expansion into Somerville through a \$300,000 grant, provided by the Massachusetts Clean Energy Centre (MassCEC). The localisation history of GTL is due to its continuous expansion and the increasing number of start-ups they host in their spaces (currently 43, planned to become 100).

The GTL initiative can be framed in terms of a business incubator that offers strategic resources tailored to the specific needs of clean-tech firms, by providing access to a prototyping space, educational assistance and trainings from sponsors and partners on

specific tools and resources (like Veolia, National Grid, Engie and CertainTeed Saint-Gobain), acceleration programs (Greentown Launch and Manufacturing Initiative), and, most notably, network building with other entrepreneurs, angel investors, venture capital firms and public organizations.

The case of Greentown Labs provides several strands of analyses, by means of territorial outcomes implications, institutional texture, and policy implications. The rationale behind the persistent interest in this project by local policy-makers is twofold: on one side, local governments typically target fields that appear to have long-standing comparative advantages in the city (Chatterij et al., 2014), and the policies tend to reflect the new ideas and human capital that can be fostered by these sectors. Public support for clean-tech is seen, by these means, as a tool for dealing with the negative externalities, like carbon emissions, associated with traditional energy sources, which have been dominating the innovation scenario over the past two decades. On the other side, local municipalities acknowledge the importance of 'seizing' industries and strategic actors within their own territorial domains, since knowledge spillovers and branching-off processes have been proved to attenuate rapidly across the city, even over just few blocks, as showed for the case of Manhattan (Arzaghi and Henderson, 2008).

In terms of policy implications, the case of Greentown Labs shows that the function of 'clustering' entrepreneurs can also be performed by private developers (Chatterji et al., 2014), thus galvanizing the concept of entrepreneurial discovery and grassroots seeding. Public policies can, thus, layer over privately-funded initiative and anchor them to broader economic or territorial initiatives, as in the case of the City of Somerville. The 20-year program 'SomerVision', by these means, provided a fertile ground for the development of Greentown Labs, and benefited from multiple positive externalities thanks to its location: among the others, the creation of new job opportunities, the requalification of a mature industrial area, and the establishment of a vibrant community of entrepreneurs, who are also encouraged and sponsored to pilot their green innovation in the city under the Somerville Green Tech Program. By these means, Greentown Labs constitutes a convergence point of a complex network of public policy initiatives that act a different scale and with different objectives. Along with the municipal level, different federal public agencies, like the NSF and the SBA, are involved in the initiative in order to enable the production of radical innovation in the clean-tech and foster sustainable transition, while at the State level, institutions like MassCEC, are primarily focused on encouraging start-up formation and growth, spurring knowledge transfer across various organizational boundaries, and creating a regional hub for specific clean-tech sectors. Therefore, a sound policy mix, at the State and local level, aiming at building and supporting clusters, can be consistent with a leading role of private initiatives and should encompass a territorially-led vision in order to internalize the externalities that can come from innovation and new start-ups.

4.3 *Neighbourhood Innovation District (Boston)*

The *Neighbourhood Innovation District* (NID) is an ongoing public strategy launched in 2014 by the Boston Municipality. The main goal is to encourage and to widespread innovation and technology within low-income neighbourhoods as necessary tools that generate a positive impact on small business growth and local economic development. However, rather than supporting a specific industrial sector in advance, the NID' strategy has adopted a more territorial-based approach able to empower the existing business activities as well as the physical features of the places. Thus, the initiative's most innovative aspect has been to shift the focus from the solely idea of entrepreneurship towards a more inclusive and community

oriented perspective taking into account the overall economic empowerment of the neighbourhood. For the first time in the framework of the innovation policies, this approach has tried to prevent the community displacement generated by the development of innovation districts whose creation inevitably leads to a dramatic rise of the real estate values. Therefore, this is why the 'NID Committee' - body created by the present administration for identifying policies, practices, and infrastructure improvements to support the development of innovation districts throughout Boston - has strongly suggested a District Housing Plan as a tool to ensure within the neighbourhood a consisting provision of new affordable housing and business spaces.

The Committee, in charge for piloting the whole process, is composed by local leaders, businesses experts, representatives of community-based organizations and representatives of the City. It encourages a participatory approach working with residents and local stakeholders in order to ensure a shared and affordable vision of economic development within the city. The results achieved by the Committee have been collected in a final document that defines the guidelines to implement an Innovation District into an existing distressed neighborhood. Four specific recommendations are highlighted in the document: ensuring an adequate entrepreneurial education programs, promoting a streamlined regulatory framework for new entrepreneurs, providing enough space for both retail activities and new affordable housing and delivering publicly-accessible business space and infrastructures that support the networking between private entrepreneurs.

Following specific criteria remarked in the Innovation District literature (transit access, affordable office space, arts and cultural amenities, involvement of non-profit organizations) and considering the peculiarities of the area (presence of high-educational institutions, vacant lots, transportation nodes) the choice fell on *Dudley Square-Upham Corner Corridor*, a vibrant zone within the Roxbury neighborhood. Overall, the area collects all physical and structural characteristics to become a promising pilot project able to spur local entrepreneurship. Since the beginning of the initiative, the area has attracted few local stakeholders' investment, such as the non-profit 'Initiative for Competitive Inner City' (ICIC) founded by Michael Porter in 1994, that proposes several State and Federal programs of research aimed to boost market opportunities and investment into inner areas (such as Roxbury) as a whole; after few months of activity only, the Roxbury Innovation Center is mainly involved in providing vocational training programs for local residents, nonetheless, the local administration, due to the lack of a thriving socio-economic environment, is struggling to find entrepreneurs ready to invest in the corridor.

5. Preliminary findings and final remarks

The case studies evaluated have been deliberately selected in order to provide evidences of different approaches in targeting innovation and cluster dynamics at the urban level. Notwithstanding the high variance of the initiatives, an overarching assessment could still be feasible by framing it within two main levels of analysis: the *objectives* and *targets* of the initiatives, in terms of territorial and/or industrial orientation, and the *negotiation process* between private and public actors, that can show either a bottom-up or top-down approach. By combining the alternative modes of the two dimensions under analysis, four areas of policy-intervention can be plotted, as displayed in *Figure 1*. Considering the role played by private entrepreneurs in launching the initiative and dealing with the different public agencies progressively involved, GTL could actually be plotted in terms of a bottom-up approach that incorporates a clear industrial orientation (SE quadrant), with some relevant openings towards a more systematic vision of local development (the modulation of the 20-

years City Plan, the requalification of the area, the pilot-tests of green innovations in the neighbourhood, etc.). NID, instead, clearly shows a strong commitment in the involvement of all the stakeholders, by dealing with a vast array of local communities and simultaneously pursuing different goals (the spurring of local entrepreneurship, the urban regeneration of the area and inclusiveness) Although the policy can still be framed in terms of the ‘innovation district’ (Katz and Wagner, 2014) approach, the overall mission is definitely consistent with a more specific territorial orientation (SW quadrant). Finally, some criticisms are related to the identification of the LTB initiative in terms of top-down vs. bottom-up approach, without questioning its narrow industrial orientation. Indeed, while we can still detect some feedback-mechanisms allowing the firms to influence the decision processes, the general methodology applied by policy-makers shows a clear preference towards a top-down implementation and a general lack of territorial orientation. Therefore, also considering the relevant differences with the GTL case, the initiative can coherently be placed in the NE quadrant.

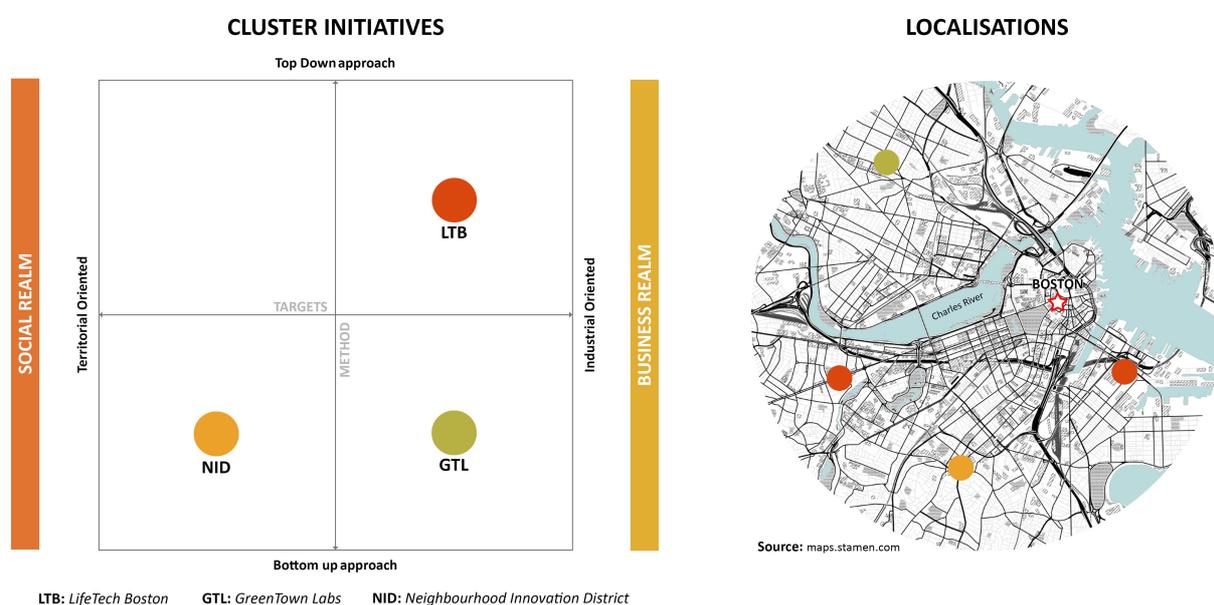


Figure 1: Overarching assessment of the three case studies

Although we acknowledge that any schematisation of these initiatives cannot but deliver preliminary and partial considerations, the scheme provides a useful tool of analysis for evaluating how public actors take into account local stakeholders in the formulation of the initiatives, which is also a pivotal element in the implementation of RIS3 policies. Bottom-up approaches, either by addressing the ‘business realm’ alone (Lorenzen, 2007), as in the case of GTL, or by involving the overall ‘social realm’, as in the NID case, are both highly consistent with the process of ‘entrepreneurial discovery’ fostered by the EU Commission.

In a first attempt to draw some insights from these findings, some critical questions arise: what is the original interpretation of the RIS3 in the ‘American style’ emerging from the policy initiatives within the Boston area? What is the role of clusters? Is there a specific interpretation of the ‘place-based’ approach useful for the EU 2020 vision?

It is not simple to find a univocal answer to these questions. The first findings within the ongoing research process, looking at the limited number of case studies previously described, highlight that the interpretive style of the term ‘innovation strategies’ is tightly intertwined on the specific synergy between different actors of the multiple helix model, with a privileged role played by the enterprise universe. As to the other principal ‘stakeholders’ of

urban regions, specifically public governmental institutions and local communities, it is possible to recognize a 'flexible geometry approach' in which strategies and roles can assume from time to time different identities, where the boundaries between public and private initiatives are often blurred. By looking at the European policy scenario, instead, these 'geometries' are likely to be shaped by a dominant regional approach, where Regions themselves actually catalyse and address the role of other public and private actors potentially involved in implementing and fostering innovation policies.

Referring to the cluster model as it is well known according to the Porter's theory and evolutionary interpretation, it would be inappropriate and substantially incorrect to investigate, chase and recognize clusters in their completeness at neighbourhood or municipal level as the assessment method adopted by Porter's research team at the Harvard Business School (see clustermapping.us) has been validated at a State and County scale. Nevertheless, their regional reconstruction of clusters delivers intriguing interpretations at urban level as well. Indeed, the physical concentrations of dense fragments and significant 'critical mass' represent authentic 'hot spots' in the urban fabric and 'topologically materialize' cluster fractals belonging to complex and widely extended network systems. The Longwood Medical Area and the Boston Innovation District, for instance, do not show only the concentration of a huge range of economic activities, but most of all propose new thriving patterns of integrated models with young actors naturally gravitating around the space of potentials and opportunities. In general, in the 'innovation district' phenomenon the ideal objective of the regeneration strategy is the synergy between increased creative production, associated with cross-fertilization interaction, and a high level of 'urbanity'.

The dialogic relationship between two 'opposite' cases like BID and NID demonstrates that locations, proximity, conditions 'ex ante' still matter, and that governance has a great importance for the possible success or failure of such initiatives. Given the relevant commitment and direct involvement of the public institutions in the BID case it is possible to interpret the evolution of the redevelopment strategy which becomes the product of a long-term planning and shared investment on the part of taxpayers, anchor institutions, and private sector partners. In the public-private-non-profit partnership the cooperation of actors has been able to manage the risk, mostly emphasizing the potential for private profit together with a recognized public benefit. Nevertheless, it is impossible to forget the overwhelming business-driven general philosophy of the policy and planning initiative.

Finally, according to the rhetoric of the official documents evaluated, this new redevelopment strategy should be adapted to meet local needs with programs intended to foster a more inclusive ecosystem, creating economic opportunities not only for the 'haves' (and tech connected) but mostly for the 'have nots'. This is the most difficult challenge that the present Boston administration is called to face after locating an Innovation Center in a critical distressed neighbourhood like Roxbury for turning really upside down the ongoing traditional strategies and doing something truly innovative: disrupt the patterns of inequality. By looking at the European case with similar lens, the main challenge for the EU policymakers can be framed in the need to pursue a novel model of RIS3 which should not only emphasize the role of industrial clusters, but also 'territorialise' the redevelopment vision. As originally the 'Smart Strategy' idea has been mostly developed in a non-spatial dimension, the centrality of territories represents the core issue. In order to overcome this limit, it is necessary to apply the principles of the 'place-based' approach for identifying, recovering and increasing the values of local cultural specificities and build virtuous regeneration projects including the potential of territorial 'DNA' related to the local communities. The conscience of places still matters.

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References

- Aranguren, M. J., Wilson, J. R. (2013) "What can experience with clusters teach us about fostering regional smart specialisation", *Ekonomiaz*, Vol. 83 No. 2, pp. 126-145.
- Arzaghi, M., Henderson, J. V. (2008) "Networking off Madison Avenue", *Review of Economic Studies*, Vol. 75 No. 4, pp. 1011-1038.
- Bagnasco, A. (1977) *Tre Italie. La problematica territoriale dello sviluppo italiano*, Bologna: Il Mulino
- Becattini, G. (1990) "The Marshallian ID as a socio-economic notion", in F. Pyke, G. Becattini, W. Sengenberger (eds.), *IDs and inter-firm co-operation in Italy*, Geneva: International Institute for Labor Studies, pp. 37-51.
- Barca, F. (2009) "An agenda for a reformed cohesion policy: a 'place-based' approach to meeting European Union challenges and expectations", [On-line] http://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report/_barca_report_en.pdf
- Capello, R. (2014) "Smart Specialization Strategy and the new EU Cohesion Policy reform: introductory remarks", *Scienze Regionali*, Vol.13 No.1, pp- 5-14.
- Camagni, R., Capello, R. (2013) "Regional innovation patterns and the EU regional policy reform: toward smart innovation policies", *Growth and change*, Vol. 44 No. 2, pp. 355-389.
- Capello, R., Cappellin, R., Ferlaino, F., Rizzi, P. (2012) *Territorial patterns of innovation*, Milano: Franco Angeli.
- Chatterji, A., Glaeser, E., Kerr, W. (2014) "Cluster of Entrepreneurship and Innovation", *Innovation Policy and Economy*, Vol.14 No.1, pp. 129-166
- Coffano, M., Foray, D. (2014) "The Centrality of Entrepreneurial Discovery in building and implementing a Smart Specialization Strategy" *Scienze Regionali*, Vol.13 No.1, pp. 33-50
- Cohen, A. (2002) *Community Development Corporations and their Changing Support Systems*, The Urban Institute - Metropolitan Housing and Communities Policy Center. Washington, DC
- Doloreux, D., Parto, S. (2005) "Regional innovation systems: Current discourse and unresolved issues", *Technology in society*, Vol.27 No.2, pp. 133-153.
- Falk, M. (2006) "What Drives Business R&D Intensity Across OECD Countries?", *Applied Economics*, Vol.38 No.5, pp. 533-547.
- Foray, D., David, P. A., Hall, B. H. (2011) "Smart Specialization. From academic idea to political instrument, the surprising career of a concept and the difficulties involved in its implementation", EPFL-WORKING-170252
- European Commission (2009) "Knowledge for Growth. Prospects for science technology and innovation" Selected papers from Research Commissioner Janez Potočnik's Expert Group, [On line] ec.europa.eu/invest-in-research/monitoring/knowledge_en.htm.

- European Commission (2010) "Communication from the commission to the European Parliament, the council, the European Economic and Social Committee and the Committee of the Regions, Regional Policy contributing to smart growth in Europe 2020", COM (2010) 553 final. Brussels.
- European Commission (2012), Guide to Research and Innovation Strategies for Smart Specialisation (RIS3), Brussels: CEC
- Florida, R. (2002) *The Rise of the Creative Class*, New York: Basic Books
- Glaeser, E., Kerr, W. (2009) "Local Industrial Conditions and Entrepreneurship: How Much of the Spatial Distribution Can We Explain?", *Journal of Economics and Management Strategy*, Vol. 18 No. 3, pp. 623-663.
- Glaeser, E., Kerr, W., Ponzetto, G. (2010) "Clusters of Entrepreneurship", *Journal of Urban Economics*, Vol. 67 No. 1, pp. 150-168.
- Hausmann, R., Rodrik, D. (2003) "Economic development as self-discovery", *Journal of Development Economics*, Vol.72 No.2, pp. 603-633.
- Iacobucci, D. (2014) "Designing and implementing a Smart Specialization Strategy at a regional level: some open question", *Scienze Regionali*, Vol.13 No.1, pp. 107-126.
- Kahn, C. B., Martin, J. K., Mehta, A. (2012) *City of Ideas: Reinventing Boston's Innovation Economy: The Boston Indicators Report 2012*, The Boston Foundation, Boston, MA
- Katz, B., Wagner, J. (2014) *The Rise of Innovation District: A New Geography of Innovation in America*, Washington: Brookings Institution.
- Lerner, J. (2009) *Boulevard of Broken Dreams*, Princeton, NJ: Princeton University Press
- Lorenzen, M. (2007) "Social capital and localised learning: proximity and place in technological and institutional dynamics", *Urban Studies*, Vol. 44 No. 4, pp. 799-817.
- McCann, P., Ortega-Argilés R. (2015) Smart Specialization Regional Growth and Applications to European Union Cohesion Policy, *Regional Studies*, Vol. 49 No. 8, pp. 1291-1302
- Marshall, A. (1920) *Principles of Economics*, London: Macmillan.
- Martin, R., Sunley, P. (2003) "Deconstructing clusters: chaotic concept or policy panacea?", *Journal of economic geography*, Vol. 3 No. 1, pp. 5-35.
- Neighborhood Innovation District Committee (2015) *Neighborhood Innovation District Committee. Report & Recommendations*, Boston, MA
- O'Mahony, M., Vecchi, M. (2005) "Quantifying the Impact of ICT Capital on Output Growth: A heterogeneous Dynamic Panel Approach". *Economica*, Vol.72 No. 288, pp. 615-633.
- Porter, M. E. (1990) "The competitive advantage of nations", *Harvard business review*, Vol. 68 No. 2, pp. 73-93
- Porter, M. E. (1996) "Competitive advantage, agglomeration economies, and regional policy. *International Regional science review*", Vol. 19 No.1-2, pp. 85-90.
- Porter, M. E. (2007) "Clusters and Economic Policy: Aligning Public Policy with the New Economics of Competition", *Harvard Business School Paper*.
- Rauch, J. (1993), "Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities", *Journal of Urban Economics* Vol. 34 No. 3, pp. 380-400.
- Samila, S., Sorenson, O. (2011) "Venture Capital, Entrepreneurship and Economic Growth", *Review of Economics and Statistics*, Vol. 93 No. 1, pp. 338-349.
- Sugden R., Wei, P. and Wilson, J. R. (2006) "Clusters, governance and the development of local economies: A framework for case studies", pp. 63-83, in C. Pitelis, R. Sugden and J. R. Wilson (eds.) *Clusters and Globalisation: The Development of Urban and Regional Economies*, Cheltenham: Edward Elgar.

Rebranding Umhlanga as an intelligent city

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une 2016

Abstract

The intelligent city agenda has emerged as a key responsive tool in the attempt to lift traditional cities out of their deepened pits of dwindling attractiveness. This paper seeks to investigate the emergence of the intelligent city and gauge whether or not the principles can be identified in the case study of Umhlanga, a booming key development node 20km north of Durban's dilapidated CBD. This paper will offer a concentrated understanding of the smart and intelligent city concepts – which will be rendered equivalent in meaning for the purpose of this paper - and unpack the evolutionary build-up to this 21st century, new era city towards sustainability, efficiency and improved quality of life in a digitalised world. Underpinning planning theories such as neo-liberalism, nodal development and new urbanism will offer a brief conceptualisation of the theoretical evolution of Umhlanga. It will seek to divulge the extent to which Umhlanga embodies the intelligent city principles, based on Hollands (2008) three framing topics of smart cities; *infrastructure-based services* *business-led urban development*, and *social inclusion, learning and development*.

Intelligent cities, smart cities, information communication technology (ICT), sustainable urbanism, smart infrastructure

1. Introduction

The unsurmountable amount of developmental pressure put on cities and their ability to function sustainably by exponentially rising urbanisation trends of the 21st century, presents traditional cities with an array of outward-spiralling challenges. Crime, degeneration, the “overstretching of infrastructure” (Jenks & Burgess, 2000; p.2) and the concurrent lack of infrastructure maintenance contribute to urbanisation pressures on cities. Moreover, the unsustainable use of resources such as energy, water and land; food supply; traffic congestion and air-pollution are common challenges, too (Washburn & Sindhu, 2009, cited in Mosannenzadeh & Vettorato), as are social and economic inequalities (Jenks & Burgess, 2000; Backhouse, 2015; Ruble, 2012). Despite these challenges, it is irrefutable that cities foster innovation and produce a large portion of global output – reinstating their role as economic wombs for the growth and enrichment of countries' economies and social development (Komninos & Sefertzi, 2009). Cities are fast changing their character to adapt more appropriately to the changes which manifest over time, in an attempt to counteract arising challenges. Sassen (1994; cited in Daniels, 2004; p. 501) states that “both industrial and traditional service activities along with new services related to banking, finance and communication constitute the new economic base of cities”.

The shift towards the intelligent city model embodies a mutually dependent relationship between sustainability and efficiency in order to create a conducive environment for all age groups and diversities to prosper together in a more liveable city habitat. Intelligent cities harness the utilisation of ICTs – among other moves towards creating city ‘smartness’ within economic, governmental, environmental, infrastructure, transport and public domains – making the “critical components of a city more intelligent, interconnected and efficient” (Nam & Pardo, 2011; pp 285). The culture which intelligent cities attract is one of knowledge,

creativity and skill which manifests into a desirable quality of life, and attracts the higher-educated, skilled workers – breeding city ‘smartness’. Preliminary findings show that Umhlanga is developing into a major investment magnet in Durban at large, presenting massive economic development opportunities; Tongaat Hulett (n.d; p. 2) states that “the area forms part of Durban’s Northern Urban Development Corridor, a key region for growth and investment and which is establishing a major new development node on the city’s doorstep”.

2. Methodology

This research was conducted via desktop research, and hopes to inform future, more detailed studies based on this topic. Material based on intelligent and smart cities was collected via websites, journal articles and online books to form a baseline understanding on which the topic is grounded. Local municipal documents were examined to identify eThekweni Municipality’s shift towards intelligent or smart city agendas – if any. The case study is based on discourses on smart cities as identified by Hollands (2008; in Backhouse, 2015).

3. Framework for analysis:

Neoliberalism is ultimately a process of relationship adjustments between the three spheres of society: the private sector, the public sector, and civil society; to expedite economic growth. Neoliberalism has a significant place in urban planning, arguing that urban economic bureaucratisation increases the cost of transactions; and that urban planning distorts land markets. Thus, neoliberalism advocates for the rollback of government by adopting principles of deregulation and outsourcing (Wright, 2013). Planning, within the neoliberal ideal thereby incorporates spatial regulatory measures to offer certainty to the market and aid economic growth – the central goal which intelligent cities are focused on achieving, amongst others. The broad policy framework engaged by neoliberal governments would usually adopt principles of decentralization, deregulation, liberalisation, fiscal conservatism, entrepreneurialism, marketization, privatism, and consumerism (Wright, 2013).

Nodal developments are typical of an all-in-one, compact city design which promotes mixed-use communities. Places of work, entertainment, learning and shopping are all incorporated into the nodal design, with residences and access to services main features, too (Regional District of Nanaimo, n.d). The term ‘node’ or ‘nodal development’ is used due to these cities’ joint function to cater for their own residents, as well as those from nearby communities; incorporating residential, commercial and service aspects within close walking proximity to each other. Although significantly designed to keep travelling distances at a minimal between work, home and recreational spaces; nodal developments are linked to neighbouring communities by vehicular, bicycle and pedestrian connectivity routes – offering alternatives to strict car reliability and thereby honouring global attempts to minimise the worldwide carbon footprint and promote sustainable living (Regional District of Nanaimo, n.d). Urban nodes are typical of the highest concentration of residential and commercial activities within a walkable parameter, coupled with a great variety of services; intending to have the character replication of a Central Business District (CBD).

New urbanism is a salient planning movement of the current era, and drives development in the built environment towards raising the quality of life for all by creating more liveable habitats. It seeks to reorder the physical elements and design of the built environment into more integrated, compact urban spaces to achieve complete communities within walking distances

of each other. These communities ultimately aim to achieve a variety of mixed-use activities; from retail, residential, civic facilities, schools, and entertainment; to healthcare and workplaces; all within a compact design. The principles of new urbanism, as presented by NewUrbanism.org (n.d) are as follows: mixed housing, quality architecture and urban design, connectivity, walkability, smart transportation, sustainability, and quality of life. These theories all have relevance to the restructuring of urban space and have a profound linkage with one another and have direct relevance to the evolution of Umhlanga, which will be further expanded on later in the paper.

4. Framing concepts

There is no universal definition for an 'intelligent city' (Komninos, 2015), and often the terms 'smart city', 'knowledge city', 'digital city' and 'information city' are used interchangeably, although they may reveal minor differentiations between them (Backhouse, 2015). It is therefore pertinent to offer some clarity on the terms 'smart city' and 'intelligent city', the two main relevant concepts which will be rendered equivalent for the purpose of this paper, and thereby used interchangeably.

According to the Oxford English Dictionary (OED, n.d), as a noun, intelligent may refer to "a person who is well versed in an art or a skill"; as an adjective, someone that "understands or knows", or has a "keen understanding". With reference to action, speech and appearance, the term suggests "showing a high degree or good measure of understanding". Moreover, the term lends itself to the aspect of 'information' which is a key topic in intelligent and smart city agendas, "bearing or conveying information or intelligence; informative; communicative". Interestingly, the OED (n.d) goes as far as to define intelligence in terms of buildings, which again, has importance in the design fabric of smart and intelligent cities and how they can offer functionality parallel to adhering to sustainable development, as the world attempts to move collectively towards more sustainable measures of living. An 'intelligent building' is "an office or building containing a set of integrated services such as heating, lighting, electronic office equipment etc. controlled by a central computer system which is capable of the most efficient and sound use of resources" (OED, n.d).

Intelligent cities are described by Guerrini (2015; p. 1) as "cities and regions that use technology not just to save money or make things work better, but also to create high-quality employment, increase citizen participation and become great places to live and work". If harnessed to the potential it promises, technology can be tweaked in intelligent ways to offer solutions to the needs of the local people. Perhaps the most defining element of an intelligent city is "the use of Smart Computing technologies or ICTs to make the critical components of a city more intelligent, interconnected and efficient" (Nam & Pardo, 2011; pp 285). Moreover, intelligent cities strive to reinvent the look and feel of the workplace, one which is designed for the people who work there as opposed to the organization itself. Honeywill (n.d; p. 1) states that an intelligent city "is characterised by its place in the new or neo-economy with commitment to cultural capital, innovative environments, diversity, high social intelligence and digital leadership", a city that gives inspiration, shares culture, knowledge and life, and one that motivates its inhabitants to create and flourish in their own lives.

He goes on to explain that there is more consciousness about the calibre of people which intelligent cities strive to attract. Therefore a great deal of effort is invested in the design of facilities which are created to cater for 'high performance teams' chasing time of the 24/7 international clock, and allowing the freedom for the reconfiguration of their facilities to correlate with their specific work targets – very different to the hierarchical order and function of traditional workplace environments of the traditional city. Komninos and Sefertzi (2009; p.1)

state that “intelligent cities are part of the orientation towards the creation of environments that improve our cognitive skills, our ability to learn, foresee and innovate”.

Similarly to the above, the term ‘smart’ will be defined so as to provide a platform on which to base a city as ‘smart’. The word ‘smart’ has a variance of meanings depending on the context to which it is referred. If applied to a person it means “clean, tidy, and well dressed”; referring to an object it suggests a “bright, fresh appearance” and when using it in context of a place, “fashionable and upmarket” best describes it (Oxford Dictionaries Online, n.d). These descriptions relate mainly to appearance and are illustrated in smart city agendas to create places of attraction which lure in investment and people, to create areas of aesthetic appeal which will contribute to the sense of place and an increased quality of life which they aspire to achieve, and to offer an environment which residents can feel safe in and proud of (Backhouse, 2015). Moreover, the term has parallel relevance to ‘intelligent’ in that its application to a person means “quick-witted intelligence” (OED, n.d; cited in Backhouse, 2015; pp. 2). Smart also refers to a device, as “programmed so as to be capable of some independent action” (OED, n.d; cited in Backhouse, 2015; p. 2), a description which has direct relevance to the ICT element of smart cities, whereby information collected and disseminated through the use of smart devices can aid in responding to the needs and interests of city residents.

The core focus of a smart city is the adoption of Information Communication Technologies (ICTs) to enhance city functions and promote economic growth, by connecting people locally and internationally without the need to travel and embark on face-to-face engagement (Nam & Pardo, 2011). Backhouse (2015; p. 2) suggests that “there is a sense that Smart Cities apply human intelligence to the problems of city living to achieve better end results”. Nowadays, most of a city’s transactions are done electronically via ICTs, welcoming a multiplication of transactions within a fraction of the time compared to those done before the dawn of the ‘information age’. This is a milestone of progress for smart cities as the increased frequency of transactions ultimately increases economic growth and concurrently, in theory, enhances the quality of life for all who are engaged with the smart city.

Smart infrastructure, specifically, “provides a foundation for all key themes related to a smart city, including smart mobility, smart people, smart economy, smart living, smart governance and smart environment” (United Nations, 2016; p.4). The most defining of these components is the fact that they are data generators, they are associated with one another and may be used in intelligent ways to assure resource optimisation and performance improvements (United Nations, 2016; Nam & Pardo, 2011)

Rouse (2005; p. 1) describes Information Communication Technologies (ICT) as “an umbrella term that includes any communication device or application encompassing : radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as video conferencing and distant learning”. These digital services presented by ICTs make connections between places separated by vast distances possible, in real-time, at the simple click of a button. Although ICTs alone do not define an intelligent city, they play a vital role in the functioning of intelligent cities (Komninos & Sefertzi, 2009; Nam & Pardo, 2011).

The pressure which current urbanization trends put on the sustainability of cities and their ability to function at optimal, offering a higher quality of life, is threatening. Jenks and Burgess (2000; p. 2) state that “cities have been seen as the cause of environmental degradation and resource depletion, casting an ecological footprint across the globe far beyond their immediate regions”; crime, degeneration, the “over-stretching of infrastructure” (Jenks & Burgess, 2000; p.2) and the concurrent lack of infrastructure maintenance contribute to urbanisation pressures on cities. The 1987 Brandtland Report strongly advocated for the move towards sustainable development, stating: “The world must quickly design strategies that will allow nations to move from their present, often destructive, processes of growth and development onto sustainable development paths” (World Commission on Environment and Development, 1987; p. 49).

By 2030, sub-Saharan Africa is expected to double to a population of 600 million people. This present an overwhelming reality for which these cities need to be planned for, and the use of smart or intelligent systems and infrastructure within the intelligent city model is proposed as a good starting point to try and counteract the challenges which result from inadequate planning provisions in light of the rapid pace of 21st century urbanisation. Moreover, the United Nations (2016; p. 5) states that ‘the Smart City’ is one dimension of the urban context of sustainability”.

The call to move towards sustainable urbanisation to counteract urban challenges associated with exponentially rising urbanisation aids in promoting factors such as “efficient management of land and resources, improved mobility, economic dynamism, higher environmental quality, safety, security, access to urban services and social cohesion” (United Nations, 2016; p. 6). With emphasis on intelligent cities; science, technology and innovation (STI) enable sustainable urbanization through inclusive initiatives to enhance cities; along with various other factors including financing and urban governance (United Nations, 2016).

5. A shift from traditional city to intelligent city

Generally speaking, cities worldwide have shared a common role as being centres of integration where people of diverse religions, races and cultures come together in celebration. Today cities are even more diverse and present huge opportunities through the evolution of science and technology; Hahn (cited in BAUM, 2013; p.2) states that “they are the breeding ground for science and technology, culture and innovation, individual and collective creativity and for the measures that prevent the effects of climate change”. Spatially, however, cities have evolved in varying ways due to historical, cultural and spatial elements unique to their own circumstances and experiences. Despite the challenges presented by cities, it is indisputable that cities are drivers of economies or “engines of economic growth and social development” (Daniels, 2004; p. 501), the common-most denominator which cities worldwide share. Every city is in competition with one another to better their economic output, to attract highly-skilled individuals, and to create competitive environments which attract investment; in a bid to raise the quality of life for its citizens (Kominos & Sefertzi, 2009).

Cities foster innovation and produce a large portion of global output – reinstating their role as economic wombs for countries’ economies. Daniels (2014) states that cities “serve a primary economic function as the locations where new forms of economic activity and economic organization evolve and gain higher value”. He, (Daniels, 2014; p.501) goes on to describe cities’ functions as “key nodes of capital accumulation, reinvestment in new sectors and focal points of the development of specialised services”, underpinning the importance of proactive, effective and efficient planning of the urban fabric in order to promote economic growth and enhance the quality of life for all. Judith Rodin, president of the Rockefeller Foundation states

that “with the right strategies, cities can use Information Communication Technologies (ICT) to ‘advance resiliency’ to a wide range of climate and social changes while fostering economic growth (Green, 2011; p.1). However, ‘intelligent cities’ is a relatively new concept in the urban environment, presenting minimal research on what the fundamental contributors to the embodiment of ‘intelligent cities’ comprises of, thus, contributing to the lack of comprehensive understanding around its topic.

Much of the literature around the concept of intelligent cities has emerged from the 1990s onwards, gaining momentum in popularity only around the inception of the new millennium.. In addition to the topic’s youth; and due to the changing nature and characteristics of cities universally, there is no universal definition of an intelligent city, nor is there a definitive set of principles which define an intelligent city (Backhouse, 2015; Nam & Pardo, 2011). What authors such as Backhouse (2015), Komninos (2015), Walsh (2012), Mosannenzadeh, & Vettorato (2014), Carter (2013), Guerrini (2015), Nam & Pardo (2011), Komakech (2005) and B.A.U.M (2013) all share in common, is the sentiment that intelligent cities have emerged in response to traditional city challenges. Moreover, they argue that if honest efforts to improve the urban framework are adopted in line with intelligent city principles, then economic growth will progress; thereby enhancing the quality of life for all in the exponentially urbanizing world.

5.1 Components of an intelligent city

Literature provides a vast selection of principles upon which an intelligent city may be defined; Nam and Pardo (2011) conceptualise smart cities according to elements of technology, people and institutions; Hollands (2008, cited in Backhouse, 2015) bases his interpretation of criteria upon which Smart Cities are grounded on, on three discourses which run parallel to those put forward by Nam & Pardo (2011), they are: ‘infrastructure-based services’, with a particular focus on ICT; ‘business-led urban development’, speaking to the issue of creating attractive business environments through infrastructure provision and attracting adequately skilled workers to the city, and; ‘social inclusion, learning and development’, combining governments’, residents’ and business’ use of new technology to transfigure the quality of life and work - working smart to address community needs. Komninos (2015; p. 178) suggests a pattern of intelligent city emergence, stating that “there is a trend towards smart and intelligent clusters, in which economies and innovation capabilities are further enhanced by digital networks, smart environments, web applications and hybrid products and services”, while Technology et al (2007, cited in Mozannenzadeh & Vettorato, 2014; p.689) indicates Smart Cities’ different domains as: economy, people, environment, governance, mobility and building. Moreover, IBM (2009; cited in Mozannenzadeh & Vettorato, 2014; p.689) defines the elements of Smart Cities as “people, business, transport, communication, water and energy”.

Drawing on Hollands (2008, Backhouse, 2015) three main areas of focus on which he bases smart cities; infrastructure-based services; business-led urban development and social inclusion, learning and development; will be expanded on and will form much of the base upon which the case study of Umhlanga will investigated, for the purpose of this paper.

Infrastructure is the ‘backbone’ to a city’s economy and functioning. Carter (2013) makes an important distinction between the elements of infrastructure; distinguishing them as physical and non-physical infrastructure. *Physical infrastructure* refers to underlying structures that support city systems; drainage systems, sewerage systems, transport networks, bridges, energy channels and so on. *Non-physical infrastructure* has more direct relevance to Hollands’ (2008, Backhouse 2015) first of three framing topics on which he bases a smart city; *infrastructure-based services*. This constitutes the invisible components of infrastructure which are holistic to cities of the information age. This infrastructural component “occurs in cyberspace and creates functional relationships between the city and humans” (Carter, 2013;

505), through systems including mobile technology and social media. Hollands' (2008; Backhouse, 2015) relates his first discourse to the topic of ICTs and their involvement in enhancing the way in which information and knowledge is disseminated amongst people and institutions to enhance city functioning and promote a higher quality of life for all citizens. This relates to the services and infrastructure components of a city which, through 'smart computing technologies', can promote efficiency and intelligence through digital interconnectivity (Backhouse, 2015). Healthcare, transportation, local government administration, education and public safety are all made more efficient and effective through such measures.

Business-led urban development is the second of Hollands' three framing topics of smart cities. This refers to the creation of attractive business environments by facilitating infrastructure investment as a draw-card to entice skills and investment into the city (Backhouse, 2015). Smart cities become an investment magnet for businesses due to the quality environments they promote. Moreover, this topic emphasises the competitive goal amongst cities to achieve economic growth, which is enhanced by capital investment into these cities as well as skills accumulation. Here, innovation is harnessed to benefit the needs and desires of the elite, the so-called skilled – skilled enough to fit the mould of human intelligence which the intelligent city invites. Backhouse (2015; p. 3) describes these knowledge elitists as 'knowledge workers', and those who fall short of the mould, fall short of the benefits. Here, the primary goal which reigns supreme above all is the maintenance of social harmony so as to avoid the disruption of achieving business and economic-oriented goals.

Last of the three topics is *social inclusion, learning and development*, which speaks to the element of community participation through the needs identified by the people, in a bid to create the quality of life they strive to have, through collaborations with government (Hollands, 2008 in Backhouse, 2015). The services and needs which people have will differ from city to city and place to place, it is therefore crucial for this collaboration between civil society and government to be adopted in order for context-specific needs to be met. Without people, there would be no city, smart or not, and in order for growth to occur – economically, intelligently, sustainably – the advantages of intelligent living need to be fostered.

With all the varying – but closely related principles of an intelligent city – Nam & Pardo (2011) suggest that these principles are context-specific to the city's individual, differentiated environment to that of another, and therefore can differ slightly.

6. Case Study of Umhlanga, wa- ulu Natal, South Africa

Umhlanga is a booming development node within the eThekweni Metro, with an ever-attractive urban fabric. It has welcomed the flight of financial giants, legal powerhouses and top-class automobile franchises from the exponentially dilapidating ruins of Durban CBD. Ethekewini's vision states that, "By 2020 the eThekweni Municipality will enjoy the reputation of being Africa's most liveable city, where all citizen live in harmony. This vision will be achieved by growing its economy and meeting people's needs so that all citizens enjoy a high quality of life with equal opportunities, in a city that they are truly proud of" (Sutcliffe, n.d).

eThekweni strives towards building a well governed city and thereby promotes public participation in their strategic planning process by holding a number of varying workshops of different scales (Sutcliffe, n.d). The Metro strives to promote 'customer care' by building ICT solutions and e-governance. This is evident in their public-private collaboration with a number of data providers to invest in infrastructure, both physical and non-physical. Teraco Data Environments launched a R35 million data infrastructure centre in Umhlanga in 2011, in partnership with eThekweni municipality. Additionally, eThekweni Municipality has partnered up with the Durban Institute of Technology, ISETT, Siemens, Business Connection and the

Department of Trade and Industry to establish 'SmartXchange', an ICT Hub. In striving towards Smart City Status, roughly 30km of fibre optics cabling has been laid by SmartXchange (Sutcliffe, n.d). Teraco Data Environments states that "the city's progressive broadband strategy and significant infrastructure investment is fulfilling its goal of being Africa's first 'Smart City'" (Teraco Data Environments, 2011).

In its bid to move towards achieving intelligent city status, eThekweni launched a trial-run smartphone application called 'Smart Community Application' which offered itself as a "responsive service delivery tool" (eThekweni Municipality, n.d) that sought to create a platform for interaction between municipality and customers, in real-time. With the click of a button, service delivery concerns could be raised instantaneously, from pot holes to blocked drains, from dysfunctional traffic lights to illegal dumping. These are the very kinds of smart technologies which cities need to adopt in order to connect with the people in real-time, in the pursuit of creating more liveable city habitats with increased quality of life for all.

In light of the shift towards sustainable development, many of the new, modern buildings which boast quality architecture in Umhlanga have been cognisant of their duty to adhere to international calls to promote sustainability; and in doing so, have followed a set of sustainability principles laid out by the Green Building Council South Africa. Their ratings for sustainability are based on a points system according to the various principles, which include: energy, water, transport, materials, emissions, indoor environmental quality, management and innovations. An example of the multi-million rand, state-of-the-art First National Bank (FNB) building is made:

- It is "designed to achieve a 150% improvement on SANS 10400:1990 requirements for fresh air rates;
- An air-cooled chiller system was installed therefore no portable water will be used;
- 50% of the timber was specified to be either Forest Stewardship Council Certified, re-used or to have a post-consumer recycled content"

(GreenBuilding Council South Africa, 2014).

Umhlanga is well equipped with services and infrastructure; it benefits from its ideal location between the M4 and N2 highways, as well as the major transport infrastructure upgrades to the M41/N2 interchange. It is in prime location to King Shaka International Airport and Dube Trade Port – a mere 20km or-so to the north. Easy and efficient accessibility to- and from Umhlanga make this node even more attractive to investment due to the hassle-free experience which companies can offer their clients. The safe, secure office parks boast high-tech security measures – one-up on Durban's crime infested CBD; well positioned, safe off-street parking courtyards for clients and visitors at the doorsteps of office block entrances; state-of-the-art camera surveillance systems – real-time data processors. All of these factors act as pull-factors for investment into Umhlanga.

7. Discussion:

Although Umhlanga is not a city in itself, Komninos and Sefertzi (2009; p. 7) point out that intelligent cities are emerging in various forms, such as "dynamic rearrangement of networks, nodes and clusters".

Collaboration between local government and private sector entities, such as Teraco Data Environments, through public-private partnerships highlights Hollands' second of three discourses on smart cities; business-led urban development. Infrastructure investment draws in human capital in the form of skilled workers as well as investment – enticing for human

intelligence to collaborate with digital intelligence to create a desirable quality of life. The knowledge elitists are favoured in these environments and Umhlanga prides itself on its business-oriented, first-class office parks which incorporate elite game-players in finance, corporate and service industries. Tying in with this discourse is the theoretical underpinning of neoliberalism. Neoliberalism is a planning theory which emphasises the rolling back of government's interference in the market, and down-scaled control in the form of regulatory guidelines for city stakeholders (Wright, 2013). These elements go hand-in-hand with creating these conducive business environments which is a capitalistic movement towards creating economic growth.

Moreover, nodal development is core to the development of Umhlanga; incorporating business, leisure, shopping, healthcare, and residential and job opportunities all within walking distance of each other; so as to decrease vehicular dependency and increase city compactness; all whilst strategically capitalising on existing development in the surrounds. New urbanism informs the urban design of this booming node, promoting the use of different convenient design systems and the provision of services all within walking distance. This demonstrates cognisance of promoting sustainable urban environments by promoting compactness, reducing carbon emissions by reduce travelling distances between places and ultimately, getting 'smart' about resource management.

Social inclusion, learning and development, Hollands' third framing topic is evident in the eThekweni (Durban) City Development Strategy (Sutcliffe, n.d), the facilitation of "outreach, awareness and capacity building programmes" are fostered to inform people and empower them with knowledge. Moreover, eThekweni strives to bridge the digital divide, evident in their telecommunication infrastructure extension, which reduces costs and offers these services to the masses at a reduced, more affordable cost; which again, aids in the promotion of economic growth. This aspect of city smartness is critical to social and economic empowerment.

eThekweni Municipality has made extensive efforts to collaborate with private stakeholders through public-private partnerships to draw investment to the Umhlanga area- which is outlined as a key development node in eThekweni's development strategy (Sutcliffe, n.d). In a move towards intelligent city status, there has been extensive roll-outs of telecommunication infrastructure. Teraco Data Environments, a private sector company who has collaborated with government to provide a R35 million data infrastructure centre in Umhlanga, states that "the city's progressive broadband strategy and significant infrastructure investment is fulfilling its goal of being Africa's first 'Smart City'" (Teraco Data Environments, 2011).

8. Considerations and Conclusion:

Smart cities are context specific and urban planners need to take cognisance of this when planning for the future of cities (UN, 2016). They need to consider a people-centred approach when designing infrastructure and take into consideration certain needs and difficulties of varying urban systems; harness technologies to predict certain possible outcomes and plan accordingly whilst not ignoring the associated, possible limitations. Public-private partnerships and a participatory approach to planning aid in promoting the sustainability of cities.

Komninos and Sefertzi (2009; p.2) suggest that although there is a positive movement towards cities adopting intelligent city principles, worldwide, they state that "still we are very far from the creation of amazing intelligent environments that open minds and transform radically human skills and mental capabilities", implying that we have only just scraped the surface of what could possibly, eventually be unveiled through a deeper understanding and the consequential application of better-informed solutions.

As a key economic node in the greater Durban region, Umhlanga's elevated level of development has placed it on the map as one of South Africa's most sought-after, higher-end value real-estate investment locations. The Umhlanga Ridge Town Centre is designed as a safe, convenient and pleasant environment for businesses and people. What Umhlanga presents is the reality that urbanisation can be beneficial if planned for accordingly and if the right policies are adopted and implemented. Moreover, falling within a developing country does not stunt the possibilities of positive urbanization and economic growth; developed countries are no further ahead in the race to achieving intelligent city status if they do not plan and implement accordingly, through policies and participation. There is no end in sight for the Umhlanga's development possibilities; structures are continuously being erected and there is no doubt that there is an incredible demand for every inch of available land; be it for business, residence or leisure. The quality of life in Umhlanga is at the higher end of the spectrum with the town centre always abuzz with activity, no matter the time of day or night. The complete urban structure of Umhlanga differs completely from that of decayed and degenerating Durban CBD – a mere 20km south of the study area – which is what ultimately strikes the interest in researching Umhlanga as intelligent city. There are many boxes of intelligent city criteria which Umhlanga ticks, but this paper has only just scraped the surface of the topic.

A detailed investigation into the intelligent city principles and their implementation into the urban design fabric of Umhlanga could assist planners to appropriately plan for the future, with regards to planning more sustainably liveable habitats with enhanced quality of life. Furthering this study could have potentially positive impacts on the future planning of intelligent cities, locally.

9. I LIO RAPH :

Allmendinger, P. (1998) Planning Practice and the Post-modern Debate, in International Planning Studies, Vol.3, No.2, 1998

Backhouse, J. (2015) Smart city agendas of African cities. University of the Witwatersrand, Johannesburg, South Africa.

Bundesdeutscher Arbeitskreis für Umweltbewusstes Management e.V. (2013) Intelligent Cities- Routes to a sustainable, Efficient and Liveable City, A report by B.A.U.M e.V. and Accenture GmbH, January 2013. Hamburg.

Carter, T. (2013) Smart Cities: The future of Urban infrastructure, 22 November 2013. BBC. [Online] Available at: <http://www.bbc.com/future/story/20131122-smarter-cities-smarter-future> [29 March 2016]

Daniels, P.W. (2004) Urban Challenges: the formal and informal economies in mega-cities. Vol. 21, Issue 6, 501-511. Elsevier.

eThekweni Municipality (n.d) Smart Community Application [Online] Available at: http://www.durban.gov.za/Online_Tools/Pages/SmartApp.aspx [26 June 2016]

Goodchild, B. (1990) Planning and the Modern/Postmodern debate, Town Planning Review, Vol.61, No. 2, pp.119-137

Green Building Council South Africa (2014) FNB Acacia House, [online] Available at: <https://www.gbcsa.org.za/projects/case-studies/?tool=&type=&rating=&> [20 June 2016]

- Guerrini, F (2015) World's Top 7 Smart Cities Of 2015 Are Not The Ones You'd Expect, [online] available at: <http://www.forbes.com/sites/federicoquerrini/2015/01/28/worlds-top-7-smartest-cities-of-2015-are-not-the-ones-you-d-expect/> [9 April 2016]
- Harper, T.L. & Stein, S.M. (1995) Out of the Postmodern Abyss: Preserving the Rationale for liberal Planning, in Journal of Planning Education and Research 14:233-244
- Harrison, P. (2001) Romance and Tragedy in (Post) Modern Planning: A Pragmatist's Perspective, in International Planning Studies, Vol.6, No.1
- Iguacu (2016) Smart cities in Africa, [online] Available at <http://weareiguacu.com/goodnews/africas-smart-cities/> [28 June 2016]
- Jenks, M. and Burgess, R. (2000) Compact Cities: Sustainable urban forms for developing countries. Spon Press, London.
- Komninos, N. and Sefertzi, E. (2009) Intelligent Cities: R&D offshoring, web 2.0 product development and globalization of innovation systems. Aristotle University, Greece.
- Komninos, N. (2015) The Age of intelligent cities: Smart environments & Innovation-for-all-strategies, Routledge, London.
- Morrison, I (2011) Birth of a town, The Ridge, [online] Available at: <http://www.famouspublishing.co.za/ridge/birth-of-a-town/> [2 April 2016]
- Mosannenzadeh, F. & Vettorato, D. (2014) Defining Smart City: A conceptual framework based on keyword analysis. Journal of Land Use, Mobility & Environment. 4-6 June 2014. TeMA, Naples.
- Nam, T. & Pardo, T. (2011) Conceptualizing Smart City with Dimensions of Technology, People, and Institutions, Centre for Technology in Government, University of New York, U.S.
- NewUrbanism.org (n.d) New Urbanism, [online], Available at: <http://www.newurbanism.org/newurbanism.html> [17 April 2016].
- Oxford English Dictionary (n.d) Definition of 'intelligent', [online] Available from: <http://www.oxforddictionaries.com/definition/english/intelligent> [29 June 2016]
- Oxford English Dictionary (n.d) Definition of 'Smart' [online] available at: <http://www.oxforddictionaries.com/definition/english/smart> [29 June 2016]
- Oxford University Press (1987) What is sustainable development? World Commission on Environment and Development's (the Brundtland Commission) report Our Common Future, [online] Available at: <http://www.worldbank.org/depweb/english/sd.html> [9 April 2016]
- Regional District of Nanaimo (n.d) Nodal development: Creating Compact, Complete, Mixed-use Communities, [online] Available at: http://www.shapingourfuture.ca/downloads/Mixed_Use_Centres_Brochure.pdf [14 April 2016].
- Rouse, M (2005) ICT (Information Communications Technology – or technologies), September 2005. [online] Available at: <http://searchcio.techtarget.com/definition/ICT-information-and-communications-technology-or-technologies> [1 April 2016]
- Ruble, B. A. (2012) The challenges of the 21st century city [online] Available at: https://www.wilsoncenter.org/sites/default/files/policy_briefthe_challenges_of_the_21st_century_city.pdf [29 March 2016].

Sutcliffe, M. (n.d) eThekweni (Durban) City Development Strategy [online] Available at: www.foresightfordevelopment.org [28 June 2016]

Teraco Data Environments (2011) Durban becoming Africa's first "smart city", 8 April 2011. [Online] Available at: <https://www.teraco.co.za/news/2011/durban-becoming-africas-first-smart-city.html> [22 June 2016]

Tongaat Hulett, (n.d) Umhlanga Ridge Town Centre: The Oval Sites, [online] Available at: http://cornubia.co.za/images/Tongaat_Hulett_URTC_Oval_Sites_Brochure.pdf [26 April 2016]

United Nations (2014) World Urbanisation Prospects: The 2014 Revision. United Nations, New York. World Commission on Environment and Development (1987) Our Common Future. Oxford University Press, New York.

United Nations (2016) Smart Cities and Infrastructure, Commission on Science and technology for Development, nineteenth session. Geneva. 9-13 May 2016.

World Commission on Environment and Development (1987) Our Common Future. Oxford University Press, New York.

Wright, I. (2013) Are we all neoliberals now? Urban Planning in a neoliberal era, '49th ISOCARP Congress 2013.

Happiness and High-rise Living: Sentiment Analysis of Geo-Located Twitter Data in Hong Kong's Housing Estates

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Abstract

The high-rise housing, a largely unfavorable housing type in Western context (Turkington et al. 2004; Jacobs 1961), is considered a success in Asia (Castells et al. 1990). Researchers argue that a high-rise housing estate, if properly designed and managed, can be a satisfactory solution for high-density cities (Yeh 2000; Yuen et al. 2006); systematic evidence supportive of the above arguments are rare (Turkington et al. 2004). Questions remain as whether high-rise living promotes or degrades happiness? What are the physical attributes that are linked to occupant sentiment in high-rise housing estates? We used sentiment analysis of Twitter data as a measure of occupant satisfaction with the living environment. Data were collected between May and June 2016 within 487 major housing estates in Hong Kong, covering a variety of building forms, density, and other built environment attributes while controlling for demographic, social and economic profiles. Results show that the design of high-rise buildings matter: the Twin-Towers and T-shaped buildings, both were popular housing types in the 70s, correlated with negative sentiment tones. Density, measured in units/ha, showed positive correlation with happy sentiment. Property age, block size, loan-to-income ratio, employment, and occupation were also correlated with sentiment tones. Findings have implication for urban planning and design.

1. Introduction

A high-rise building is defined as a structure taller than 5 level for Europeans (Turkington et al. 2004), 7 levels for Americans (NFPA 2015), or 30-50 stories for Asians. It was once considered a necessity to solve housing needs after the WWII and for rapidly industrializing cities. Le Corbusier's visionary "Ville Radieuse" (the Radiant City) pioneered the concept of high-rise housing blocks with lasting influences on urban planning practices worldwide (Curtis 1996). High-rise housing was largely viewed as unfavourable in Western context. Literature associated a life in high-rise buildings with various unpleasant outcomes (Gifford 2007). Jane Jacobs likened high-rise housing projects to the "corridors of a bad dream".(Jacobs 1961); Alexander believed high-rises makes people crazy thus buildings should not exceed 4 stories altogether (Alexander et al. 1977). In Europe, high-rise residential buildings are considered as "problematic living conditions, deprived areas, a poor population, a negative image, ... in short, they are not the most popular areas in town" (Helleman & Wassenberg 2004). They are associated high-rise living with fear (Newman, 1975), mental health difficulties (Fanning 1967), suicide (Marzuk et al. 1992; Lester 1994), behavioral problems (Ineichen & Hooper 1974; Robert Gifford 2006), poor social relations (Bickman et al. 1973; Holahan & Wilcox 1979; Arie Nadler Daniel Bar-Tal 1982), and hindered child development (Oda et al. 1989) anxiety, isolation and ill-health (Jephcott &

Robinson 1971; Conway & Adams 1977). Systematic studies with randomized control for socio-economic confounders, yielded similar findings that high-rise dwellers are less satisfied than those living in low-rise houses (Moore 1975; Canada Mortgage and Housing Corporation 1979; Saegert 1979; Franck 1983; Rohe 2009).



Figure 1 *Ville Radieuse (the Radiant City)* proposed by Le Corbusier



Figure 2 *High-rise housing estate in Tai Koo, Hong Kong*

In contrast, Asian cities appeared immune to the high-rise-phobia elsewhere. Cities such as Hong Kong and Singapore championed high-rise housing program (Castells et al. 1990; ROONEY 2003), where living off the ground became the norm and the high-rise public housing programme was credited as a success (Yeung & Wong 2003). The majority of high-rise residents, concluded by a Singaporean survey, expressed satisfaction with their floor levels (Yuen et al. 2006). Asian immigrants seemed to have brought their home success to a few western cities, such as Vancouver, Melbourne or Toronto where a resurgence in high-rise housing occurred in recent years. Researchers argued that the high-rise high-density urban environment, if properly designed and managed, can offer a viable solution to house the population in 'good' density (Yeh 2000).

What design attribute that made Asia's high-rise living viable remains, however, poorly understood. Existing studies, mostly relied on questionnaire data from a few housing estates, cannot explain conditions across the full spectrum of housing forms: high-rises, low-rises, or mid-rises. We don't understand the impact of urban morphometric such as building forms (slabs, towers, etc.), density, property age (Asian high-rise buildings maybe newer than Western counterparts), or amenities on occupant sentiment. Questions remain as whether high-rise living promotes or degrades happiness compared with alternative housing types? What are the physical attributes that are linked to pleasant living experiences? Earlier literature attributed failure of high-rise housing to bad design by architect and developer (Coleman 1985), yet evidence remained sparse (Turkington et al. 2004).

The rise of social media provides new opportunities to study the relationship between people and the built environment. User-generated contents, together with account profile, location, and mood can be readily available with internet access. Existing studies looked at the temporal pattern of mood using Twitter data at national scale (Durahim & Coşkun 2015) or analytics of epidemic diseases (Nagar et al. 2014). Little has been done using geo-coded social media data to study the built environment. Correlations between mood and built environment characteristics were found. Strong sentiments were found near parks, transport hubs, and polluted areas in New York, according to a recent study (Bertrand et al. 2013). Social media data allow us to avoid uncertainties from survey and self-reported data.

We conducted a cross-sectional study using 487 major housing estates in Hong Kong. Our sample covers a full spectrum of housing forms, from super high-rise to single family homes. We used the sentiment tones of geo-coded Twitter data as a proxy for residents' happiness and satisfaction. The purpose is to identify the correlation between sentiment and physical attributes i.e. building forms, amenities, controlling for density, access, location, and demographic variables such as income, age, education, etc.

Re-examining high-rise living has practical significance today. Compactness and high-density are viewed as a planning therapy to make cities richer, healthier, happier (Glaeser 2012). Skyscrapers are believed to have fostered social capital and creativity (Glaeser 2011). Jacobian economists consider high-density cities to be more innovative due to agglomeration externalities and knowledge spill-over (Jacobs 1969). Others view high-density cities as a necessity in light of growth pressure from urbanization, land and resource constraints (Dantzig & Saaty 1973; Jenks et al. 2004) while urban sprawl, the low-density suburbs on the opposite end of the density spectrum is viewed in unfavourable light (Montgomery 2013; Katz 1993). High-rise housing is a necessary ingredient in every high-density city recipe. Knowing the precise dosage and ingredient make-up for 'good density', therefore, is of importance to urban planners and design practitioners.

2. Methods

2.1 Study Subjects

We compiled a sample of 487 major housing estates in Hong Kong, a 50-50 split between private and public ownership. A major housing estate is by definition that accommodate either 1) over 3,000 residents or 2) 1,000 households according to the 2011 census data (Department of Census and Statistics 2012). Each is a gated community by itself, some even included playground, grocery stores, markets, kindergarten, or schools. The sample cover all 18 districts of Hong Kong (Figure 3) and is representative of the territory. Built within six decades, the sample vary considerably in physical attributes such as building forms, density (unit/ha), topography, street patterns, access to public transit, and nearby open spaces (Table 1).

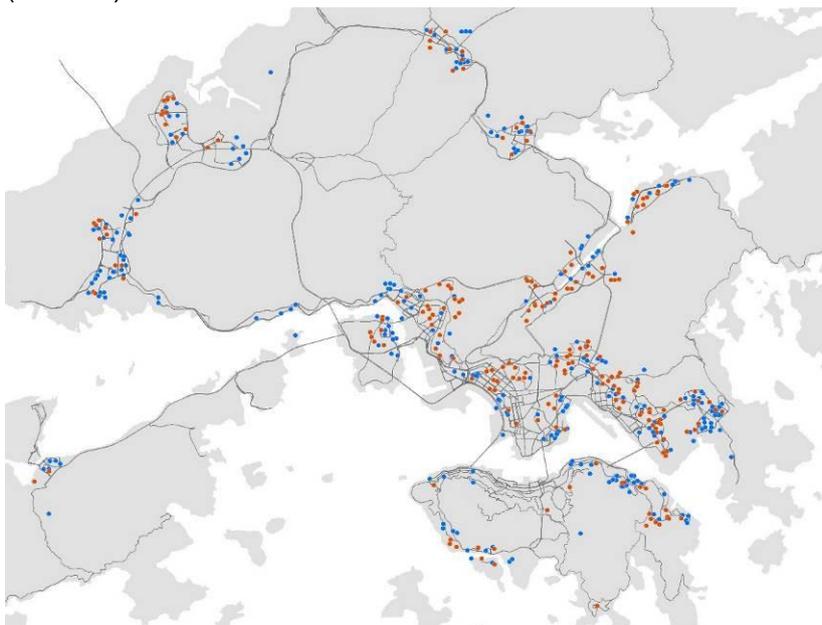


Figure 3 Location of major housing estates in Hong Kong. Public housing estates are colored in red while private ones in blue.

2.2 Data & Source

We used a combination of 2016 Twitter data, 2011 census data, and GIS database. We used streaming APIs, a digital tool allowing access to the live stream of Tweet data. Sentiment analysis are performed using the Linguistic Inquiry and Word Count (LIWC), a lexicon-based linguistic analysis tool which reads a given text and counts the percentage of words that reflect different emotions, thinking styles, social concerns, and even parts of speech. The output is the measure of “Emotional tone” from 100 to 0, where 100 stands for positive, upbeat style; while 0 as anxiety, sadness, or hostility. The value of 50 suggests either a lack of emotionality or ambivalence. The tool has been validated in previous studies on verbal expression of emotion (Tausczik & Pennebaker 2010; Kahn et al. 2007). A limitation to the current method is that we are currently 1) unable to process non-English tweets; 2) over-sampling younger population who tend to be more active in social media; also, there might be a representative gap between the active Twitter user group and the population in Hong Kong. However, we consider the sentiment analysis of social media a valuable supplement to the traditional method of questionnaire with various uncertainties of its own.

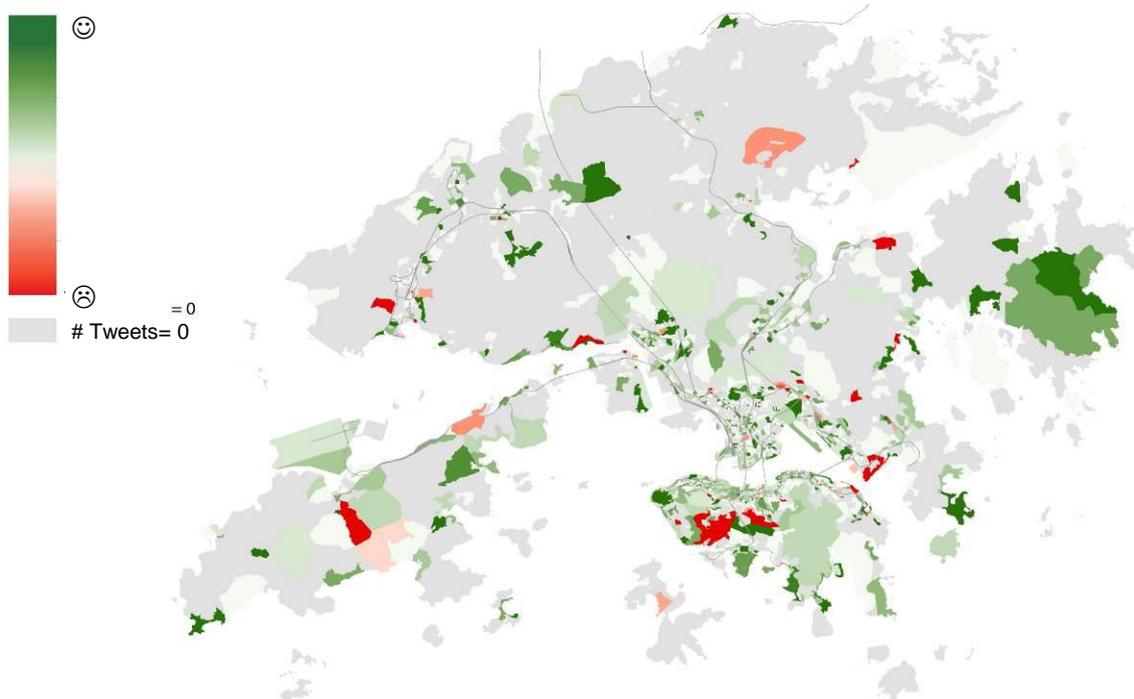


Figure 4 : Average Twitter Emotional Tone in Hong Kong by Tertiary Planning Units. Tweets collected from May 1 to June 30, 2016.



Figure 5 Housing types in Hong Kong included in the study sample. Source: Hong Kong Housing Authority

GIS database layers such as road network, open spaces, public transit, and topography were obtained from OpenStreetMap (OSMF 2016). We measure the number of road intersections within 200 meters off the housing estate boundary, a popular index for block size and road network density. We also recorded distance to the nearest transit station (MTR) and open spaces maintained by the government. Topographical slope was measured in unit of degree. The geographic boundary of the 487 major housing estates are derived from CentaMap, a comprehensive digital map service for real estate properties (CentaMap Company Limited 2016). CentaMap also provides data on amenities within the housing estates, such as swimming pools, playground, grocery stores, wet market, kindergarten, and schools. Google satellite imagery are used to detect building types such as the Twin-Tower, the T-shaped, Y-shaped, Cruciform, slabs, etc. (Figure 5).

Socio-demographic information for the 487 major housing estates are available at aggregate level via the Census and Statistics Department of the Hong Kong Government (Department of Census and Statistics 2012). The database consists of both individuals (headcount, education level, age, gender, ethnicity, language use, marital conditions, and occupation) and households (household size, median income, rents, mortgage payment, home ownership). The census data also included the total number of units, whether it is private or public, the maximum and minimum size of housing unit, and property age.

3. Results & Discussion

A total of 129,269 tweets were recorded in Hong Kong dated between May 1 and June 30, 2016, each consists of text, time stamp, and basic account profile. 45,824 are in English language, 28,175 tweets contained GPS coordinates, and 4,563, or 3.5% of the total can be identified within the boundary of the 487 housing estates. Table 1 summarizes built environment attributes for the sample including density, estate age, unit size, nearby street intersections, topography, distance to MTR stations, open spaces. Table 2 summarizes the demographic, social and economic attributes aggregated from the 2011 census database.

Table 1 Summary of built environment attributes for 487 housing estates included in the sample

Variables	Emotional Tone	Density	Property Age	Distance to MTR station	Distance to open space	Max. unit size	# of street Intersections (within 200m)	Topographic slope
Unit	0-100	Housing unit/ha	year	meter	meter	Square foot	count	degree
Mean	54.9	673.3	24.4	85.5	73.2	721.7	11.0	5.5
Max.	99.0	5861.3	54.0	1562.4	1472.7	5530.0	66.0	18.0
Min.	1.0	14.3	5.0	0.0	0.0	253.0	0.0	2.0
St. Dev.	29.0	465.8	9.7	159.4	145.5	459.3	11.4	3.3

Table 2 Summary of demographic, social and economic attributes for 487 housing estates

Variables	Gender (male=1)	% under 25	% Chinese	% College Degree	% English Speaker	% Married	Loan/Income Ratio	Median household income	% Employed	% Employer
Unit	binary	0-100	0-100	0-100	0-100	0-100	0-100	HK\$/month	0-100	0-100
Mean	46.7	24.0	95.1	19.7	2.5	51.7	12.8	26,866	46.2	5.1
Max.	53.1	44.9	100.0	43.1	54.1	65.1	31.1	157,000	64.6	16.2
Min.	38.8	11.5	50.0	1.8	0.0	34.2	0.0	6,500	28.4	0.9
St. Dev.	2.3	5.3	5.9	10.3	5.0	5.5	9.6	18,414	6.0	2.5

Table 3 summarizes the results from the multi-variate regression model, where the left-hand (dependent) variable is the average emotional tone measured from tweets inside a housing estate. The right-hand variables are attributes of the built environment as well as demographic, socio-economic ones as control variables. Major findings are below:

First, the design of buildings matter. The Twin-Tower(雙塔型), a popular public housing type in the 70s designed to facilitate eye-contact between households and to reduce crime (Yeung & Wong 2003), correlated with negative emotional tones ($p < 0.05$). Twin-Towers estates measured nearly 8 units lower in emotional tones compared with alternative building forms. Similarly, the T-shaped tower estates measured 19 units lower ($p < 0.1$). Housing estates with playground facilities are happier by 22 units than those without ($p < 0.1$), while those with swimming pools are 30 lower ($p < 0.05$).

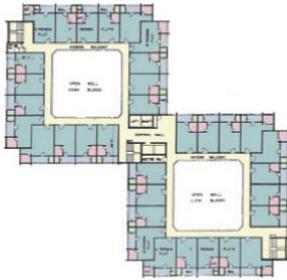


Figure 6 Typical floor plan of a Twin-Tower; Source: Hong Kong Housing Authority



Figure 7 A Twin-Tower Building, Oi Man Estate, Ho Man Tin. Source: Peter Steward

The denser a housing estate is the merrier: each increment of one unit per ha is associated with 0.02 unit increase of emotional scores ($p < 0.05$) -- we remain cautious not to over interpret the happiness-density correlation with a small sample. We did not find significant correlation between emotional tone and the distance to MTR station or nearby open spaces, nor is the number of road intersections matter in the model results. Private housing estates appeared happier than public ones, measuring 38 scores higher on average ($P < 0.05$). The age of housing estates, the number of years since inauguration, negatively correlated with emotional tone ($p < 0.05$). The above results remained significant after controlling for demographic, social and economic attributes.

Emotional tones were negatively correlated with the percentage of college-educated residents ($p < 0.1$); an increase of 1% with college degrees correlated with 2 units decrease in sentiment tones ($p < 0.05$). Correlations with age group, ethnicity, language use and marriage were insignificant in our model. Of the economic attributes, happiness negatively correlated with the median loan payment/income ratio ($p < 0.01$), not household income. 1% increase in loan payment to income ratio decrease the happiness score by 2 units. The percentage of residents in workforce, those either employed or self-employed, correlated strongly with positive mood; 1% increase in workforce population was associated with 4 unit increase in emotional tone ($p < 0.01$). The percentage of people working in certain occupational sectors, such as finance, government, trade, transport and information, correlated negatively with happiness.

Table 3 Regressing 'average emotional tone' on built environment, demographic, and socio-economic attributes

<i>Number of obs</i>	119
<i>F(27, 91)</i>	1.78
<i>Prob > F</i>	0.02
<i>R-squared</i>	0.36
<i>Root MSE</i>	26.62
Average Emotional Tone (<i>happy=100, neutral=50, unhappy=0</i>)	<i>Coef. (p-value)</i>
Built Environment Attributes	
<i>Twin-tower buildings (yes=1)</i>	-7.55 (0.019**)
<i>T-shaped buildings (yes=1)</i>	-19.01 (0.076*)
<i>Y-shaped buildings (yes=1)</i>	8.06 (0.329)
<i>Unit density (100 unit/ha)</i>	0.02 (0.029**)
<i>Private housing (private=1, public=0)</i>	37.94 (0.017**)
<i>Age (year since built)</i>	-0.92 (0.012**)
<i>Swimming Pool (yes=1)</i>	-28.98 (0.036**)
<i>Playground (yes=1)</i>	16.93 (0.232)
<i>Distance to nearest MTR station (m)</i>	0.00 (0.89)
<i>Distance to nearest open space (m)</i>	0.01 (0.622)
<i>Maximum unit area (1,000 sqft)</i>	0.00 (0.568)
<i># of street Intersections (within 200m)</i>	-0.32 (0.24)
<i>Topographical slope (degree)</i>	0.94 (0.343)
Socio-demographic Attributes	
<i>% of ppl. with college degree</i>	-2.37 (0.028**)
<i>% of youth (under 25)</i>	-1.64 (0.122)
<i>% of ethnically Chinese</i>	0.44 (0.74)
<i>% of English speaker</i>	0.90 (0.507)
<i>% of ppl. Married</i>	-0.49 (0.636)
Economic-Occupational Attributes	
<i>Median loan payment/income ratio</i>	-1.74 (0.023**)
<i>Median household income (1,000HK\$/month)</i>	-0.26 (0.483)
<i>% of ppl. in workforce</i>	3.89 (0.007***)
<i>% of ppl. in finance sector</i>	-7.42 (0.002***)
<i>% of ppl. as public official</i>	-3.89 (0.056*)
<i>% of ppl. In elementary sector</i>	-2.53 (0.222)
<i>% of ppl. In agriculture & fishery</i>	-55.61 (0.202)
<i>% of ppl. In trade</i>	-4.15 (0.021**)
<i>% of ppl. In transport</i>	-6.00 (0.005***)
<i>% of ppl. In information</i>	-11.89 (0.015**)
Intercept	123.69 (0.376)

* 90% significance level, ** 95% significance level, *** 99% significance level

4. Conclusion

We conducted a pilot study on social media sentiment in Hong Kong's housing estates to identify the correlation between happiness and built environment attributes. The novelty of this study is the use of geo-coded social media data as a proxy to measure sentiment, allowing us to detect and compare intra-city variations as a result of built environment attributes. The following findings are of interests to urban planners and design practitioners.

- Building types such as the Twin-Towers and T-shaped buildings are found to be negatively associated with happiness.
- Tweets in private housing estates appeared happier than public ones;
- Occupants in old housing estates were less happy than those in new ones.
- Density is positively correlated with sentiment tones; although this should not be over interpreted as causality.

Limitations & Next Steps

- The number of geo-coded tweets are limited with a two-month period. The number of tweets fell within the footprint of the 487 housing estates are relatively small (10 tweets per estate on average). This shortcoming will be improve in future as our data-collection continues.
- Sentiment analysis for Chinese and other languages were not included in this paper; multi-language parsing tools are needed in the next stage studies.
- This is only a cross-sectional study without control of past sentiment and built environment attributes. Further study will look into the historical dataset and adopt the quasi-experiment research design.

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References

- Alexander, C., Ishikawa, S. & Silverstein, M., 1977. *A Pattern Language: Towns, Buildings, Construction*, New York: Oxford University Press.
- Arie Nadler Daniel Bar-Tal, O.D., 1982. Density Does Not Help: Help-Giving, Help-Seeking and Help-Reciprocating of Residents of High and Low Student Dormitories. *Population and Environment*, 5(1), pp.26–42. Available at: <http://www.jstor.org/stable/27502951>.
- Bertrand, K., Bialik, M. & Virdee, K., 2013. Sentiment in New York City: A High Resolution Spatial and Temporal View. *arXiv preprint arXiv:1308.5010*, pp.1–12. Available at: <http://arxiv.org/abs/1308.5010>.
- Bickman, L. et al., 1973. Dormitory Density and Helping Behavior. *Environment and Behavior*, 5(4), pp.465–490. Available at: <http://eab.sagepub.com/cgi/doi/10.1177/001391657300500406>.
- Castells, M., Lee, G. & Kwok, Y.-W., 1990. *The Shek Kip Mei syndrome : economic development and public housing in Hong Kong and Singapore*, London: Pion Ltd.
- CentaMap Company Limited, 2016. CentaMap. Available at: <http://hk.centamap.com/gc/home.aspx> [Accessed May 15, 2016].
- Coleman, A., 1985. *Utopia on Trial: Vision and Reality in Planned Housing* 2nd ed., London: Hilary Shipman Ltd.
- Conway, J. & Adams, B., 1977. The social effects of living off the ground. *Habitat International*, 2(5-6), pp.595–614. Available at: <http://linkinghub.elsevier.com/retrieve/pii/0197397577900327> [Accessed June 29, 2016].
- Curtis, W., 1996. *Modern Architecture Since 1900* 3rd ed., London: Phaidon Press.
- Dantzig, G. & Saaty, T., 1973. *Compact City : A Plan for a Livable Urban Environment*, San Francisco: W. H. Freeman & Co.
- Department of Census and Statistics, the G. of H.K., 2012. District Profile of 2011 Population Census.

- Available at: <http://www.census2011.gov.hk/en/major-housing-estates.html> [Accessed June 26, 2016].
- Durahim, A.O. & Coşkun, M., 2015. #iamhappybecause: Gross National Happiness through Twitter analysis and big data. *Technological Forecasting and Social Change*, 99, pp.92–105. Available at: <http://www.sciencedirect.com/science/article/pii/S0040162515002024> [Accessed July 16, 2015].
- Fanning, D.M., 1967. Families in Flats-Fanning. *British Medical Journal*, 4, pp.382–386.
- Franck, K., 1983. Community by design. *Sociological Inquiry*, 53(2-3), pp.289–313. Available at: <http://onlinelibrary.wiley.com/doi/10.1111/j.1475-682X.1983.tb00038.x/abstract>.
- Gifford, R., 2007. The Consequences of Living in High-Rise Buildings. *Architectural Science Review*, 50(1), pp.2–17.
- Glaeser, E., 2011. How Skyscrapers Can Save the City. *The Atlantic*. Available at: <http://www.theatlantic.com/magazine/archive/2011/03/how-skyscrapers-can-save-the-city/308387/> [Accessed June 20, 2016].
- Glaeser, E., 2012. *Triumph of the City: How Our Greatest Invention Makes Us Richer, Smarter, Greener, Healthier and Happier*, London: Penguin Books.
- Helleman, G. & Wassenberg, F., 2004. The renewal of what was tomorrow's idealistic city. Amsterdam's Bijlmermeer high-rise. *Cities*, 21(1), pp.3–17.
- Holahan, C.J. & Wilcox, B.L., 1979. Environmental Satisfaction in High- and Low-Rise Residential Settings: A Lewinian Perspective. In J. R. Aiello & A. Baum, eds. *Residential Crowding and Design*. Boston, MA: Springer US, pp. 127–140. Available at: http://dx.doi.org/10.1007/978-1-4613-2967-1_9.
- Ineichen, B. & Hooper, D., 1974. Wives' mental health and children's behaviour problems in contrasting residential areas. *Social Science & Medicine (1967)*, 8(6), pp.369–374. Available at: <http://linkinghub.elsevier.com/retrieve/pii/0037785674900833> [Accessed June 30, 2016].
- Jacobs, J., 1961. *The Death and Life of Great American Cities*, New York: Random House.
- Jacobs, J., 1969. *The Economy of Cities*, New York: Random House.
- Jenks, M., Burton, E. & Williams, K. eds., 2004. *The Compact City: A Sustainable Urban Form?*, London: Taylor & Francis.
- Jephcott, P. & Robinson, H., 1971. *Homes in high flats: some of the human problems involved in multi-storey housing*, Edinburg: Oliver and Boyd.
- Kahn, J.H. et al., 2007. Measuring emotional expression with the Linguistic Inquiry and Word Count. *The American Journal of Psychology*, 120(2), pp.263–286.
- Katz, P., 1993. *The New Urbanism: Towards an Architecture of Community*, New York: McGraw-Hill Education.
- Lester, D., 1994. Suicide by jumping in Singapore as a function of high-rise apartment availability. *Perceptual and motor skills*, 79(1 Pt 1), p.74.
- Marzuk, P.M. et al., 1992. The effect of access to lethal methods of injury on suicide rates. *Archives of general psychiatry*, 49(6), pp.451–458.
- Montgomery, C., 2013. *Happy City: Transforming Our Lives Through Urban Design*, New York: Farrar, Straus and Giroux.
- Moore, N.C., 1975. Social aspects of flat dwelling. *Public Health*, 89(3), pp.109–115. Available at: <http://www.publichealthjrnl.com/article/S0033350675800606/fulltext> [Accessed June 29, 2016].
- Nagar, R. et al., 2014. A case study of the New York City 2012-2013 influenza season with daily geocoded Twitter data from temporal and spatiotemporal perspectives. *Journal of medical Internet research*, 16(10), p.e236. Available at: http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4259880&tool=pmcentrez&render_type=abstract [Accessed December 6, 2015].
- NFPA, 2015. *NFPA 1 Fire Code*, Available at: nfpa.org.
- Oda, M. et al., 1989. Effects of high-rise living on physical and mental development of children. *Journal of human ergology*, 18(2), pp.231–235.

- OSMF, 2016. OpenStreetMap. Available at: <https://www.openstreetmap.org/> [Accessed May 15, 2016].
- Robert Gifford, C.L., 2006. Housing quality and children's socioemotional health. *Journal of Housing and the Built Environment*, 21(2), pp.177–189. Available at: <http://www.jstor.org/stable/41107338>.
- Rohe, W.M., 2009. Urban planning and mental health. *Prevention in Human Services*, 4(1-2), pp.79–110. Available at: <http://www.tandfonline.com/doi/abs/10.1080/10852358509511162?journalCode=wzpe20#.V3PkKEWvWSI.mendeley> [Accessed June 29, 2016].
- Saegert, S., 1979. A Systematic Approach to High Density Settings: Psychological, Social, and Physical Environmental Factors. In M. R. Gürkaynak & W. A. LeCompte, eds. *Human Consequences of Crowding*. Boston, MA: Springer US, pp. 67–82. Available at: http://dx.doi.org/10.1007/978-1-4684-3599-3_8.
- Tausczik, Y.R. & Pennebaker, J.W., 2010. The Psychological Meaning of Words: LIWC and Computerized Text Analysis Methods. *Journal of Language and Social Psychology*, 29(1), pp.24–54.
- Turkington, R., van Kempen, R. & Wassenberg, F., 2004. *High-rise housing in Europe*, Delft: Delft University Press.
- Yeh, A., 2000. The planning and management of a better high density environment. In M. K. Ng & A. Yeh, eds. *Planning for a better urban living environment in Asia*. Ashgate: Aldershot, pp. 116–143.
- Yeung, Y.M. & Wong, T.K.Y., 2003. *Fifty years of public housing in Hong Kong: a golden jubilee review and appraisal*, Hong Kong: The Chinese University Press.
- Yuen, B. et al., 2006. High-rise living in singapore public housing. *Urban Studies (Routledge)*, 43(3), pp.583–600. Available at: <http://ezlibproxy1.ntu.edu.sg/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=buh&AN=19869441&site=eds-live&scope=site>.

EVER SMARTER, CITIES THAT LEARN: the application of complex adaptive systems theory to urban development

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Recent developments in technology have fundamentally changed the way we live, work, communicate, interact and, most profoundly, perceive our environment. Our daily lives have been enhanced by new capabilities, new channels and new approaches. With all this, have our cities changed as much? Irrespective of the urban problems that have been identified with the design of cities in the past 100 years, we persist with the same design approaches. Instead of using these technologies to perpetuate, perhaps make more efficient, previous practice that has led us to the conundrums we face today, how might we engage new approaches?

Smart cities are being developed that take advantage of ICT capabilities, such as by deploying sensors to monitor the use of urban resources such as space, water or power. For example, roads are monitored and tariffs charged according to demand. These changes are transforming public amenity, workplace experience and community engagement in support of greater innovation and economic activity.

Our conceptual approaches are not synchronised with the realities of city activities. We can observe this in our conceptualisation of urban developments as static spatial entities even though we have been developing ideas and theories about the cities in order to help us visualise and conceptualise them as dynamic systems. Our conceptualisation therefore has not yet extended to cities, which are adaptable enough and can not only learn but through the process of learning evolve to something more resilient and better. The paper identifies a way forward.

Technology and us.

There is real need for us to change the way we think but changes are never easy. Often when we think we are changing, it is just an illusion. Slavoj Žižek in *Less than Nothing: Hegel and the shadow of dialectic materialism*, describes our inability to distinguish between paradigm shift and supporting something that we already know with modified or new theory. He illustrates this as a difference between what he calls Ptolemisation to truly Copernican revolution.

When a certain discipline is in crisis, attempts are made to change or supplement its theses within its basic framework – a procedure one might call “Ptolemisation” (after data poured in which clashed with Ptolemy’s Earth-centred astronomy, his supporters introduced additional complications to account for the new data); then, the true “Copernican” revolution takes place, which, instead of just adding additional complications and modifying minor premises, changes the basic framework itself. So when we are dealing with self-professed “scientific revolution”, the question to ask is always whether it is truly Copernican revolution, or merely a Ptolemisation of the old paradigm (Žižek 2012).

Today when dealing with cities and city futures we would benefit from a *Copernican revolution*. Unfortunately a lot of the work we do is reinforces what we already know and

does not test assumptions. By visualizing cities and therefore all the process and elements within cities structure (their infrastructure, architecture, landscape, planning, eco-systems, social networks) in a different way may lead us to Copernican revolution. Can technology help us to change the way we think in these urban design and planning?

As mentioned above, recent developments in technology have forever changed the way we live, work, communicate, interact and, most profoundly, perceive the environment in which we live. Regardless of the urban problems that have been identified with the design or cities in the past 100 years, we persist with the same design approaches. It is possible to postulate that we using advances in technology to support the existing status quo, thus correcting problems that have emerged from inappropriate past strategies that only further embed these strategies.

At the same time we are surrounded with new computational techniques, software systems and techniques, often been developed in other fields, which can help us to perceive and design the world around us in very different ways. Recent trends of looking into natural systems for clues and alternative approaches have been prominent in discussions in planning and urban design. But we are also very much aware that we are not able to come even close to understand what is really going on within natural system and trying to model properly natural processes is impossible. Nevertheless, by observing city through a different lens and using the considerable data available for modelling makes our design possibilities so much more complicated and in the same time much more exciting. There is a hope that soon we will be able to start Copernican revolution. As Rod Barnett and Jacqueline Margetts said:

Rather than consider nature as a model and city as a copy (which is, for instance, a hallmark of biomimicry), we need to find within the urban itself the condition of its evolution (Barnett and Margetts 2015).

And where better to look at ideas of evolution than in Darwin's work. Although working in the mid 19th century, Darwin relied heavily on algorithms.

Algorithms

Algorithms are nothing else but processes or set of rules to be followed in long calculations or any problem solving operations (Rogers, H. Jr. 1967). But what has changed from Darwin's time is "*the theoretical reflection by mathematicians and logicians on the nature and power of algorithms in general, a 20th century development that led to the birth of computer, which in turn has led to much deeper and more lively understanding of the powers of algorithms in general* (Dennett 2013).

Today we are very much aware that Darwin discovered not only one algorithm, but rather a large number of related algorithms among which he had no ability to distinguish. This ability to distinguish in between different algorithms has only recently become possible. In his book, published in 1859, *On the Origin of Species*, Darwin introduced scientific theory about natural selection and evidence that diversity of life comes from common descent through a branching pattern of evolution. Ever since this discovery biologist and ecologists have been referring to this as the Tree of Life, until through DNA sequencing we discovered the relationship among species encoded in their genes. We also started to understand the role of compressed information in genes and how this can effect evolution processes. Furthermore, few weeks ago, on 11 April 2016, a team of scientists unveiled a new tree of life (Zimmer 2016). The new diagram can illustrate the evolution of all living things, which previously was not possible. But this new Tree of Life looks nothing like a tree but rather as exploding fireworks (Fig.1).

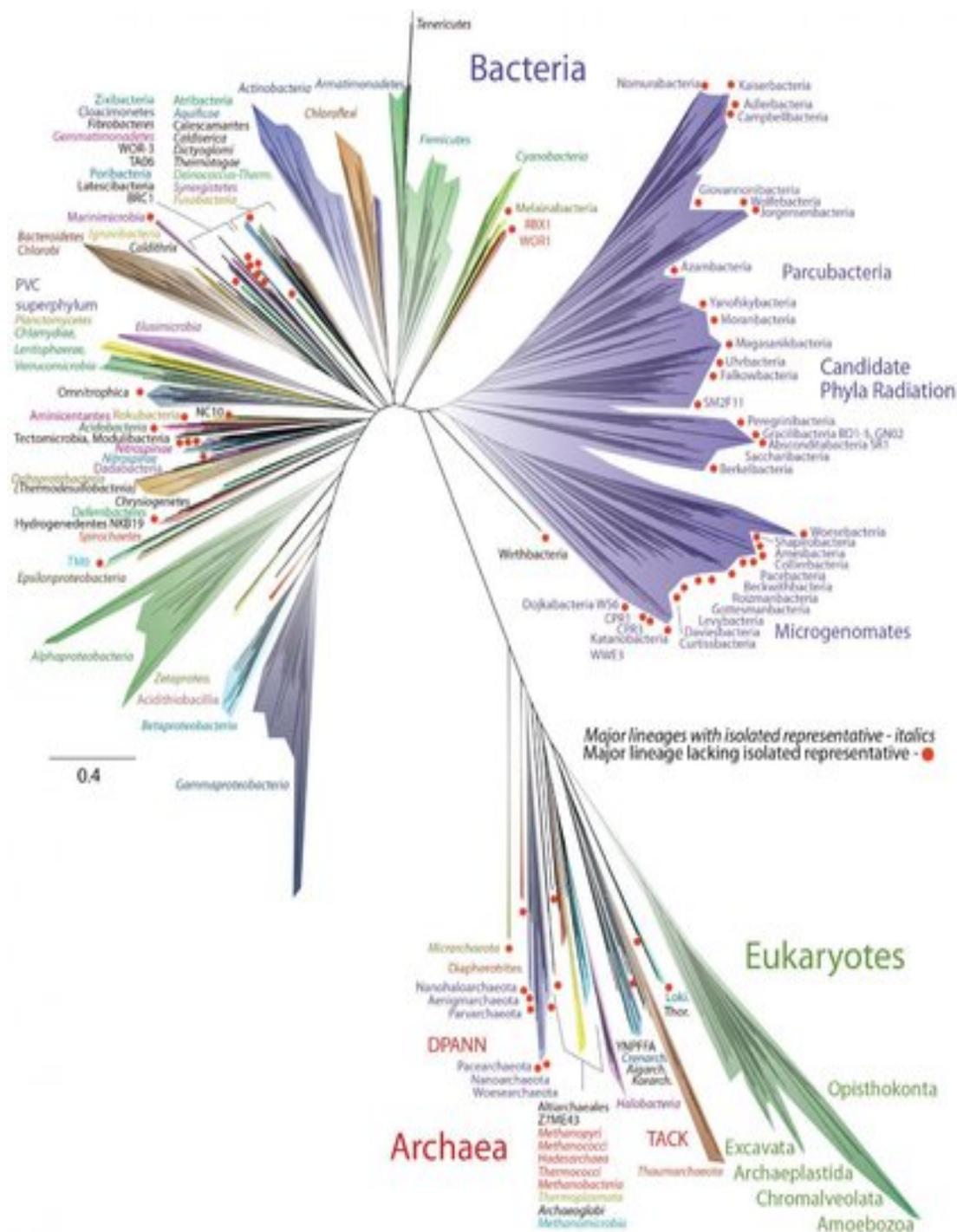


Figure 1. The New Tree of Life (Source: Hug et al, 2016)

Although these algorithms and evolutionary insights are revealing, we know that when dealing with city development we cannot rely just on evolution processes. Evolution and adaptation are not driven just by chance, but by *set of laws that allow nature to discover new molecules and mechanisms in a fraction of the time that random variation would take place* (Wagner 2014). Evolution of our cities happens much faster than any evolution in natural systems. It requires constant disturbance and depends of what Andreas Wagner describes as the *arrival* of the fittest.

Arrival of the Fittest

Wagner has built his theory based on work by Hugo de Vries at the beginning of the last century. Even in nature *natural selection may explain the survival of the fittest, but it cannot explain the arrival of the fittest* (Vries 1904, p.826). What de Vries tried to resolve was the innovation problem. He did not believe that innovation could come from just natural selection. He together with other evolutionists searched for better sources of innovation like mutation. Many believe that innovation must be explained by natural but unguided selection and that robust and able to evolve, unguided selection creates innovation (Pagel 2012, 2016).

In *Arrival of the Fittest*, Wagner tries to illustrate the missing part of Darwin theory. His book is based on 15 years of research and the use of computational technologies and suggests that genes do not act alone but form large and complex networks. He was able to model this networks and randomly alter some of their features in order to simulate random mutation. Natural selection pushes mutation down to lower limits. These limits are set by the power of random genetic drift, and may limit ability of the system to survive. When we plan and design cities we now have ability to also randomly alter some of their features or to introduce purposeful disturbance, which we know is essential for any natural system to evolve.

In *Novelty, Adaptive Capacity, and Resilience* Craig Allen and Buzz Holling (2010) identify novelty and innovation as essential for system to remain dynamic and functioning. Without novelty or innovation the system may become over-connected and unable to change (Gunderson and Holling 2001). Emergence of novelty through introduction of disturbance allows system to create variety of options, which is essential for the system to maintain adaptive capacity. It also *serves as a reservoir of potential functions that may be required following transformations or as normal system dynamics evolve* (Gunderson and Holling 2001).

In a similar way the philosopher Michel Serres believes that disturbance or even turbulence is a permanent state of any natural system and is essential not only for the system to survive but also for the system to enrich itself (Serres 1992). The positive impact of disturbance or even turbulence within cities has been well documented. Fernand Braudel and William McNeill refer to it as autocatalytic processes. They describe how autocatalytic character of European cities in between 11th and 19th century was expressed by commercial and industrial expansion, which by comparison was not present in Asia (Braudel 1995, McNeill 1982). McNeill observes that a dominance of top-down power stops any self-organization or bottom up process to develop. In *The Pursuit of Power* he writes:

In China the command element in the mix remains securely dominant. Market behaviour and private pursuit of wealth could only function within the limits defined by the political authorities (McNeill 1982).

Autocatalytic processes has not had a chance to emerge within such a system. Peter Allen in *The Visible expression of co-evolving Complexity*

Autocatalytic behaviour could be also explained as positive feedback loop, in which small changes or small deviations are amplified and lead to heterogeneity, or difference, essential for system to survive.

Feedback Loops

Feedback loops are usually associated with designing a control system. In these control systems the feedback loop uses the system output to adjust its performance to meet a better output, that is,

Feedback occurs when outputs of a system are routed back as inputs as part of chain of causes-and-effect that forms a circuit loop (Ford 2010).

Feedback loops play an important role in cybernetics, a theory developed in 1940s and 1950s. A simple cybernetic system consists of sensor, compactor and activator in which the sensor provides feedback to the compactor and the compactor give guidance to activator. This then provides an output in form of feedback, which is effective in the environment (Littlejohn 2001). However, although cybernetic systems rely on compactor nevertheless, most of cybernetic devices do not have compression faculty. In biology, compressed information is usually genetic and is essential for system to evolve and survive.

It is important to understand that there are two different types of feedback loops: positive and negative. Negative and positive feedback loops are defined differently in different disciplines. However the best way to explain negative feedback loop is by explaining thermostat. A thermostat in the room will read the temperature, compares this with the desired level to which it was set up and act if needed to change the supply of heating or cooling to achieve the desired temperature. It stops the indoor environmental system from deviating too far from the desired level and in this way it promotes homogeneity. This is a closed system, able to learn but it will never be able to evolve. In this context learning is viewed as ability to recognize an existing patterns, but in order to promote the ability to adapt, change, or emerge into something new and different, learning and feedback loops are required. These feedback loops are called positive feedback loops. In biology the two feedback loops exist side by side, where negative feedback loops tend to slow down processes and positive feedback loops accelerate them. Cities also have combination of two different feedback loops and their character is dependent on which kind of feedback loops play a dominant role.

Feedback Loops and Smart Cities

It is not difficult to imagine what would happen in ecology if predominate feedback loops will be negative and try to stop any deviation from the desired stage. The answer is simple: evolution will not be possible. Therefore the question is why we design our cities in the way that stop them develop positive feedback loops, adapt and change? Why we are so afraid of change? Even if we know the change is essential for our survival.

In recent years many jurisdictions have become fascinating with the idea of the Smart City. Our ability to have access to big data and real data, analyse and model them had profound impact on the way we understand our cities. New ways of describing the built environment are constantly emerging. We see our cities as layers of networks and digital information blanket (Ratti 2016). We no longer see cities in isolation from the larger environment. We are able to model what we call *stocks and flows*, which allows us to see how dependent cities are on resource imported from outside. As Manuel De Landa describes:

Cities have always been parasitic creatures, in short, surviving thanks to the inflow of food and human genes (De Landa 1999).

Although a Stocks and Flows model can allow us to visualise cities dependence on the resource and model cities' metabolism with more precision, it does not allow us to model what is the most important element *the condition of its evolution* (Barnett and Margetts 2015). System Dynamic model, which operates on a software platform called 'whatIf?' designed for model development involving multidimensional objects and creating/managing quantitative scenario. Unfortunately although System Dynamic model allows us to gain understanding of the behavior of complex systems, nevertheless it only operates using elements (stocks and flows), which are predetermined. Emergent spatial developments, self-organization and development of new and coherent structures, patterns, and properties (Goldstein, 1999) cannot be modeled since new stocks and flows cannot be generated.

We encounter the same problem when we try to obtain real-time data from sensors. We now rely on sensors to monitor functioning of our cities. There has been considerable investment to install the basic data infrastructure, such as switches and routes for high speed internet. With these we are able to enhance traffic management, monitor moisture, noise, water level, overcrowding problems, air quality, measure parameters for forest fire prevention, river flooding, greenhouse gasses, etc., etc. The potential to monitor and to control is considerable. While all this technology can make our cities smart it is not sufficient to be smart enough to survive. The city is still operated as a closed system (does not matter how complex they are) with negative feedback loops in order to manage and control our cities within what a desirable range. By doing this we prolong what Buzz Holling describes as the *conservation* stage (Gunderson and Holling 2001) in the model of Cycle of Adaptive Change (Holling 1986). This dynamic cycle consists of four phases: growth, conservation, collapse/release and reorganization, where *Growth* is described as a period of rapid accumulation of resources (capital) competition and sizing opportunities, combined with high but decreasing resilience. *Conservation* is described as a time when growth is slowing down and resources are stored to be used for system maintenance; this period is characterized by stability and certainty, which leads to reduced flexibility and lowers resilience. The phase of creative destruction, known as the *Release* phase is characterized by chaotic collapse of existing systems and the release of accumulated capital; in this phase, certainty is replaced with uncertainty and the resilience of the system increases. In the phase of *Reorganization* we experience extreme uncertainty, but at the same time, this phase is characterized by a very high level of creativity and innovation (Fig.2).

When we deal with cities we often neglect two phases, Release and Reorganization, putting all our efforts on Growth and Conservation. Our focus with Smart Cities is to ensure stability and certainty by trying to monitoring and controlling activity to remain in a target state, making sure that nothing can collapse, traffic runs as smoothly as possible, overcrowding is minimized and, where possible, temperatures remain at the same level. The phase of Conservation is constantly artificially supported to ensure that stasis is maintained, a condition we have come to expect. Uncertainty should be avoided by all costs while certainty is protected by careful monitoring. By the metric of our quality of life, we have benefited significantly from the integration of multiple information and communication technologies (ICT). ITC helps us to improve performance of urban services, reduce costs and resources consumption and even improve contacts between citizens and government (NYC 2015). We now know exactly when the next bus, tram, train will arrive, where is the closer Uber car waiting to takes us home, what is the level of pollution and is it safe to come out of our houses. We are able to anticipate so many things that uncertainty is beginning disappearing from our vocabulary. But can we allow this certainty to dominate processes that guide development of our cities? Should we insist on artificially supporting the phase of conservation (Fig.3) or should we try to

introduce some form of disturbance that would allow our cities not only to learn to recognized patterns but also learn how to view things differently.

there may be a quite different set of patterns out there other than those which environment is providing me (Gell-Mann, M. 1994)?

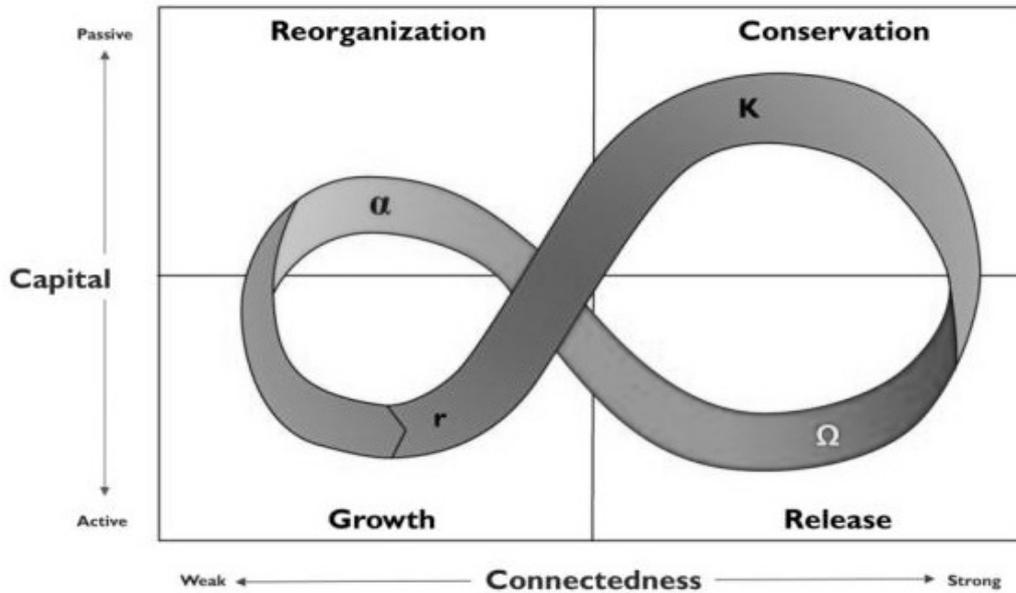


Figure 2. Cycle of Adaptive Change (source Holling 1986)

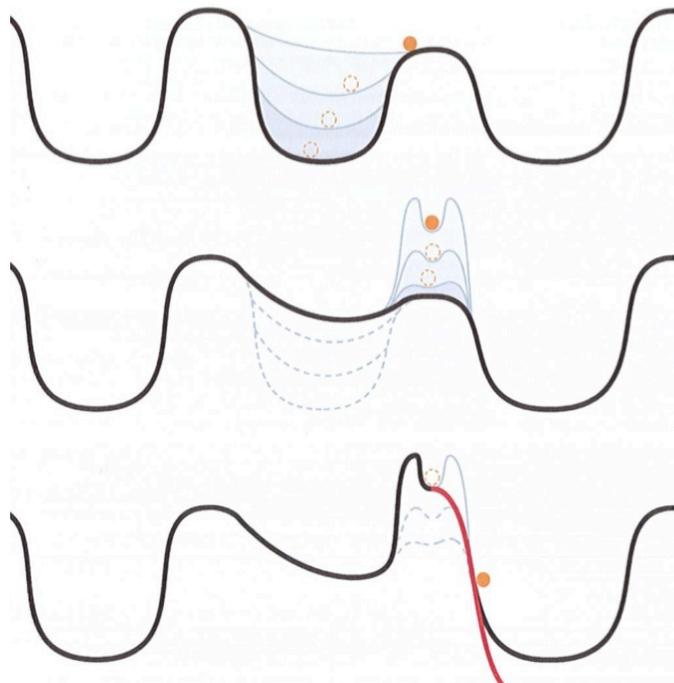


Figure 3. Artificial support of Phase of Conservation

According to Gell-Mann innovation begins with getting rid of some unnecessary prohibition that was adopted a long time before together with a useful idea. By getting rid

of prohibition we may discover a new sort of freedom that previously was not possible and this, in turn, could help us to formulate problems differently by seeing and perceiving the world in very different ways. Introduction of disturbance could allow us to do just that. The only question is how to introduce disturbance into the system without having catastrophic consequences.

Disturbance

Natural systems are in constant state of turbulence (Serres 1992). Small and frequent disturbances are regularly incorporated into ecosystems. The challenge, however, arises when these disturbance events are either sufficiently large, or infrequent (Shugart 2005). This kind of disturbance may occasionally have positive effect but it is also wise to try to avoid it. Therefore we can either search for *the urban condition of its evolution*, try to introduce series of small disturbances that may lead to dramatic, but positive changes in the future.

So is this possible in the urban context and is it beneficial? One example can be observed in development of Rome at the end of 16th century.



Figure 4. Rome in 18th century as the result of Sixtus V interventions.

When the exiled Cardinal Montalto was elected Pope in 1585 (taking the name Sixtus V), a substantial part of Rome was in ruins (McBrien 2000). The former capital of the Roman Empire was graced by many monumental architectural structures and churches, but it was largely deserted. Although he served as Pope for only five years, Pope Sixtus V managed to put in place an organisational structure for the city that still influences the way the city functions and grows. Together with the Swiss engineer Domenico Fontana,

he reinvented the city. Rome was conceived as a network in which urban spaces became nodes articulated by obelisks brought to Rome from Egypt during the Roman expansion a few centuries earlier. The result was described by Edmund Bacon as “not manipulation of mass but articulation of experience along an axis of movement through space (Bacon 1976). From being static and dilapidating, Rome became dynamic and thriving again. Small actions led to complete reconfiguration of the city.

We often refer today to this kind of intervention as acupuncture and can observe many examples of urban acupuncture as disturbance that helps cities to reconfigure themselves, to adapt and become more resilient. With all technologies available to us today, with all different data sources, we are now in position that could allow us the instruction of the fittest into the city structure and watch its consequences. We can also start to introduce positive feedback loops. As mentioned before, cybernetic devices may not have a compression function but we have now to our disposal evolutionary and genetic algorithms, as well as better and better ability to model Complex Adaptive Systems. We also have the New Tree of Life. So we can either sit back and relax and dream about what Darwin would have done if he knew what we know now, or we can start looking at the world around us differently, without prohibition and fear of change. What are the new existing patterns out there, which we cannot see?

During the presentation of our paper at the conference we will show the work that has been done in Melbourne and Galapagos, which will illustrate what has already been done and how we can progress from there.

Bibliography

Allen, P. (1997) *Cities and Regions as Self-Organizing Systems: Model of Complexity*. London: Taylor and Francis.

Allen, P. (2016) The Visible expression of co-evolving Complexity. (accessed in June 2016 k.tudelf.nl)

Barnett, R. and Margetts, J. (2015) “Disturbanism in South Pacific: Disturbance Ecology as Basis for Resilience in Small Island States” in *Resilience in Ecology and Urban Design*, by S.T.A. Pickett, M.L.Cadenasso, and B. McGrath, eds. New York: Springer

Braudel, F. (1995) *A History of Civilization*. London: Penguin Books.

Darwin, C. (1947) *On the Origin of Species*. London: Oxford University Press.

De Landa, M. (1999) “Nonlinear Development of Cities” in *Eco-Tec: Architecture of the In-Between*, Amerigo Marras, ed. New York: Princeton Architectural Press.

Dennett, D. C. (2013) *Intuition Pumps and other tools for thinking*, London: Penguin Group.

Ford, A. (2010) *Modelling the Environment*, Washington D.C.: Island Press

Gell-Mann, M. (1994). Complex adaptive systems. In G. Cowan & D. Pines & D. Meltzer (Eds.), *Complexity: Metaphors, models and reality* (pp. 17–45). Reading: MA: Addison-Wesley Publishing Company.

Goldstein, J. (1999) “Emergence as a Construct: History and Issues”. In *Emergence*, Volume 1, Issue 1.

Gunderson, L.H. and Holling, C.S. (2001) *Panarchy: understanding transformations in human and natural systems*. Washington D.C.: Island Press

Holling, C.S. (1986) Resilience of ecosystems: local surprise and global change. In Clark, W.C. and Munn, R.E. (eds.) *Sustainable Development of Biosphere*. pp.292-317. Cambridge: Cambridge University Press.

Hug, L. A., Baker, B. J., Anantharaman, K., Brown, C. T., Probst, A. J., Castelle, C. J., . . . Banfield, J. F. (2016). A new view of the tree of life. *Nature Microbiology*, 1, 16048. doi:10.1038/nmicrobiol.2016.48
<http://www.nature.com/articles/nmicrobiol201648#supplementary-information>

Littlejohn, S. (2001) *Theories of Human Communication*. Long Grove: Waveland Press, Inc.

McNeill, W. H. (1982) *The pursuit of Power: Technology, Armed Force and society since A.D. 1900*. Chicago: University of Chicago Press.

NYC Mayor's Office of Tech + Innovation, September 2015 www1.nyc.gov (accessed in June 2016)

Pagel, M. (2016) Breaking the Wall of Collective Stupidity: How Evolutionary Biology Explains Creativity (<http://falling-walls.com/Mark-Pagel-1644>)

Pagel, M. (2012) *Wired for Culture: Origin of the Human Social Mind*. New York: WW Norton & Co.

Ratti, C. and Claudel, M. (2016) *The City of Tomorrow: Sensors, Networks, Hackers, and Future of Urban Life*. New Haven: Yale University Press

Rogers, H. Jr. (1987) *Theory of Recursive Functions and Effective Computability*, Cambridge MA: MIT Press

Schmitt, G. (2011) <http://futurecities.etz.ch>

Serres, M. (1992) *The Natural Contract*. Michigan: The University of Michigan Press, Ann Arbor

Shugart, H.H. (2005) Equilibrium versus non-equilibrium landscape. In: Wiens, J. and Moss, M. (eds.) *issues and perspective in landscape ecology*. Cambridge MA: Cambridge University Press.

(de) Vries, H. (1904) *Species and Varieties: Their Origin by Mutation*, Chicago: The Open Court Publishing Company. p.826

Wagner, A. (2014) *Arrival of the Fittest: Solving evolution's greatest puzzle*, New York: Penguin Group

Zimmer, C. (2016) Scientists Unveil New 'Tree of Life'. *Science: New York Times*, 11.04.2016.

Zizek, S. (2012) *Less than Nothing: Hegel and the Shadow of Dialectical Materialism*. New York: Verso

An Empirical Study on Mega-city Commercial Spaces Distribution Characteristics: Exploratory Big-data Analysis on Guangzhou, China

(An Empirical Study on Mega-city Commercial Spaces Distribution Characteristics)

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Abstracts: The distribution of commercial retail networks is one of the most important factors influencing the evolution and layout of a modern mega-city. This paper, taking Guangzhou as a representative example, explores the aggregation and diffusion characteristics and general laws of the distribution of commercial retail networks, using the Kernel analysis method, based on big-data mining from half-open and open source internet. The results show that the site agglomeration degree, population agglomeration degree and the distribution of consumption level generally represented different kind of center point. Finally, we investigate the driving mechanism, including urban planning driver, policy trigger and pushing force, inner impetus and cohesion force, in order to reveal and explain the general law of distribution of a commercial retail network. This paper will also provide the reality basis for the urban planning, as well as the coordinated and healthy development of commercial retail networks.

Key words: Commercial Retail Network, Distribution Characteristics, Driving Mechanism

1 Introduction

Commercial space as an important contributor of urban development, is always studied to optimize the structure of urban land and function. The distribution of commercial retail facilities is closely related with the land use, transportation, urban expansion, service industry, etc. Thus the study of commercial retail network location is emphasized by the governments on urban planning and companies on location selection in the decision-making. And the distribution rule is one of main subjects in the fields of geography, urban planning as well as architecture (ZHANGWenzhong et al,2006; FENG Jian et al, 2007; CHAI Yanwei, et al 2010; ZHOU Suhong, et al 2008).

The idea of People-Oriented and the recent rise of techniques based on big-data in China, had an impact on the traditional studies increasing focus on space-behavior (Wang De, Guangde Li, Wei Zhu, 2013).

Guangzhou is the most famous Chinese traditional trading mega-city, and has experienced rapid development over the past decades. Since emerging economies generally represent faster urbanization than economic growth, the evolution of commercial retail space in Guangzhou typically reflect most characteristics of commercial retail network in both the old and new town area.

This study aims at conducting an urban-level quantitative spatial data analysis to explore the aggregation and diffusion characteristics of commercial retail network in a mega-city, based on both traditional planning data and big-data mining from Baidu Map, Public Comment, Open Street Map (OSM), etc. This study also aims to analyze how factors impact on the distribution, so as to provide a better understanding and suggestions of urban planning. There are three objectives in this study including: (1) observing and measuring the relationships between commercial retail network and urban morphology quantitatively; (2)

analyzing the mechanism of commercial retail network distribution; (3) providing implications and guidance for future urban planning. The outcomes can be shared within and beyond the borders of China in order to optimize the urban land use distribution and the efficiency of commercial retail network.

The remainder of this paper is organized as follows: Section 2 reviews the related literature and studies; Section 3 introduces the method and data used in this study; Section 4 presents the basic distribution characteristic information of case study area, Guangzhou, from three dimensions in urban morphology: site agglomeration degree, population agglomeration degree and the map of consumption level; Section 5 investigates the driving mechanism of commercial retail facilities distribution, including urban planning driver, policy trigger and pushing force, inner impetus, cohesion force, etc., in order to reveal and explain the general law of distribution. Section 6 draws conclusions and discusses the implications of these policies.

2 Literature review

Spatial distribution of urban commercial retail facilities is one of the main research objects in commercial geography. The methods and perspectives in the research has been progressing. Researches focus on perspectives including the interaction models between customer behavior and commercial space theoretically (Reilly, 1931; Converse, 1949; Huff, 1964; Wilson, 1970; Rushton, 1969), and distribution characteristics from a social-economics perspective (Davies, 1977; Potter, 1982). The research methods of spatial distribution and clustering of commercial networks from a perspective of customer behavior has a matter of concern in China (WANG De, 2013, 2001; HAN Huiran, et al 2011; ZHUWei, 2010). Kernel density, standard deviational ellipse and Ripley's $K(r)$ function, etc. are the usual methods to analyze the inner space structure of commercial facilities (ZHANG Xun, et al 2013). The research is mainly based on the traditional data set including national economic census and questionnaires. It cannot reflect directly the comments of customers, and the results cannot be updated in time since the investigation usually takes a long time.

Recently, the utilization of open source and half-open source data have become an possible data set to study the distribution of commercial space. Some researchers took trials to develop new data set and study methods. Based on the catering data mining from Public Comments, the distribution of the catering industry is studied through kernel density and comprehensive assessment (QING Xiao, et al. 2014). The existence of hierarchy structure of commercial districts in the center system was proved in an empirical study of Shanghai based on mobile phone signaling data (WANG De, et al. 2015). Two commercial centers in Shenzhen were recognized through floating car GPS data (ZHOU Suhong, et al. 2014). Therefore, various information can be found in multi-source data from the internet. Data mining from the internet may be the most direct way to evaluate the distribution of commercial retail networks, and this data could best reflect information relating to customers' behavior.

3 Date and methods

3.1 Data source and database construction

This study uses at least four kinds of data sets in addition to traditional data, including merchant data from Public Comment, Point of Interest (POI) data from Baidu and data from Mapbox and Baidu Heat Map.

The first data set comes from Public Comments: the most popular lifestyle information and trading platform. It supplies merchant information, consumption comments, preferential activity, and O2O trading serves. It covers many fields including catering, shopping, recreation, etc. It has been reported that the transaction volume in Public Comment ranked first in the past six months in the Market Research Report of Chinese Commercial Service

Industry. Thus the data from Public Comment could well represent the current utilization of local commercial services. Catering has the most contributors among all the categories in Public Comments, as the catering service in Public Comments is most commonly used, and it shows similar distribution with the other retailing categories (QING Xiao, et al. 2014). Therefore, we use catering data from Public Comments to explore the distribution of commercial retail network in Guangzhou.

There are 140249 pieces of Guangzhou catering data from Public Comment till 10th April, 2016. We surveyed data ranked in top of 6% in every administrative district as valid samples, since the other merchant data lack enough customers' attention, and they can be thought as very small or unstable shops. Then there are 8415 pieces of data all over the city collected via crawler technology. All the data is cleaned and then interpreted through the address coding module of Javascript API from Baidu Map, according to the business addresses in Public Comment.

The second data set is Baidu POI (Point of Interests). The Fourth Quarter Financial Report in 2016 reveals that, the amount of commercial category of POI has reached 20,000,000, making Baidu the most completed POI map data set. The POI data covers all the categories of sites, and the information of each point includes name, category, longitude and latitude.

The third data comes from Baidu Heat Map. Through the position signal of the cell-phone of Baidu Map users from the base station, the number of users in the area can be counted, and then the dynamic map can be rendered automatically every minute in Baidu map background processing. The amount of Baidu Map users in each month has reached 30 billion in China by November, 2015. Therefore the samples in the Baidu Map could reflect universal customers' behaviors. We chose the maps 17:30pm-20:30pm in working days and maps 12:00am-20:00pm from 16th May to 22nd May in weekends to observe the population distribution around Guangzhou.

An urban-wide spatial database is established based on GIS (Geographic Information System), including basic socio-economic data and map data such as road network and metro network. Socio-economic data comes from the 2015 Statistical Yearbook of Guangzhou City, and map data comes from the Open Street Map data (OSM, 2014).

3.2 Study method

Kernel, which is a method to calculate the elements density around, is generally utilized in spatial analysis as a kind of non-parametric estimation method. It focus on the location of certain point, distributed the attributes within the specified distance threshold value ($Rad=h$). The density decays from the biggest value in the center to 0 at the surrounding areas (Silverman, 1986). The decaying method depends on the Kernel function.

Assume x_1, x_2, \dots, x_n are independent samples extracted from distribution density function f , the value of f at x is $f(x)$, then

$$f_x(x) = \frac{1}{nh} \sum_{i=1}^n k\left(\frac{x-x_i}{h}\right)$$

$K(*)$ is the Kernel Function; $h>0$ is the width; $x-x_i$ is the distance from x to sample x_i .

In order to reflect the distribution of commercial facilities accurately, we choose 500m as the proper distance threshold value according to several trials, and analyze the site agglomeration degree, population agglomeration degree and the level of consumption.

4 Distribution characteristic of the retail and catering industry in Guangzhou

Guangzhou city is the third biggest city in China. The land area is 3843 square kilometers and the permanent population in 2014 is 11,390,000. There are 11 districts in Guangzhou. The central city consists of Liwan District, Yuexiu District, Haizhu District, Tianhe District, part of Baiyun District, part of Panyu District and part of Huangpu District. And the other part of districts constitute the suburb. The land area and population density in each district can be read in fig.1 and fig.2. And the construction status of commercial retail network is shown in fig.3.

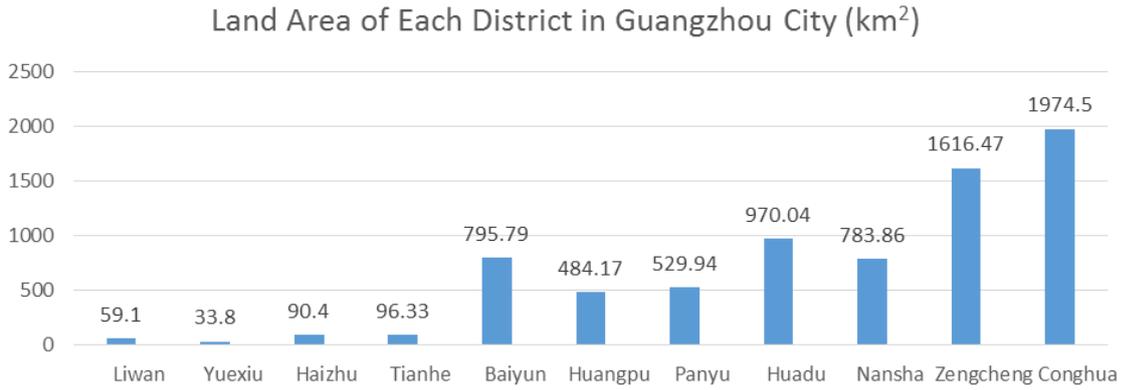


Figure 1: Land Area of Each District in Guangzhou City

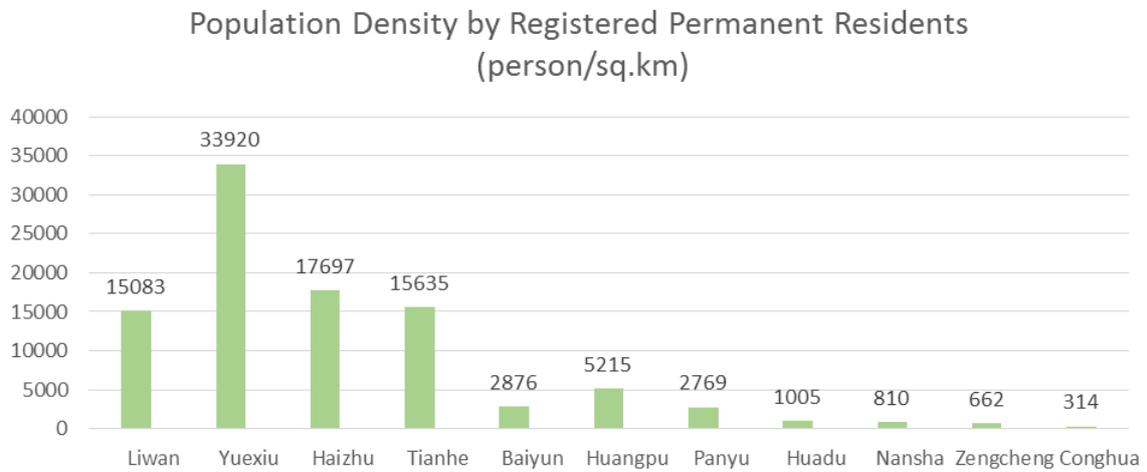


Figure 2: Population density by Registered Permanent Residents

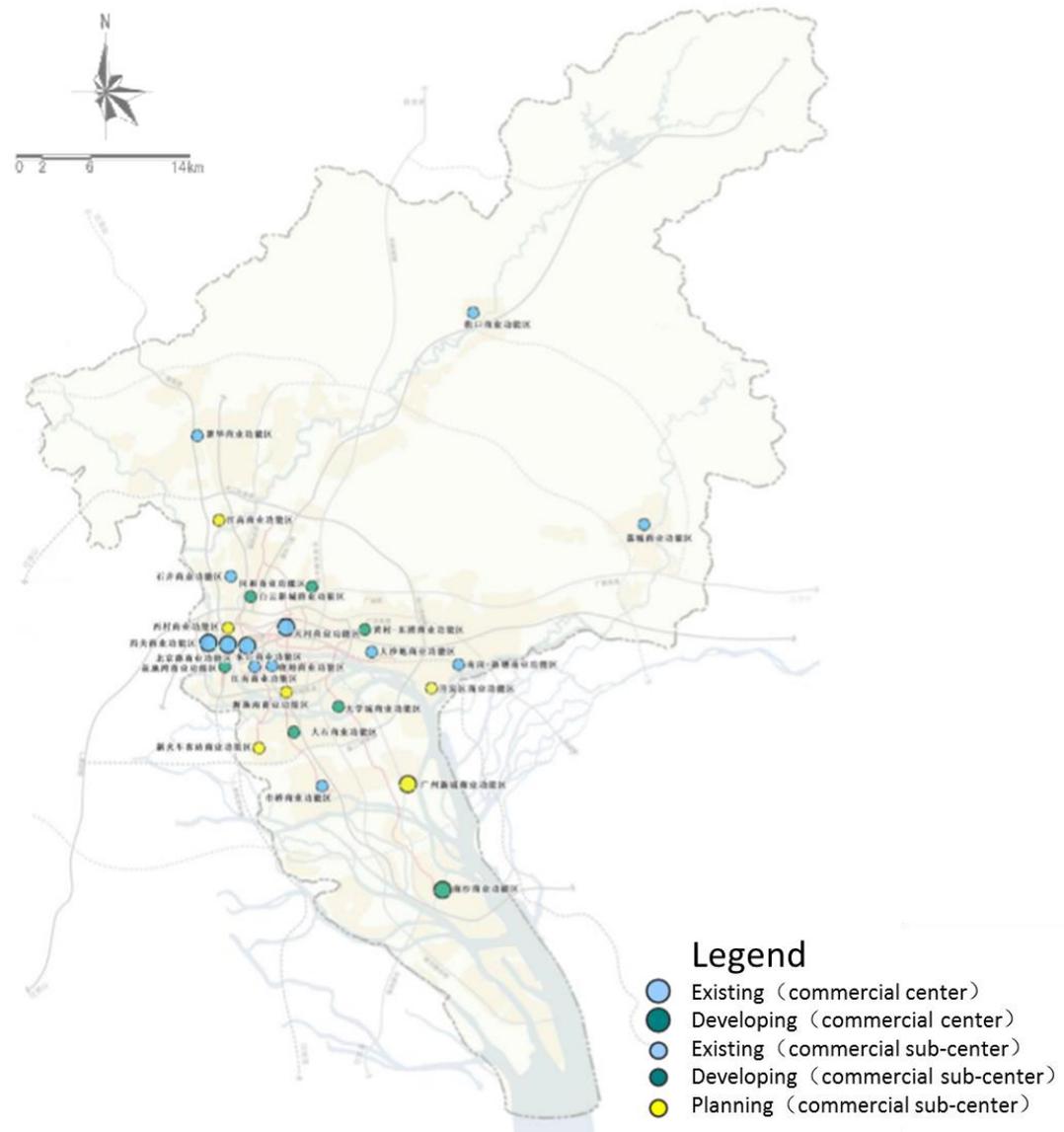


Figure 3: Construction Status of Commercial Retail Network

4.1 Site Agglomeration Degree

Based on 8415 pieces of merchant information, we analyzed the distribution of shops and canteens in Guangzhou using the Kernel method. The hierarchical organization of commercial retail network can be identified easily in the fig. 4. The strongest commercial centers are located in the central town, and secondary-class commercial centers are located in the center of each municipal district. The map shows that a multi-center hierarchical urban structure has been established. We classified these commercial retail space into three ranks according to the magnitude of Kernel value. And the strength of the commercial center generally coincides with the urban construction degree.

The commercial centrality implies the degree of urbanization. Generally speaking, equal access to commercial facilities represents high urbanization, and the higher the site agglomeration degree is, the more the urbanized this area is.

Two extremely strong-value areas in the central town, one of which matches with the traditional impression of existing new city center, can be distinguished clearly on the map. But another one, Changgang, with very strong value can be also distinguished in the west of Haizhu District. That is not perceived as a city center in urban planning nor in people's cognition. However, the agglomeration degree of old city center, which is around Gongyuanqian, is much lower than that of Sport Center and Changgang. The result is out of

expectation, as Gongyuanqian is the city center in the old town in the planning. Another extreme example is the weak commercial space illustrated on the map in Nansha District, which was one of the National Open Economic Zone with the high attention of the government. This district was intensively developed with a huge settlement more than 20 years ago. However, the area with low Site Agglomeration Degree and Population Agglomeration Degree shows that the development is much slower than the expectation, and very fewer new residents lives in this district, although plenty of properties in this district has been sold out already. These two examples demonstrate how the real intensity of commercial network could grow beyond the purpose of urban planning and people's cognition.

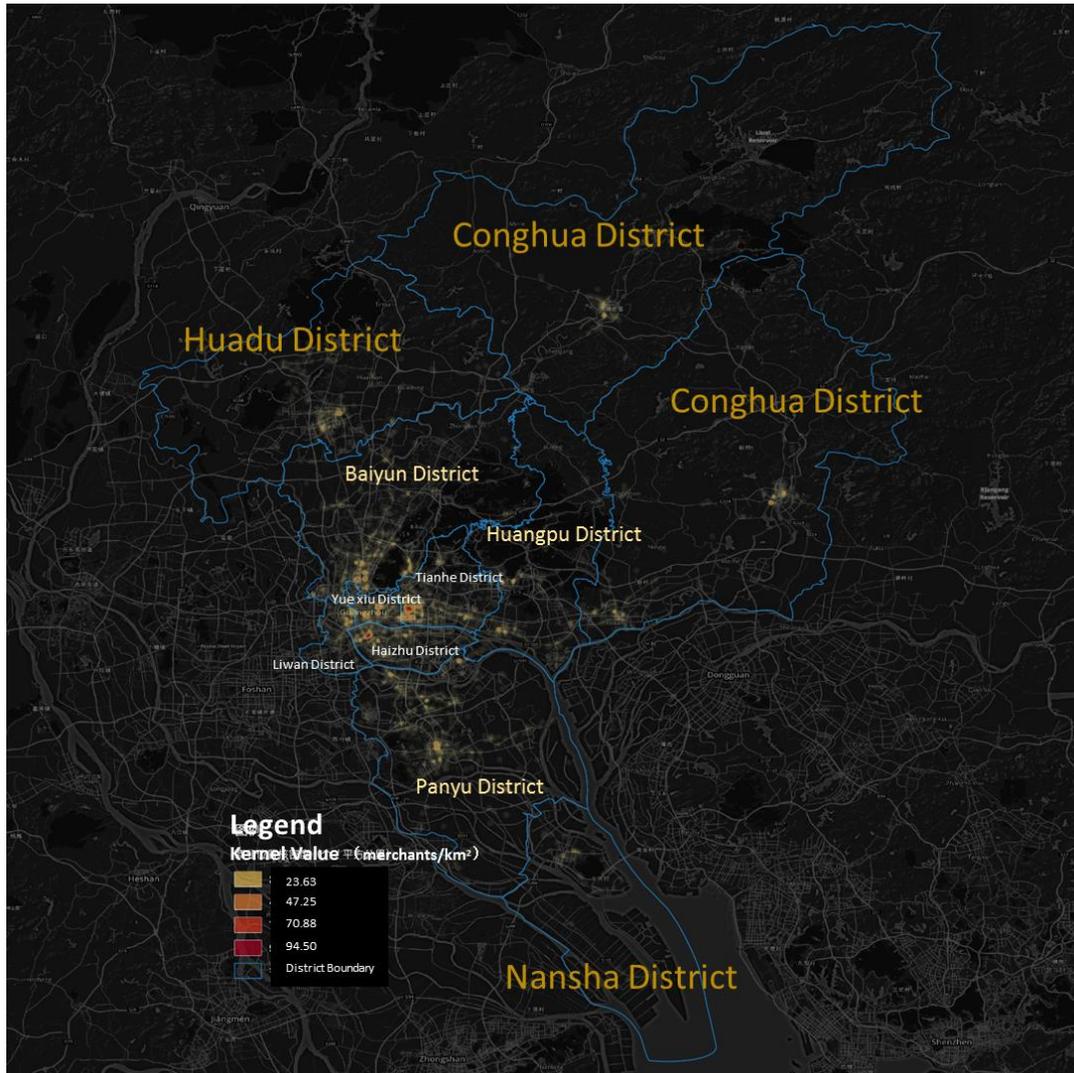


Figure 4: Site Agglomeration Degree of Commercial Retail Network in Guangzhou City

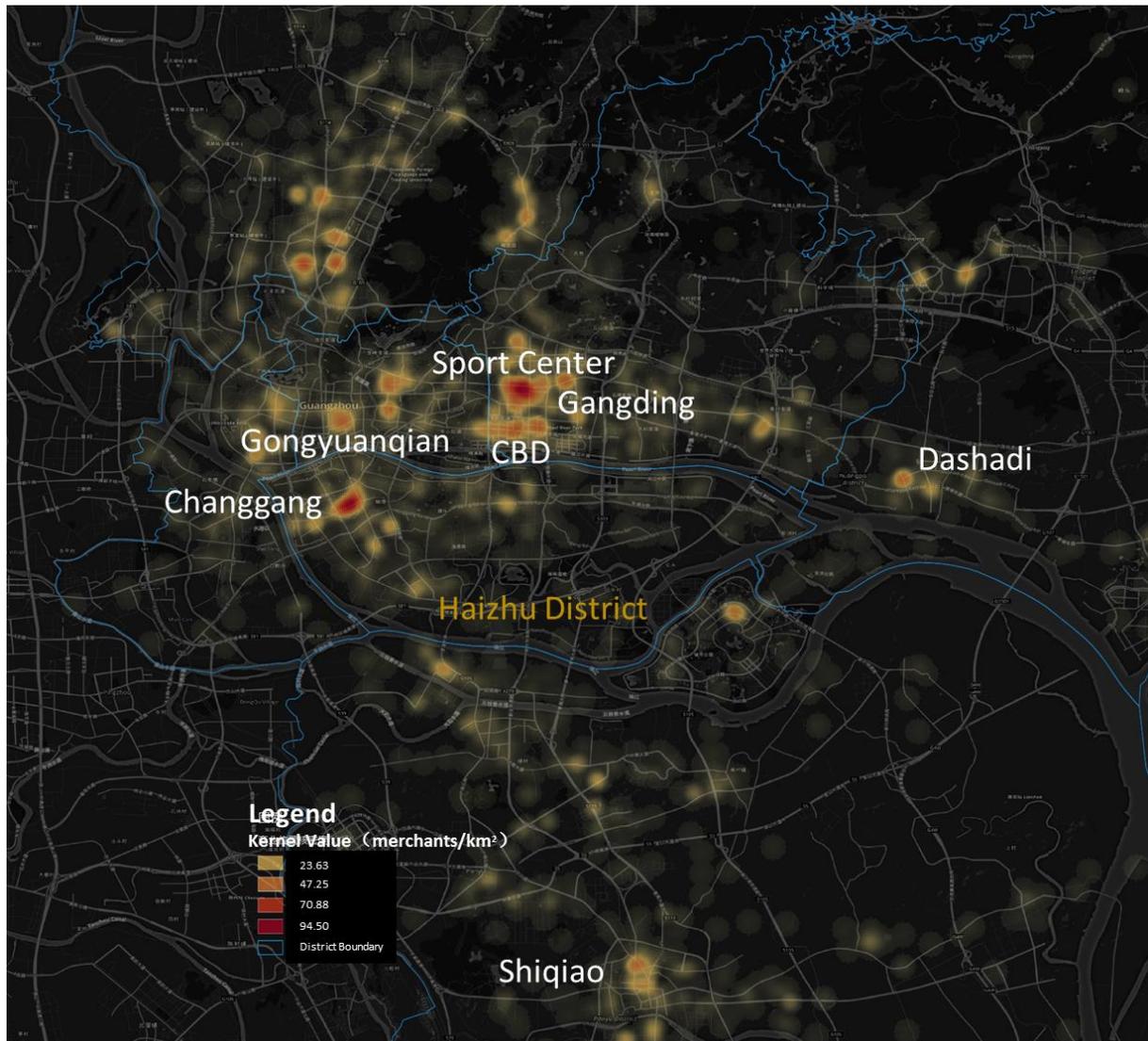


Figure : Site Agglomeration Degree of Commercial Retail Network in central city of Guangzhou

4.2 Population Agglomeration Degree

Practical attraction to the people can be assessed by the Baidu Heat Map. We got the average value of 350 Baidu Heat Maps and made it into a new map to illustrate how much people utilize the commercial facilities (fig.6). It is found that the population agglomeration degree of commercial retail network does not entirely match the site agglomeration degree. Apart from some specialized markets, the first three commercial area with highest population agglomeration degree in leisure time are Gangding, Sport Center and Gongyuanqian.

The high value of sub-centers in agglomeration degree does not present the similar intensity of population agglomeration degree. On one hand, the commercial retail space with high site agglomeration degree does not always represent high popular agglomeration degree. For instance, it exists in Shiqiao of Panyu District and Dashadi in Huangpu District, both of which have a similar value of site agglomeration degree and similar function in their own district, but the population agglomeration degree of Shiqiao is much higher than that of Dashadi. That means the efficiency of Shiqiao commercial space is much higher than Dashadi. On the other hand, the main centers shows obvious polarization phenomena, which means that the attraction and utilization of the main centers is much stronger than the other sub-centers.

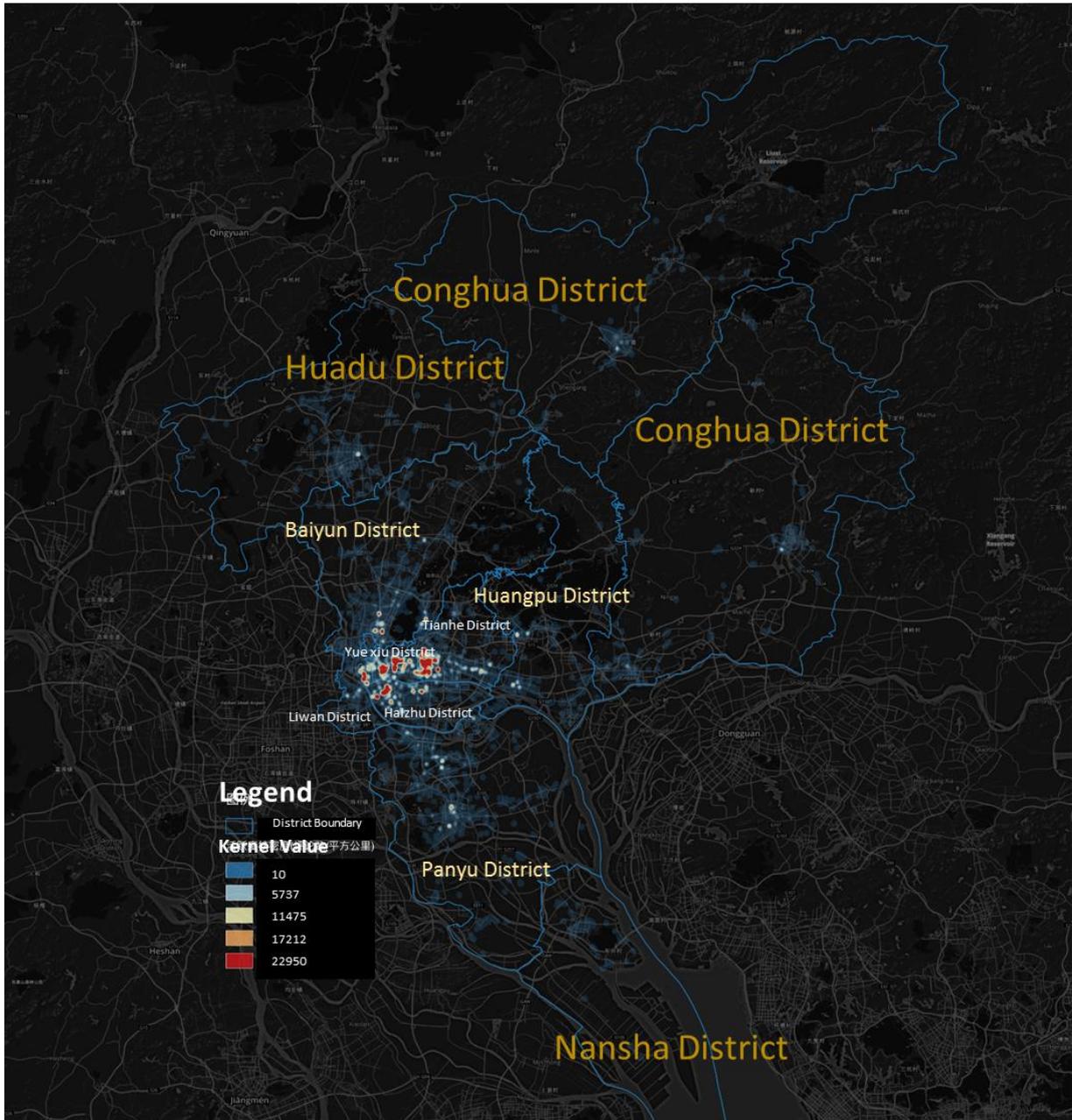


Figure 6: Population Agglomeration Degree of Commercial Retail Network in Guangzhou city

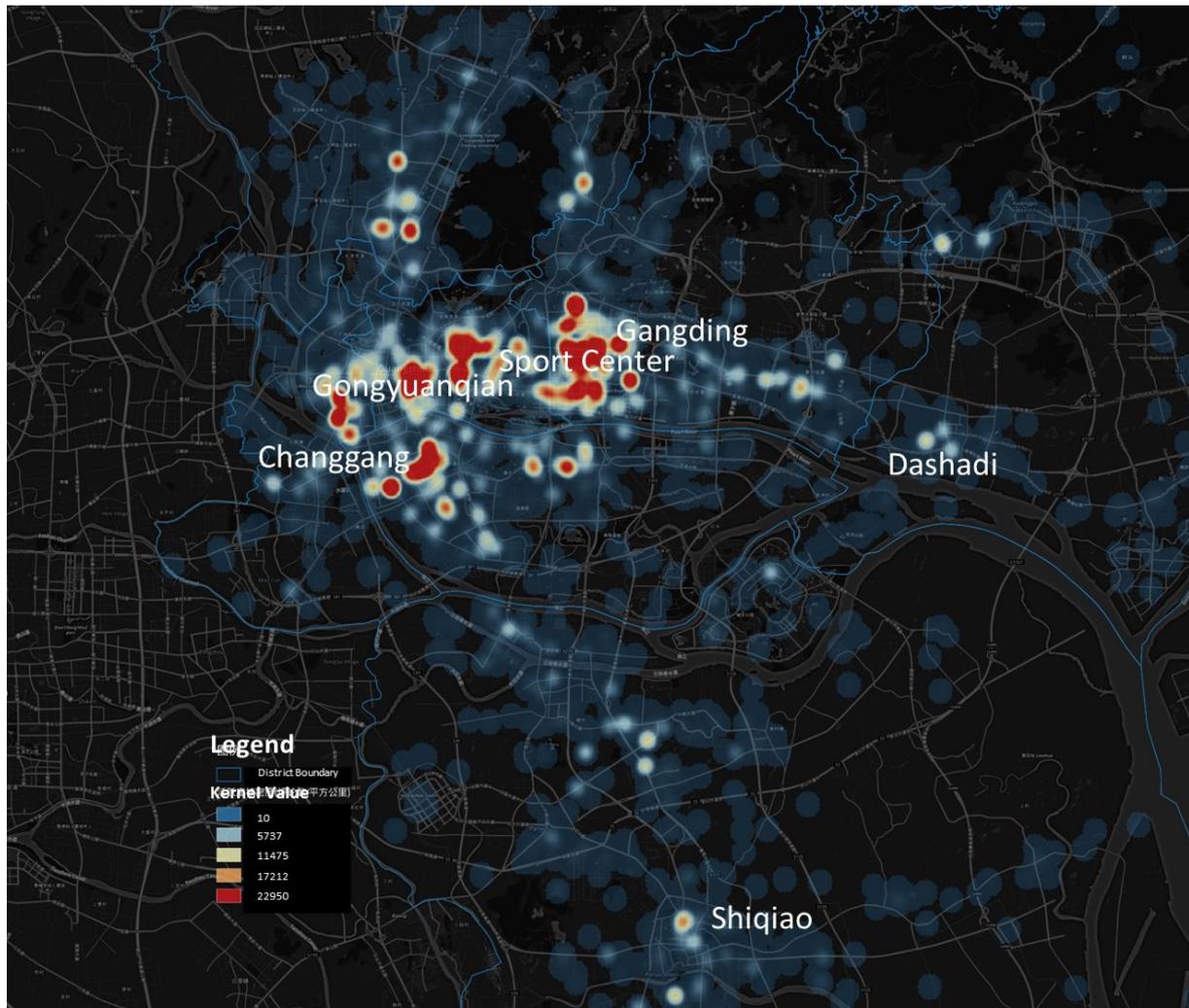


Figure : Population Agglomeration Degree of Commercial Retail Network in central city of Guangzhou

4.3 Consumption Level

The map of consumption level comes from the data of personal consumption prices in Public Comments. It reveals the consumption class of commercial areas. Service in CBD is the best and the average price of products there is the most expensive, and the secondary one is Sport Center. Both of them suggest that the new city center is the area of higher consumption. On the contrary, the consumption level of the city center in old town is much lower, although it has a high site agglomeration degree and population agglomeration degree. This reveals consumption habit differences from people in new town and old town. People around new town center prefer higher quality products and service.

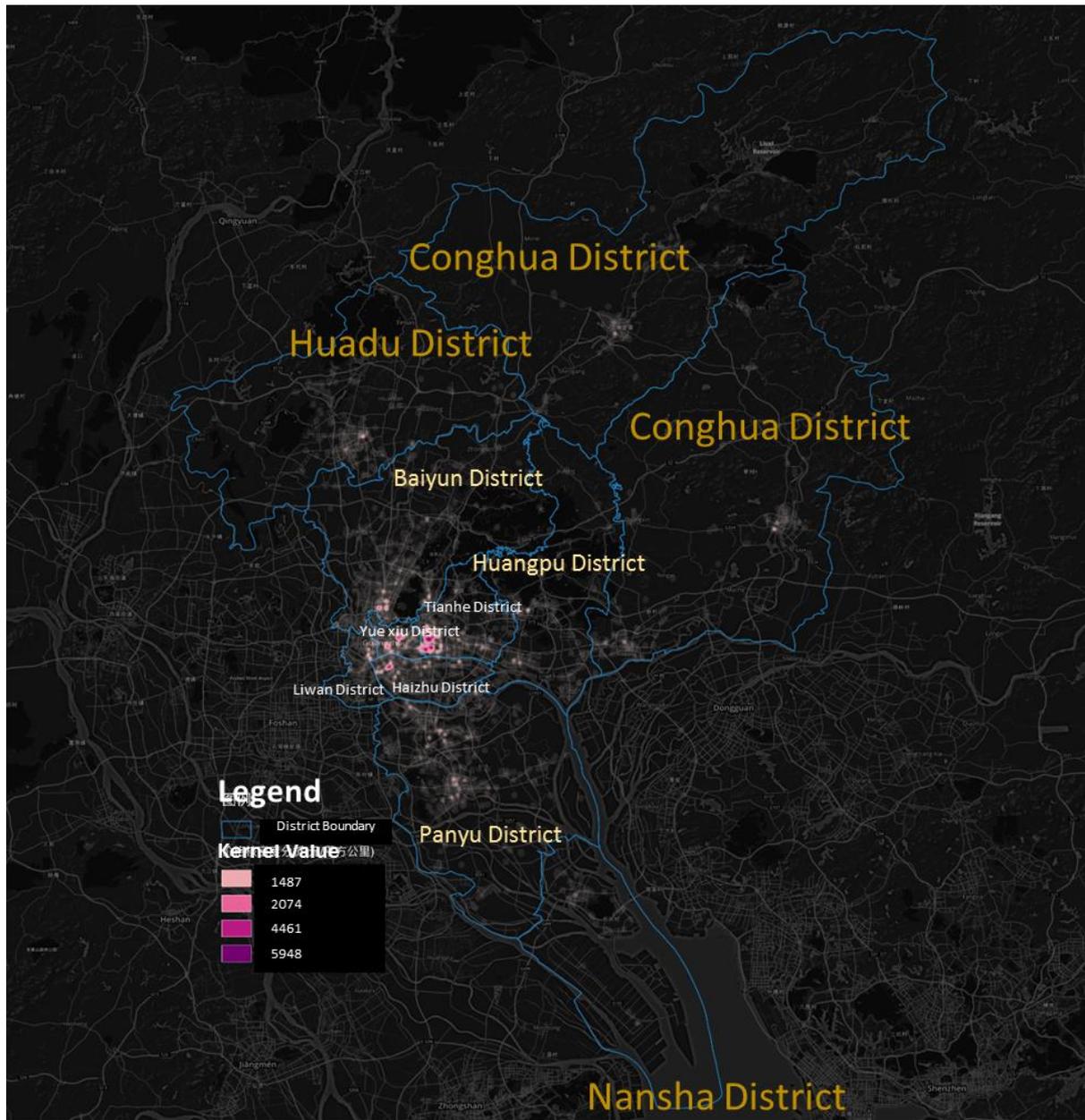


Figure 8: Consumption Level of Commercial Retail Network in Guangzhou city

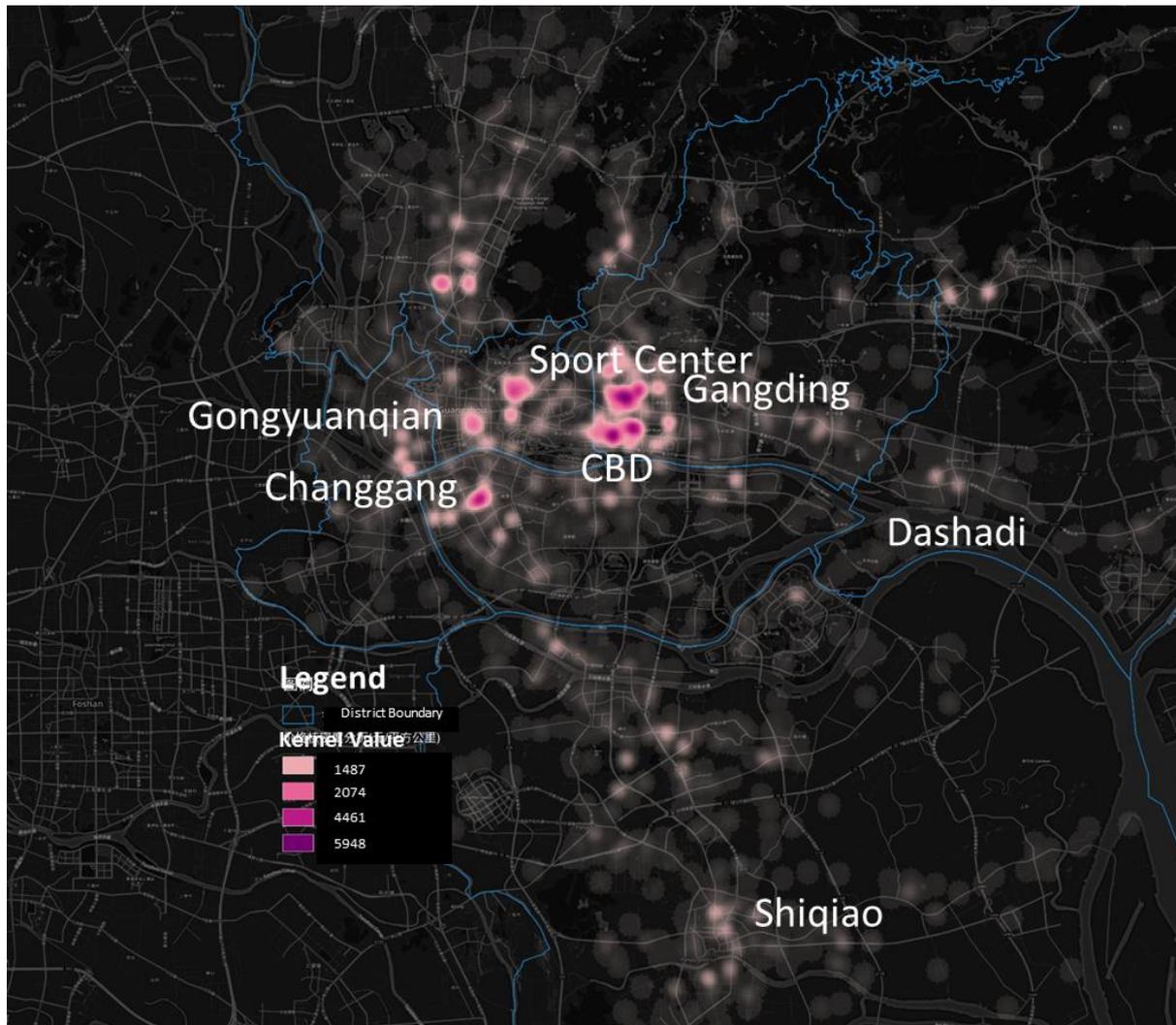


Figure : Consumption Level of Commercial Retail Network in central city of Guangzhou

5 Implications discussions

.1 Urban planning driver

Urban planning is the most important factor to reflect the form of commercial retail network. We compared master plans of Guangzhou in different periods (Fig. 10). Most of them appear highly relevant to the practical construction, especially in the period with good macro social-economic environment.



Figure 10: Master plans and stratigic plans from 1 4 to 2016



Figure 11: The 4th version of master plan in 1 4



Figure 12: The 11th version of master plan in 1 64

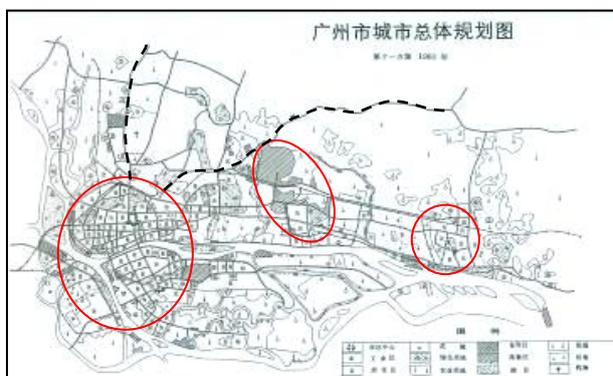


Figure 13: Master plan in 1 84

11 versions of master plans were made during 1954-1964. Lands in existing town and new town in the future had been well planned according to classical planning theory in the master plan in 1954. But the scenario has not been complemented in the end. The practical development could be divided into two phases. In phrase 1 from 1953 to 1957, the local government intends to repair the destroyed city caused by the Second World War, while the outlay of city before the war generally remained. In phrase 2 from 1958 to 1964, the macro policy promoted industry construction, so lots of industrial districts emerged in the urban periphery, but the construction of housings and commercial areas still stayed in the old town. But the version in 1964 has not been well complemented because of the political crisis in that time.

The version in 1984 planned three clusters from west to east. Three new districts, (Tianhe District, Fangcun District and Huangpu District), were established since then. The 6th National Game triggered the planning and construction to the east. The construction of housing during 80s and 90s was mainly in Tianhe District. And the initial commercial space in Sport Center appeared in this period.

Most of current commercial retail network has been established according to the version in 2006.

The recent version is the comprehensive plan in 2016 which was just approved by the State Department in February 2016. It took a long time to get the approval. But the main scenario in this version was generally realized according to this version. The site agglomeration distribution of commercial retail network in our study generally matches this version.

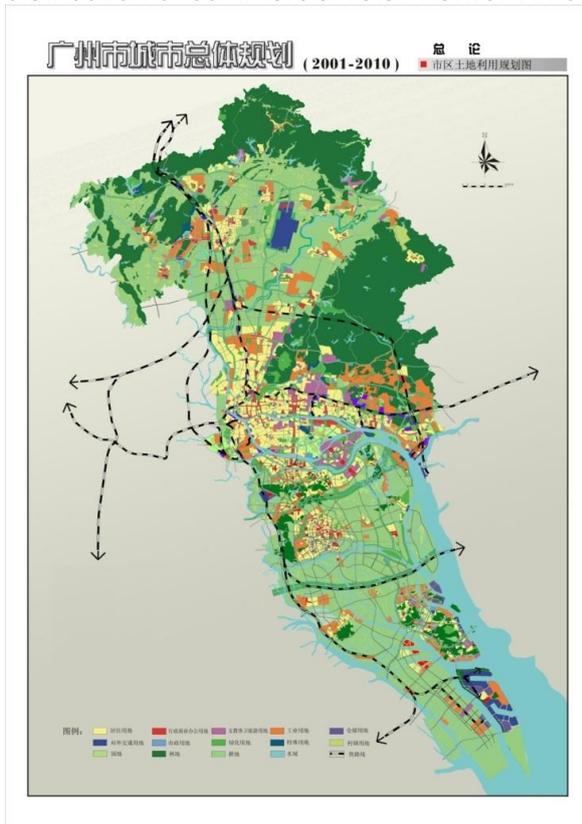


Figure 14: master plan in 2006

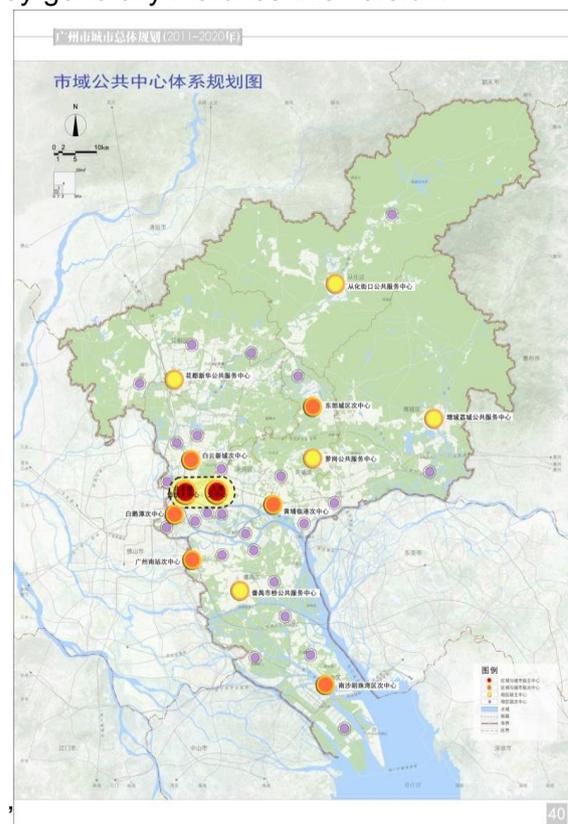


Figure 1 : master plan in 2016

.2 Policy Trigger And Pushing Force

The future of urban planning matches the scenario suggested by experts and local government, policy will be the initial factor in development and will be the main force behind investment. The planning was not always implemented until the policy trigger appears, which could be proved by the master plans during 1954-1964. Generally speaking, macro policy is the main trigger of development of new towns in China, as it creates new centers from blank spaces, and pushes new investment on these area intensively. The longer the policy continues, the better the area is developed. The 6th National Games in 1987 provided a

direct reason to develop the Sport Center from vast farm land to an urban built area. Then Sport Center area was upgraded to become the new city center over the course of two decades. Till now, the local government still insists on the development of this area. Sport Center area has been strengthened continually when the new CBD in adjacent block was built in 2010. The new city center is continually expanding because of decisions by the local government in these years. When the financial center and cluster of internet headquarters, are built in the near future, just to the east of CBD, it is uncertain what will happen.



Figure 16: Flower s uare in CBD

.3 Inner impetus

We extracted the distribution of other site data via Baidu POI, and counted relevant facilities respectively within 500 meters around each above-scale commercial district. Based on the distribution of commercial area and other relevant site categories which include the metro stations, office buildings, housings and gardens, it is possible to evaluate how well the commercial retail network is coupling with the other kinds of facilities.

Applying Linear Regression via SPSS, with the utilization of metro stations, office buildings, housings and gardens as explanatory variables respectively, the correlation of each site category on commercial retail network is evaluated and the result is listed in Table 1.

The result indicates, the correlation is decreasing from metro stations to housings. Metro stations represented an obvious positive correlation with commercial retail network. The development of commercial districts relies heavily on public transportation accessibility. Office building is a secondary factor affecting the commercial retail network. It helps to attract quality customers. And garden shows weak positive correlation with the commercial retail network. However, housing represents negative correlation with above-scale commercial districts.

We also divided these above-scale commercial districts into Central Town Commercial Districts and Suburban Commercial Districts according to their locations. This was supposed to show different correlation between these two kinds, but the result, as shown in Table 2 suggests very little difference in these variables. The factor of the metro station did represent weak correlation, as the metro network is not well formed in the suburbs. This result implies the location of above-scale commercial spaces may not always depend on the location in central town. And it could be also proved by examples in some big Chinese cities. The commercial center in the suburbs of Licang District has developed to become the third biggest commercial center in Qing Dao City.

Due to the distribution of residuals, the clustering of over and under prediction values shows that there are still other explanatory variables that were ignored in the model. In reality, there should be many location factors affecting the distribution of commercial retail network, e.g. the distribution of culture facilities, recreation facilities, medical and sports facilities. Because of this, we will check the other possible indicators in the next step.

According to the distribution of coefficient, coherence between commercial retail network and public transportation accessibility in each ring is weaker and weaker from the center to the suburbs. The central city represents high coherence with metro stations, especially in the new city center.

Table 1: Estimation results of correlation between commercial area and other factors.

Model	B	S.E.	t	Sig.
constant	44.633			.004
Housing	-.087	.554	-.157	.876
Garden	1.501	2.783	.540	.594
Metro Stations	26.342*	14.117	1.866	.073
Office Building	2.566	1.709	1.501	.145

Table 2: Estimation results of correlation between commercial area and other factors in Central Town and suburbs.

		Central Town		Suburbs	
		B	Sig.	B	Sig.
Housing		-0.25	0.783	-0.414	0.550
Garden		3.583	0.663	2.852	0.257
Metro Station		47.771	0.146	2.474	0.797
Office Building		2.926	0.326	3.586	0.098
constant		31.710	0.484	50.663	0.000

.4 Cohesion force

It is obvious that the polarization effect happens when the size of the commercial space reaches a certain level. On one hand, the area of commercial space is expanding. The new city center has continued enlarging over the past 40 years, and new shopping malls still emerge in the city center. When the area Sports Center and Gangding became one of biggest commercial area, more and more shopping malls chose to locate in this area with the development of Tianhe District. Now the Tianhe commercial district has expanded to be nearly 3 square kilometers including the Sport Center, Zhujiang New Town, Gangding and North Tianhe. And the total commercial area of shopping centers in this district has reached up to over 2,000,000 square meters. In the future, when financial center and cluster of internet headquarters will be built, the commercial space in the area will go on expanding. On the other hand, similar classes of shops and canteens accumulate. We analyze the consumption level in each commercial district, based on the data of consumption price from Public Comments. The map of consumption level implies the distribution of commercial space class. And it shows high-mid class commercial space clusters in the new city center. Actually, the high class shopping mall in the old town declined and moved to the new city center in recent years.

6 Conclusion and discussion

Guangzhou is one of the typical mega-cities of China, and the experience of commercial space development is quite meaningful for the other developing countries. This study employed exploratory spatial data analysis to identify the distribution of commercial retail network and the drivers based on multi-source data, applied agglomeration degree to measure the distribution, and finally analyzed how the factors impacted the distribution of the commercial retail network. Based on the analysis in this study, some points were recommended for urban planning, especially commercial retail network plan.

Firstly, from the study method aspect, this study tentatively utilized data captured from half-open source internet via some simple programming (e.g. Public Comments, Baidu Heat Map, Baidu POI). In the future, more and more quantitative researches on urban planning are necessary for integrating land use and its practical effects. For this sake, we try to construct a database to assess the commercial districts. The traditional method of getting the information on different sites, takes a long time to investigate and the statistical data may not

reflect sufficient or real-time situation. This pilot would be helpful to feedback the survey and collect sufficient and real-time data in a short time.

Secondly, this study analyzed the force factors to form the commercial retail network. Public transportation accessibility is the most important factor to the commercial area, especially that the metro accessibility strongly supports commercial centers in the central town. Office building is the secondary factor affecting the commercial retail network. It helps to supply steady customer flow. Garden may have more positive effects to the commercial area in central town than in suburbs, while the coloration between garden and commercial area is not very strong. However, housing is not very popular to the above-scale commercial centers.

Thirdly, this study focused on Guangzhou which is a typical mega-city in China. We can expect to be able to generalize the experience to other cities in other developing countries. The government dominates the direction of urban development, and urban planning decides the land-use in the development. While the inner impetus and cohesion force, such as location, public transportation accessibility, land-use and the cluster effect of commercial spaces, eg. strongly impact on the status of commercial retail network.

However, it is important to fit the features of cities. For instance, sustainable policy force from local government is very important to develop a fine commercial retail network, but it is only suitable to a city with a strong government. In addition, some experiences may only fit the mega cities. For the medium-sized or small cities, without railways or new town areas, some inner impetus and policy push may not exist.

Acknowledgements:

Grateful thanks to the mentor, Slawomir Ledwon, who gave lots of constructive suggestions to improve this paper. His efforts is sincerely appreciated.

References:

- Zhang, Wenzhong, Li, Jinye(2006) Study on Residents' Shopping Location Preference and Shopping Location Choice. *Acta Geographica Sinica*, 61(10): 1037-1045.
- Feng, Jian, Chen, Xiuxin, Lan, Zongmin(2007) The Evolution of Spatial Structure of Shopping Behaviors of Beijing's Residents. *Acta Geographica Sinica*, 62(10): 1083-1096.
- Chai, Yanwei, Weng, Guilan, Shen, Hao(2008) A Study on Commercial Structure of Shanghai Based on Residents' Shopping Behavior. *Geographical Research*, 27(4), 894-906.
- Chai, Yanwei, etc. (2010). *Urban Space and Residents' Shopping Behavior*, Nanjing, Publishing House of Southeast University.
- Zhou, Suhong, Lin, Geng, Yan, Xiaopei(2008) The Relationship among Consumer's Travel Behavior, Urban Commercial and Residential Spatial Structure in Guangzhou, China. *Acta Geographica Sinica*, 63(4), 395-404.
- Wang, De, Li Guangde, Zhu, Wei, Wang, etc. Lingyun(2013) Establishment and Application of Consumers' Behavior Model in Guanqian Commercial Street, Suzhou. *City Planning Review*, 37, 28-33.
- Zhang, Xun, Zhong, Ershun, Zhang, Xiaohu, etc. (2013) Spatial Distribution and Clustering of Commercial Network in Beijing during 2004-2008. *Progress in Geography*, 32, 1207-1215.
- Qing, Xiao, Zhen Feng, Zhu Shoujia, etc. (2014) Spatial Pattern of Catering Industry in Nanjing Urban Area Based on the Degree of Public Praise from Internet: A Case Study of Dianping.com. 34(7), 810-817.

Wang, De, Wang, Can, Xie, Dongcan, etc. (2015) Comparison of Retail Trade Areas of Retail Centers with Different Hierarchical Levels: A Case Study of East Nanjing Road, Wujiaochang, Anshan Road in Shanghai. *Urban Planning Forum*. 223(3), 50-60.

Zhou, Suhong, He, Xinhua, Liu Lin(2014) Validation of Spatial Decay Law Caused by Urban Commercial Center's Mutual Attraction in Polycentric City: Spatiotemporal Data Mining of Floating Cars' GPS Data in Shenzhen. 69(12), 1810-1820.

Endnote:

ⁱ We used individual pieces of data for each merchant. So every pieces of data for each restaurant in shopping malls were collected and were counted as an individual sample data.

ⁱⁱ The agglomeration degree of Sport center, Changgang and Gongyuanqian respectively is between 70.88-94.50, 70.88-94.50 and 23.63-47.25.

ⁱⁱⁱ The population agglomeration degree is re-rendered according to the mean value of 350 Baidu Maps, which were rendered 17:30pm-20:30pm in working days and 12:00am-20:00pm from 16th May to 22nd May in weekends.

^{iv} Tianhe District was established and divided from suburbs in 1985, for the preparation of the 6th National Game in 1987. Actually, most of the development of land depends on the decision of local government, as all the land-ownership belongs to the state in China, and only the land-use right during a certain period can be remised to the other stakeholders via land auction system. The local governments control the development through land auction plan and urban planning.

^v Licang District has the third biggest commercial area among 8 districts and 4 county-level city in Qingdao City. It has been thousands of years since the settlement was formed in this district, although it has been suburbs of Qingdao city due to the historical reasons.

The Role Big Data Plays in the Construction of Smart City: A Case Study in Shanghai

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Abstract

Smart city construction is a good solution to Chinese city problems in the context of globalization. The paper introduces how Big Data influences the construction of smart city and analyzes the role Big Data plays in the process of smart city construction in Shanghai through a case study.

1 Introduction

The construction of smart city is one of the objectives of China's national Planning in recent five years. The paper first introduces the construction of smart cities in China, then compare smart city construction processes in six Chinese cities including Beijing, Shanghai, Shenzhen, Guangzhou, Hong Kong and Taipei. Then the paper analyses the role Big Data plays in the process of urban planning, and illustrates it with a case study in Shanghai. In the last part the paper concludes.

2 The Construction of Smart Cities in China

2.1 The Spatial Distribution of China's Smart Cities

The total number of the first batch of pilot cities that Chinese Housing Construction Department announced in January 2013 is 90, including 37 prefecture level cities, 50 counties and 3 towns. The total number of the second batch of pilot cities is 103, which is announced in August 2013. Its spatial distribution has the following characteristics:

- (1) The smart cities groups of eastern region have been taken shape, and the characteristics of spatial concentration are obvious.

This region has irreplaceable advantages in terms of technology and talent. After the development in recent years, information industry and information network construction has had a considerable scale. Also, the local government attaches great importance to information construction and provides a relaxed environment for the industry. In China, the earliest cities that began the construction of smart cities are located in the traditional economic developed regions, such as Ningbo and Shanghai.

- (2) The distribution of smart cities in the Midwest is according to point to an area.

The trend of the rise of the central region is very obvious. The number of the pilot smart cities in places like Hunan, Hubei, Anhui and Henan has great trend to catch up with the east coastal economic developed region, which shows that the construction of smart cities is not limited in coastal economically developed regions. At the same time, the driving effect that the big cities can bring to small and medium-sized cities is also very obvious.

2.2 Smart Cities Construction Policy in China

China's national 12th five-year plan is set according to the objective requirements of China's economic and social development. Smart cities construction mainly including three platforms i.e. the smart cities digital application platform, the smart cities management platform and the smart cities public service platform is a kind of technical support means for the construction content which is mentioned in the China's national 12th five-year plan.

2.3 The Mode of Smart Cities Projects in China

At present, China's smart cities construction and operation of investment models include three kinds as followings: governments invest and operate the smart cities, and the enterprises participate in the construction; governments and enterprises construct and manage smart cities together through joint venture; enterprises construct and operate smart cities, and governments and the public purchase services.

(1) Governments invest and operate the smart cities, and the enterprises participate in the construction.

The operation mode led by governments is that government will pay for the construction and operation. For example, in 2012, Wuxi set aside 200 million yuan each year as special funds for the Internet of things, and district financial departments provide funds. At the same time, the Ministry of Industry and Information Technology has allocated 5 million special funds to support the development of the Internet of things.

(2) Governments and enterprises construct and manage smart cities together through joint venture.

The mode that governments and enterprises construct and manage smart cities together through joint venture is mainly applicable for partial fields of construction that do not reach the national security and public interest. This mode lets the construction make full use of the social capital. One typical practice is that the Shanghai municipal government signed "*The Cooperation Framework Agreement to Build a Smart City*" with China Mobile Company. Governments make general guidance and enterprises invest and construct smart cities.

(3) Enterprises construct and operate smart cities, and governments and the public purchase services.

For some public service fields, the mode that enterprises operate smart cities and the public purchases the services is also worth recommending. This type of mode is a conservation of government resources.

2.4 The Development Trends of Smart Cities Construction in China

At present, China has four national Third-Party Alliances, including the China Smart Cities Industry Alliance, the National Smart Cities Industry Technology Innovation Strategic Alliance, China's Smart Cities Planning and Construction Promotion Alliance and China's Smart cities Development Promotion Work Alliance.

The finance capital supports the construction of smart cities. The smart cities market is also increasingly favored by the financial capital, and it has caused a wave of speculation for

many times. In the A-share market, the part of “smart cities” that related to national policies would increase a lot after the announcement of some policies or after the pilot. The amount of investment of smart cities is about two trillion according to the estimate, which reached a half of the amount of the country's investment in 2008.

The construction of smart cities will move to undeveloped regions. The construction of smart cities is not only limited in eastern coastal developed regions, but also it begins to move to undeveloped regions gradually, which is very useful to narrow the digital divide between the regions and to improve the current situations of unbalanced economic development of China's various regions.

The international communication about smart cities becomes increasingly frequent. The construction of smart cities is not limited in China. The China EU urbanization Partnership Forum held in 2013 identified fifteen cities to participate in the cooperation of China and Europe smart cities pilot. More and more international communication is also a new trend of the construction of smart cities in China.

3 The Comparison of Smart Cities Planning in China's First Tier Cities

Beijing, Shanghai, Guangzhou and Shenzhen are the four first tier cities which are widely recognized in the mainland of China. And Hong Kong and Taipei, which have been in the international leading position in terms of the construction of smart cities, are also the most developed cities outside the mainland in China. The author would like to study and organize the relevant planning policies of smart cities of the mentioned six cities and discuss the strategic objectives of the construction of smart cities in China and the differences in the main content.

3.1 The Comparison of Strategic Objectives

The four first tier cities in mainland China, which include Shanghai, Beijing, Guangzhou and Shenzhen, have issued relevant construction policy text of smart cities. Taipei promoted the the fifth development plan of “i-Taiwan” in 2008, and in 2011 launched the “UI-TAIPEI” and the “*Outline Plan for the Promotion of Construction of Smart Cities by Taipei Municipal Government*”. Hong Kong SAR has not issued directly relevant policy of smart cities, but in 2011, Hong Kong SAR launched the cloud computing services and standards as the strategy and direction of the Hong Kong government. As we can know from the comparison between the above mentioned cities' relevant plan texts, the smart cities construction goal of the four first tier cities in the mainland of China is inclined to promote the development of the city and the upgrading and transformation of the industry through the construction of information infrastructure. Although the public's participation and demand has been mentioned in Beijing and Shanghai, such as “Take the public demand as the center”, “Smart cities construction results will be shared by the public” etc., Hong Kong and Taipei have more description about urban public service and public participation in the policy text of smart cities through comparison. Although the relevant plans of Hong Kong SAR have been issued for a long time, they still highlight that we should promote the development of learning and culture based on

the people-oriented. Taipei also put forward “close” and “barrier free” and other planning requirements, which also highlight the needs of the public.

3.2 The Comparison of the Implementation Contents

In the implementation of smart cities content comparison, this thesis compares the contents of the implementation of smart cities planning in the six cities through the six dimensions and eighteen elements (see Chart 1 below).

Chart 1: The Comparison of the Original Urban Planning Objects

City	Planning statement	Key words
Beijing	There are infrastructure with ubiquitous broadband, intelligent integration of information technology applications and innovation and sustainable development environment. The plan, which treats the public' needs as the center, is operated efficiently and integrates information technology and urban economic and other social aspects deeply.	Public infrastructure, intelligent integration, innovation, sustainable, information technology, deep integration
Shanghai	The plan tends to promote information construction as the Shanghai innovation driving force, an important means of transformation and development and the strategic measure to cover the overall situation of modernization. It mentions that it is better to improve network broadband and intelligent application of intelligence and form a good environment for the development of urban information infrastructure. The results would be shared by the public.	Information construction, digitization, networking, intelligence, infrastructure, innovation, transformation, integration
Guangzhou	The plan mentions that there should be deeper application of information technology, extensive coverage of the information network, high concentration of intelligent technology, high-end development of intelligent economic and efficient and convenient intelligent service for the public. The city will build a number of strategic information infrastructure and intelligent management and service system. The city also needs to develop a number of intelligent industries, to break through a number of new generation of information technology, to enhance the level of application of information technology of public and to improve the security system of smart cities development.	Information construction, high-end development, security system, intelligence industry
Shenzhen	The plan shows that it will accelerate the construction of infrastructure of information and communication technology, promote the application of management and social service of smart cities and form the sustainable development and	Information construction, innovation, industrial upgrading, urban development, information infrastructure

	the industrial system of the smart cities so that city can be prosperity together with industry.	
Hong Kong	The plan shows that it is necessary to promote the digital economy, promote advanced technology, encourage innovation, develop Hong Kong as a technology cooperation and trade hub, promote a new generation of public services and promote learning and cultural development. Also, it mentions that related departments should promote public participation and continue to work with the mainland. The “Smart Hong Kong, Smart Life” new technology will promote sustainable economic development, establish the sharing and collaboration platform and provide close and integrated electronic services for the public.	science and technology, innovation, a new generation of public service, learning, public participation, cooperation, life
Taipei	The plan, which treats the ubiquitous integration services of smart cities as a spindle and “Smart cities, Preferably Life” as the vision, provides 24-hour ubiquitous government services for the whole year. The plan wants to let all members of the public can enjoy the attentive government services anywhere anytime with the easy operation of intelligent appliances through the universal communication equipment and fast, barrier free network connection service so that it can promote the policy of “Develop high quality network society” and construct the advantages of sustainable development of the city.	integration, quality life, government services, network society, sustainable development

The strategic objectives of the above four cities are generally distributed in aspects of the infrastructure of smart cities, public management services and information and economic. Compared with the four cities in the mainland, Taipei city and the Hong Kong SAR attach more importance to the other three dimensions, including cities’ humanistic literacy, public perception and the construction of the soft environment. In the dimension of humanities quality, the Taipei municipal government stresses the importance of learning and the concept of lifelong learning, and the government makes great effort to make up the digital gap. Taipei launched e-learning platform, integrated the traditional learning and digital learning and improved the ability of students to use the network. The Hong Kong government emphasizes the cooperation of education and vocational training institutions to improve the skills of young people and the people on the job.

3.3 The Comparison of the Distribution of Specific Implementation Content

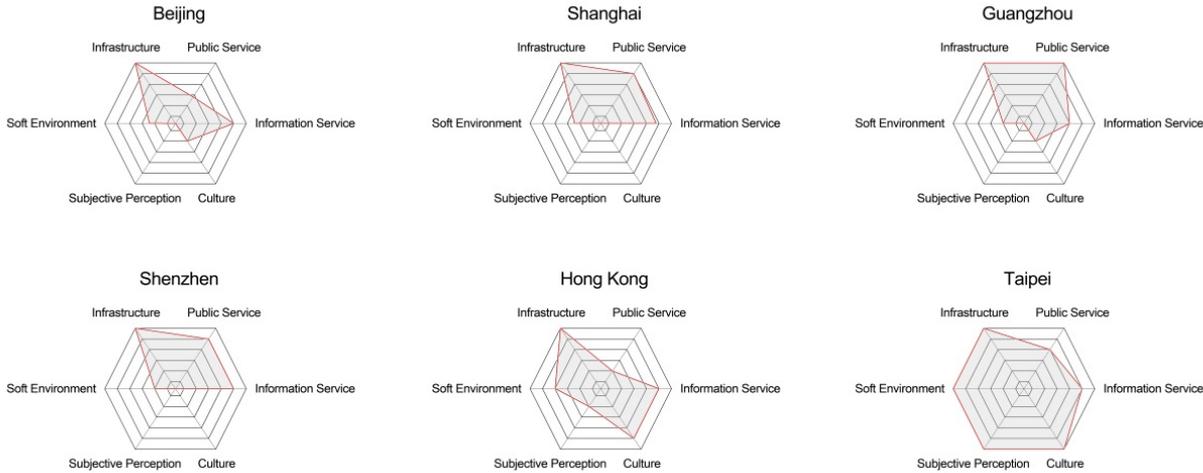


Chart 2: Comparison of Planning Objectives in Six Cities

According to the different focus of the smart cities plan in these cities, the author set the full marks for all the dimensions to 6 and divided them equally in proportion. Then the author made the chart of the six dimensional analysis according to the different focus in different dimensions of the cities. As we can know from chart 1, all the first tier cities take infrastructure construction, information services and other aspects very seriously; Shanghai, Guangzhou and Shenzhen have also made a greater length of planning in the public service, while Beijing is slightly less. In the soft environment and humanities quality and other dimensions, the smart cities planning of four first tier cities in the mainland is only slightly involved, and the residents of subjective perception is the obvious blind area of the construction of smart cities. Because the planning has relatively long time, Hong Kong pays more attention to the aspect of digital construction rather than the content of the public service. In contrast, Hong Kong and Taipei are more concerned about the construction of the soft environment, subjective perception, culture and other aspects, and Taipei greatly surpassed the four first tier cities in the mainland in these aspects.

4 The Influences of Big Data on the Construction of Smart Cities

At present, China has already complete the information infrastructure construction. With the largest population of Internet users, China has more massive data than any other country in the world. The use of Big Data will make ICT (Information and Communication Technology) apply to the construction of smart cities more easily.

4.1 The Big Data Provides more methods to analyze and solve the city problems.

Nowadays, public services, urban efficiency and other urban problems in Chinese cities are exploding in recent years. The rapid development of ICT and the popularity of social network produce a large number of data sources. These data provide us with new platforms to observe, analyze and research the cities. Big Data has already shown huge business value for corporations and social value for the government. The researches on these Big Data have

great prospects of in reducing the social costs of economic operation and improve the efficiency of government decision-making, thus providing better conditions for the construction of smart cities.

4.2 Big Data provides new notions in the construction of smart cities.

In urban planning, we need to take full account of the needs of enterprises and urban residents. With Big Data, the process of urban planning will get much more information from enterprises and urban residents. The Big Data requires that we should take the initiative to find the problem governments, residents and businesses are concerned. And this is exactly what role Big Data plays in the process of urban planning.

5 The Case Study: Analysis on the Construction of Smart City in Shanghai based on Big Data

Broadband wireless is the development trend of global communication network, the public WLAN hot-spot in wireless city is also considered as the “fifth infrastructure”. As the basis and important content of the construction of smart cities, the construction of public WLAN hot-spot is an important part for Shanghai to enhance its construction level of smart cities, and improve its urban competitiveness.

5.1 Data Sources and Research Methods

The data adopted in this paper are from CMC Shanghai branch. Matching the address information of Shanghai’s mobile WLAN hot-spot in 2009 and 2015 with its vector map, then the spatial distribution map of Shanghai’s mobile WLAN in the two years is obtained. With the People’s Square as the circle center, five concentric circle buffer areas are made to be the region to count the number of public WLAN hot-spot in different circles. They will be analyzed in combining with the vector diagram of road loop in Shanghai.

Getis-Ord-G can calculate the hot spots for the high frequency occurrence of events. It generally takes the distance weight, and the attribute of space unit is required to be positive, so as to analyze the non-randomness of events in spatial distribution.

This paper firstly transfers the address of established WLAN hot-spots into a point coordinate data set with the latitude and longitude conversion software, the data set takes GPS coordinate as the coordinate system. Then, with the ArcGIS software, vector map of Shanghai is loaded, and the WLAN hot-spots in each area will be counted with street or town as the smallest unit. Through the Getis-Ord-G hotspot analysis on this data, a value of Z and P can be obtained. The spatial factor clustering can be judged for high-value clustering or low-value clustering through the value of Z and P.

Local statistics of Getis-Ord can be expressed as:

$$G_i^* = \frac{\sum_{j=1}^n w_{i,j} x_j - \bar{X} \sum_{j=1}^n w_{i,j}}{S \sqrt{\frac{[n \sum_{j=1}^n w_{i,j}^2 - (\sum_{j=1}^n w_{i,j})^2]}{n-1}}}$$

X_j is the attribute value of element j, W_{ij} is the spatial weights of element i and j, n is the

total number of elements, and :

$$\bar{X} = \frac{\sum_{j=1}^n x_j}{n}$$

$$S = \sqrt{\frac{\sum_{j=1}^n x_j^2}{n} - (\bar{X})^2}$$

Gi statistics is the Z value, so no further calculation is required.

Getis-Ord·G analysis needs to check the elements that are close to the element environment, the hot-spot with statistical significance requires elements to have a high value. Comparison result between partial sum and sum of all elements can reflect the spatial clustering. For example, if the difference between the two is very large, they cannot produce a random result but a Gizscore. The higher the value, the closer the clustering of hot-spots. As for the negative Gizscore, it indicates the spatial clustering of low value (cold-spot).

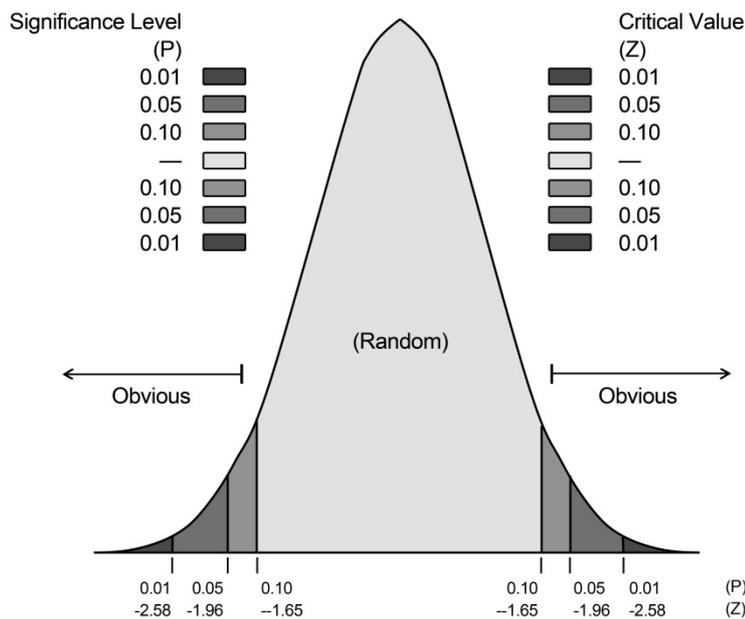


Chart 3: distribution of Gizscore in Getis-Ord·G analysis

In addition, the value of P producing in calculating the spatial clustering indicates the probability, spatial pattern is the probability of a random process. So the lower the value of P, the probability to observe a random spatial pattern is lower. The value of P and Z are in a normal distribution. When the value of Z is extremely high or extremely low(negative), these scores are associated with smaller P values. Generally, when the value of Gizscore is no less than 2.58, or no more than -2.58, the corresponding value of P is lower than 0.01, meaning that the confidence ratio is above 99%.

5.2 Circular distribution features of Shanghai WLAN hot-spots

According to the analysis on Shanghai's circular buffer area, as shown in following figure, distribution of Shanghai's public mobile WLAN hot-spots show obvious difference in 2009 and 2015, the number of WLAN hot-spots in all circular buffer areas has great changes.

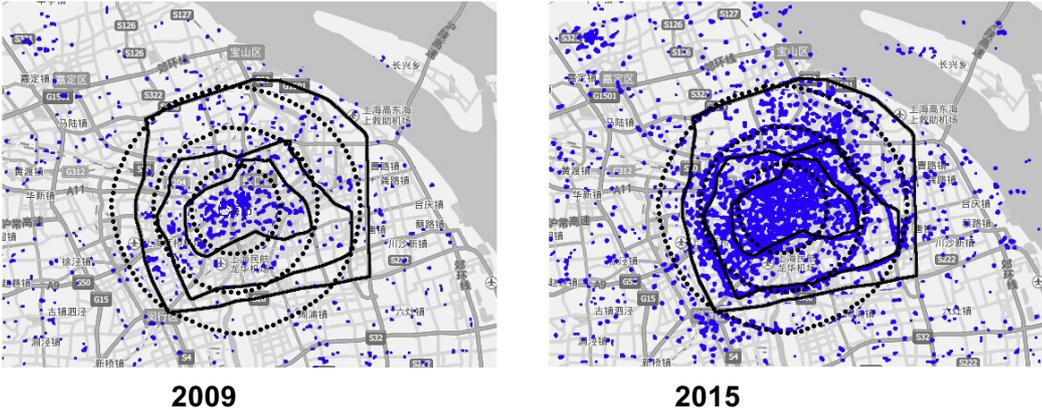


Chart 4: Comparison of Shanghai's Pubic Mobile WLAN Hot-spots

Central urban area is the main body of WLAN hot-spots distribution. WLAN hot-spots were mainly distributed within 15km of the central urban area in 2009 and 2013, meanwhile, the circular distribution of WLAN hot-spots also has obvious changes over the past few years. Proportion of Shanghai's mobile public WLAN hot-spots within 5 km to the central urban area has reduced from 28% to 18.9%, that within 10-15 km to the central urban area has maintained at about 12.7% or 12.8%, that within 15-20 km to the central urban area has slightly increased from 7% in 2009 to 8.9% in 2015. The greatest increase appears in the areas that are more than 20km away from the central urban area, the proportion has increased from 21.6% in 2009 to 37.9% in 2013. On the whole, the number of public WLAN hot-spots in Shanghai's central urban area has a slight reduction, the increase in the surrounding regions of central urban area is not obvious, the remote areas has a great increase.

5.3 Analysis of high and low concentration of WLAN hot-spots in Shanghai

A further analysis would be made to judge the main agglomeration areas of mobile WLAN hot-spots in Shanghai from 2009 to 2015, so as to form a hot-spot analysis chart. The area with high Z value will be defined with major agglomeration area, the rest is the general agglomeration area. As shown in the following figure, Shanghai's mobile WLAN hot-spots mainly distributed in downtown area in 2009, and showed a typical center-external structure. Remote districts, such as part streets in Chongming, Jinshan and Nanhui, the WLAN hot-spots were rare. In 2015, the space distribution of WLAN hot-spots in Shanghai grows to two concentration areas. Except for traditional concentration area in the downtown area, the southwestern region of Shanghai has also formed the agglomeration hot-spots.

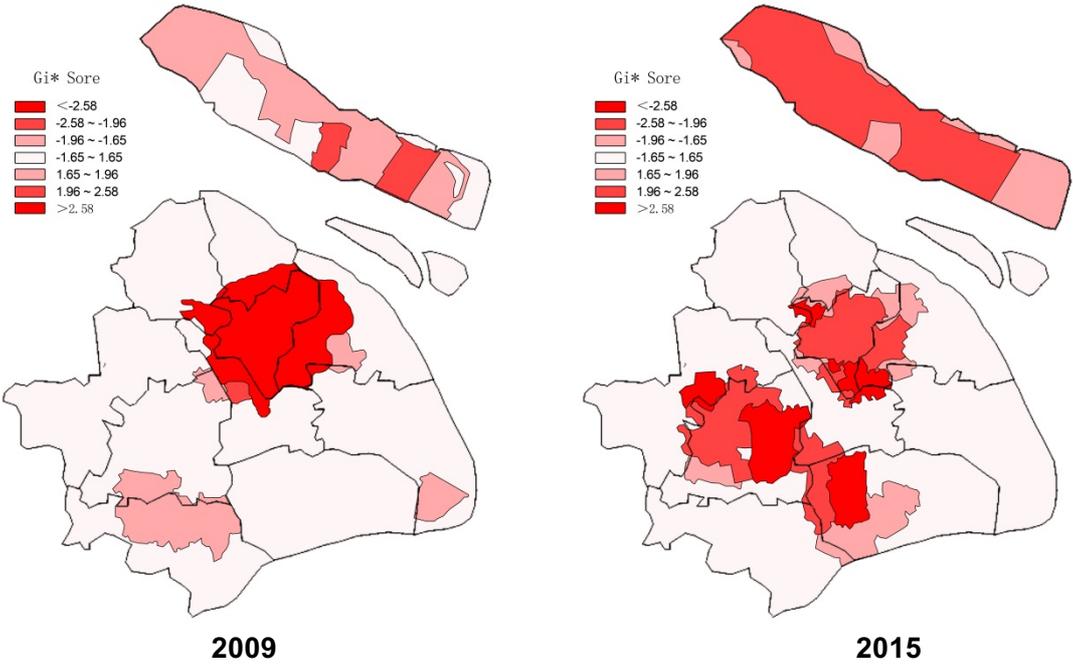


Chart 5: Distribution of Shanghai’s WLAN Hot-spots

(1) WLAN hot-spots are mainly gathered in the business center and location of higher education institutions

It can be seen from the hot-spot analysis chart that the distribution of WLAN hot-spots are relatively random within the center city, the distribution of WLAN hot-spots out the center city is mainly gathered at several business centers. In 2009, the regions that had the most intensive WLAN hot-spots were Xujiahui, the Bund and other traditional commercial areas, which was mainly because of the office buildings concentration and developed commerce. In 2015, the suburb areas that are far away shows obvious gathering of WLAN hot-spots, such as the Songjiang New Town, Nanqiao New Town. The construction of many colleges in suburb new towns also promotes the rapid improvement of WLAN hot-spots.

(2) Suburbanization process of the city promotes the suburbanization layout of WLAN hot-spots

Suburbanization process of Shanghai also develops rapidly in recent years with the issuance of some policies. Due to the limited land supply in downtown area, the land price becomes expensive, many business organizations, government sectors and large industrial enterprises gradually move to the suburbs, the multi-functions suburbanization gradually realizes. Moreover, as the population and industries have been relocated, the layout of public WLAN hot-spot will also spread to the suburbs along with the suburbanization. All in all, the smart cities ultimately serves for the urban residents, urban environment and urban economy. Population is the key of smart. With the suburbanization of population, infrastructure construction in the suburbs is constantly improving, livability has also been promoted. The layout of WLAN hot-spot in suburbs also indicates the ubiquitous connotation of smart cities.

(3) Cold-spot distribution of public WLAN

The streets that have the least mobile WLAN hot-spots in 2009 and 2015 are

undeveloped areas, their communal facilities and commercial supporting are not perfect. In 2009, 55 streets or towns didn't have the WLAN hot-spot, and the number reduces to 8 by 2015. However, streets or towns that have less than 10 WLAN hot-spots are as many as 68, which locate in remote districts.

5.4 A case study on the development of public WLAN hot-spot in local areas

(1) The public WLAN hot-spot construction at Songjiang University Town is the hottest

The construction of Songjiang University Town is a new education exploration in Shanghai, which has a positive effect on improving the efficiency of Shanghai's higher education, resources sharing and scale expansion. Songjiang University Town covers a huge area of more than 8000 acres, it is the largest university park in China.

In the construction of Shanghai's mobile WLAN hot-spot, Fangsong Street, where the Songjiang University Town locates, has a greatest change. In 2009, it only had 7 mobile WLAN hot-spots, however, the number sharply increased to 395 by 2015, ranking the first among all streets or towns in Shanghai. Among them, more than 320 CMCC campus WLAN hot-spots distribute in the Songjiang University Town, which makes the university town to have the most obvious increase of WLAN hot-spot. Moreover, the business and population gathering brought by the university town also provides power for the construction of WLAN hot-spot in the four streets of Songjiang urban area

(2) The WLAN hot-spot at Pengpu new village street increases slowly.

Pengpu new village street locates in the northwest of Zhabei District, Shanghai. Its construction started in 1958 and finished by 1990s. Most buildings are multi-layer public houses and their volumes are huge.

The permanent resident population of Pengpu new village street is about 160 thousand. However, since it was constructed long ago, the planned construction space was small, this area develops slowly in recent years, its public WLAN hot-spot construction has been in a lagging position. In 2009, only the Republic Commercial Plaza in Pengpu new village street had one WLAN hot-spot. With the full construction of WLAN hot-spot in Shanghai, number of WLAN hot-spots at the Daning road street, which is adjacent to the Pengpu new village street, has increased from 8 to 59, while that of Pengpu new village street has only increased to 5. The permanent resident population of Daning road street is only about 70 thousand, which is less than half of that in the Pengpu new village, but its WLAN hot-spots are 12 times as many as that of Pengpu new village. The old worked gathering areas or villages in the city would often be blind spots in information construction, which is also one of the problems that need to be urgently improved in the city's information construction.

6 Conclusion

Firstly, the policy and theoretical guidance for the construction of smart cities is not perfect. Construction of smart cities is still in the initial stage in China, policies, regulations and plannings have just launched. Many cities have encountered problems in the construction, such as the standards of smart cities are not unified, lacking of policy guidance, development

stage is not clear, insufficient public participation.

Secondly, key points of policy planning related to the smart cities should be gradually adjusted in China's big cities. First of all, all dimensions' construction of smart cities should be orderly promoted on the basis of current construction stage. In view that China's information and communication infrastructures are not perfect all over the country, which still have a long way to go, the construction of smart cities should be orderly promoted by stage. The planning schemes for the construction of smart cities should also be adjusted correspondingly according to the objectives and requirements in different cities and at different stages.

Thirdly, the big data era provides a revolutionary opportunity for the construction and development of smart cities, enhances the ability of smart cities to analyze and solve problems, as well as providing a new thought and idea for the smart cities planning. The city research and planning under the support of "big data" analysis technology promotes us to focus on the recent construction of the city while paying attention to long-term strategies, put more concerns to the subtle areas that are not concerned before.

Fourthly, from the WLAN hot-spot distribution in Shanghai, it can be known that the construction of smart cities in Shanghai has characteristics of circling-laying development and uneven distribution on the space distribution. Construction of smart cities has a close connection with urban space and urban function. In future development, attention should be paid to eliminate the regional spatial difference in the construction of smart cities, so as to conform to the ubiquitous characteristic of smart cities, improve the construction quality and coverage of smart cities in Shanghai, narrow the gap with the advanced international cities.

References:

1. Vanolo A. Smartmentality: The smart city as disciplinary strategy[J]. *Urban Studies*, 2013: 0042098013494427.
2. Townsend A M. Smart cities: Big data, civic hackers, and the quest for a new utopia[M]. WW Norton & Company, 2013.
3. Lee J H, Phaal R, Lee S H. An integrated service-device-technology roadmap for smart city development[J]. *Technological Forecasting and Social Change*, 2013, 80(2): 286-306.
4. Hao L, Lei X, Yan Z, et al. The application and Implementation research of Smart City in China[C]//2012 International Conference on System Science and Engineering (ICSSE). IEEE, 2012: 288-292.
5. Batty M, Axhausen K W, Giannotti F, et al. Smart cities of the future[J]. *The European Physical Journal Special Topics*, 2012, 214(1): 481-518.
6. Hollands R G. Critical interventions into the corporate smart city[J]. *Cambridge Journal of Regions, Economy and Society*, 2015, 8(1): 61-77.
7. Cocchia A. Smart and digital city: a systematic literature review[M]//Smart city. Springer International Publishing, 2014: 13-43.

Interaction Mechanism between Urban Planning, Land Supply, Housing Spatial Structure of Hong Kong

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This paper established the economic-social model to examine the interaction mechanism between urban planning, land supply and housing spatial structure in Hong Kong. Firstly, through the literature review, the model is based on the assumption that 1 urban planning controls residential land supply, especially embodied in Outline Zoning Plan OZP 2 housing spatial economic structure is determined both by upstream urban planning, residential housing supply, and the downstream housing demand, which is further influenced by housing spatial location structure 3 housing spatial economic structure also impacts the land supply in return through feedback of land revenue 4 housing spatial location structure is shaped by urban planning system within the long period of time. Secondly, three questions are examined in sequence: housing spatial location structure under long-term guidance of urban planning and land supply system urban planning's impact on residential land supply the interaction mechanism between OZP, residential land lease, housing spatial location structure and housing price in spatial-temporal dimension. In detail, for the question 1, the spatial location structure is visualized and analyzed through GIS based on the data of 300,000 POIs point of interest of 2016, Hong Kong population census, annual digest of economic statistics, employment statistics, rateable value statistics. For the question 2, this paper studies the residential land lease during 2006-2011 in comparison to spatial structure and volume of the supplied residential land and floor area by the statutory OZP through GIS analysis under the framework of "Hong Kong 2030 planning vision and strategy". For the question 3, a 10-year 2006-2011 spatial statistic of the price and volume of private housing is analyzed in GIS through real estate exchange data to generalize its spatial economic structure. Above all, with the synthesis of above studies, indicators of Outline Zoning Plan, land sales, spatial location structure and spatial economic structure are identified for private housing exchanges of 2006-2011 in GIS for SPSS multi-factor regression, aiming at identifying the most dominant factors contributing to real estate price in spatial dimension. Also the time-series regression model is applied to examine the impact of land supply on real estate price in temporal dimension. Finally, this paper concludes the findings regarding the interaction mechanism between urban planning, residential land supply, housing spatial economic structure and spatial location structure.

Urban Planning Land Supply Spatial Economic Structure Spatial Location Structure Housing Price

1. Introduction

Hong Kong is among the mostly dense mega-cities in the world, characterized by its manipulated land scarcity and compact development mode. Since the colonial period, Hong Kong has gone through the vicissitudes of sea reclamation in Central by British colony government (1840-1940), manufactory industry booming in Kowloon and Hong Kong islands (1945-1979), "10-year housing program" and new town development (1980s), regional infrastructure construction (1990s). Housing's spatial structure is the sensitive economy barometer, and is shaped both by visible hand and invisible hand. As the low-tax free harbor, Hong Kong government has been adopting the high land price policy with land monopoly for century. Thus land revenue constitutes the major fiscal resources for local government. The outline zoning plan (OZP) functions as the statutory planning tool for development control, also as the mediation between various stakeholders, including government, developers and public. In reference to OZP and under the adjustment of market, Hong Kong urban planning is implemented through residential land lease, further shaping the housing spatial location structure and housing spatial economic structure.

This paper tends to build the political economic framework, probing into Hong Kong housing spatial structure (spatial location structure and spatial economic structure) and its determining factors, to discuss the impact of urban planning and land supply on housing spatial structure. In terms of research methodology, this paper firstly generalizes the assumption based on literature review. Then it carries on major quantitative analysis to justify or modify the assumption to come up with empirical conclusions.

2. Research object definition

(1) Urban planning

Urban planning in this paper refers to the planning tool. This paper focuses on the strategic plan (Hong Kong 2030, planning vision and strategy) and the outline zoning plan (OZP) specially, to not only analyzes the planning terms, but also quantify the index of land use control.

(2) Land supply

The "land supply" in this paper has dual definitions. The first one is the long-term land stock, indicated in OZP and "Hong Kong 2030". And the second one is the yearly sold land parcels, with both the quantity and location evaluated.

(3) Housing

Even though in recent days, 1.3 million population of Hong Kong live in public housing developments, with 29% in public rental housing and 18% in subsidized sale flats, the land for public housing is provided by government with cheap price. Thus the policy oriented public housing units are not commodified and unexchangeable. This paper omits the public housing, only studies the rest 53% private housing in free market. And due to the retarded urbanization process in Hong Kong since 1990s, most of the exchanged private housing units are secondhand.

(4) Spatial structure

The housing spatial structure contains two kinds of structure, namely spatial location structure and spatial economic structure. The spatial location structure is evaluated by six factors: travelling time to the nearest subway station, kernel density of housing, kernel density of life service, public housing density, job-housing balance ratio, resident density. And the spatial economic structure is evaluated by housing exchange price, most of which are secondhand housing.

3. Literature review

Most of the relevant literature review focused on the topic of land supply, land prices's determining factors, housing price's determining factors, the relationship between land price and housing price, urban planning's impact on housing price. The relationship between each two of land supply, land price, land demand, housing supply, housing price, and housing demand could be summarized as followed:

a). In the short run, land price is determined by land demand; in the long run, it is determined both by land demand and land supply. The housing price presents the similar trend, impacted by the housing demand in the short run, both by the housing demand and housing supply in the long run.

b). The housing price would negatively influence the land supply through land revenue feedback.

c). In the long run, the increase in housing demand would result in the increase of land supply. However, in the short run, the increase of housing demand would not lead to the increase of land supply directly, but render the intentional lagging of land supply to maintain the high land price.

d). Housing demand would impact the land price through land demand.

e). In the long run, land price constitutes the major cost for housing development, thus determining the housing price. In the short run, housing price determines the land price by influencing future profit gain of developers.

f). The housing supply and land demand correspond to land supply and housing demand respectively, which are mutually transferable with calculation method in "Hong Kong planning standards and guidelines" and "Town Planning Ordinance".

In addition to the relationship between six key factors mentioned above, the upstream urban planning would impact the land supply in the long run. Meanwhile, the housing demand is also determined by investment environment, consumption capability, economic atmosphere, etc. Figure 1 shows the general interaction mechanism between these factors.

4. Research methodology

4.1 Research assumption

Based on the literature review, this paper establishes the political economic research assumption:

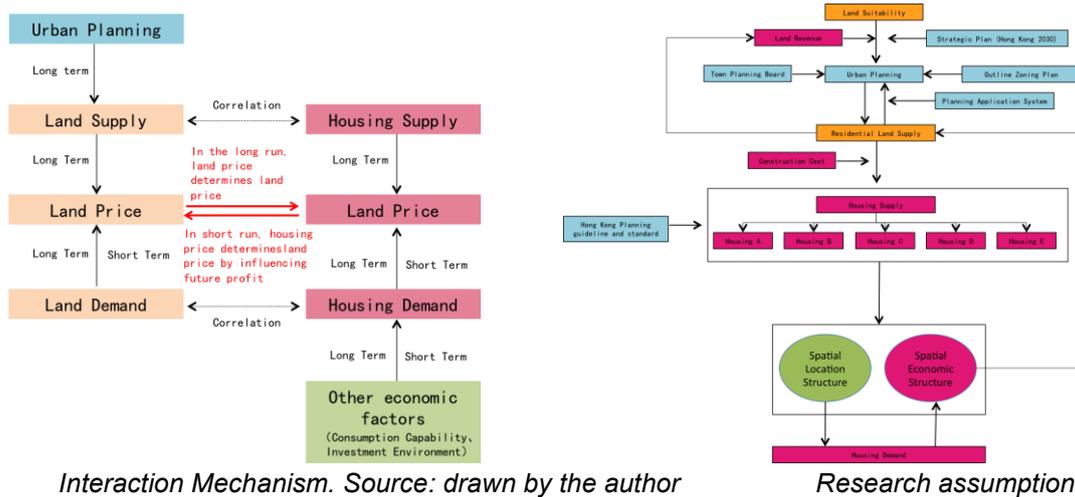
(1) Urban planning controls residential land supply, especially embodied in OZP.

(2) Housing spatial economic structure is determined both by upstream urban planning, residential housing supply, and the downstream housing demand, which is further influenced by housing spatial location structure.

(3) Housing spatial economic structure also impacts the land supply in return through feedback of land revenue.

(4) Housing spatial location structure is shaped by urban planning system within the long period of time.

In detail (figure 2), OZP is the statutory planning tool for land lease and development control. And usually OZP is in accordance to macro strategic plan. Town planning board is the authorized organization for OZP making and implementation. Planning application and approval system is the only channel to connect OZP and private housing development. "Hong Kong planning standards and guidelines" also controls private housing patterns strictly, especially the height and density. There are five kinds of housing development in total. The density decreases from housing A to housing D, wherein housing A is normally the high rise, with plot ratio of 5-10 in down town area; and housing D is the low rise, with plot ration around 1. Housing E is the residential units converted from previous industrial land.



Interaction Mechanism. Source: drawn by the author detailed . Source: drawn by the author

4.2 Research key questions

This paper focuses on 3 key research questions (figure 3):

- (1) Housing spatial location structure under long-term guidance of urban planning and land supply system.
- (2) Urban planning's impact on residential land supply.
- (3) The interaction mechanism between OZP, residential land lease, housing spatial location structure and housing price in spatial-temporal dimension.

5. History of Hong Kong housing and new town development

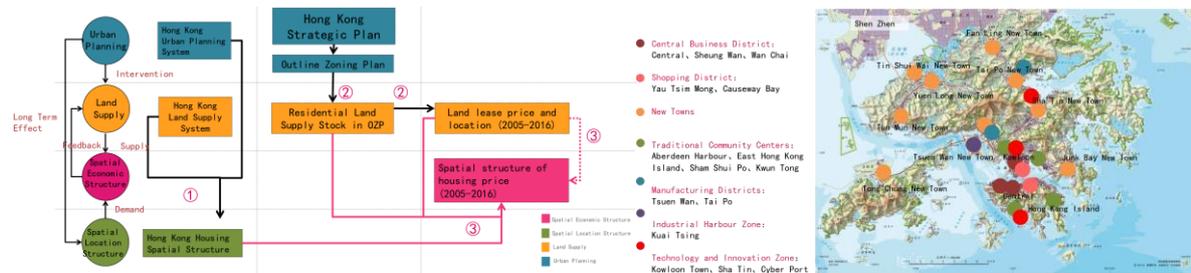
Hong Kong private housing is actually propelled by public housing development to some extent. In early resettlement estate program from 1954, a lot of homeless people in fire disaster (1953) and new mainland immigrants were provided with government subsidized houses with just normal quality. In 1960s, many public sanitation problems arose in resettlement estates due to high population density and improper management until the amalgamation Housing Authority and commencement of 10-year housing program for more systematic service and professional management in 1973. This well-known housing program constitutes an ambitious policy for appeasing the public against social unrest from 1973 to 1982 by Crawford Murray MacLehose, who became a governor of Hong Kong in 1971. Construction of public housing also became the driving force for new town development since 1970s. It has formed the development model that the public housing, infrastructure and facilities enter first, then the private development enters after.

In 1978, the "Home Ownership" scheme was introduced to help tenants who wished to purchase their own homes. In 1982, the long-term housing strategy was consequently proposed with potential spanning of 1987-2001. A new Home Purchase Loan Scheme was introduced in 1988 to enable eligible people to buy a private flat on the private market. Then in 1997, the Tenants Purchase Scheme came into operation to help tenants buy their present public rental flats at cheaper price than market. And the quota of the Home Purchase Loan Scheme introduced in 1988 was enlarged to encourage more families to buy their flats with interest free loans.

With government's housing policy to convert more public housing for private ownership to promote capital flow, the subsidized sale flats take up 18% of the whole housing stock currently. Hong Kong public housing movement sets the foundation and infrastructure for private housing which accounting of 53%. This is quite typical in new town development in New Territory. Population in public housing is firstly introduced by policy, then more private housing would be attracted for balance and life diversity. Now, a lot of private

housing are mixed with public housing for social integrity. In metropolitan area, with urban renewal, many traditional public housing were reconstructed for mixed-use development to accommodate different class of residents.

Nowadays, there has formed the spatial structure of metropolitan core area and nine new towns in New Territory, as shown in figure 4. Several functional zones have also come into being including central business district, shopping district, new towns, traditional community centers, manufacturing district, industrial harbor zone, technology and innovation zone.



Research work flow. Source: drawn by the author

Hong Kong spatial structure.

Source: drawn by the author

6. Hong Kong urban planning and land supply system

6.1 Urban planning system

The figure 5 illustrates the timeline for Hong Kong urban planning system development. The year 1974 witnesses the significant change of Hong Kong urban planning system when <Revised Urban Planning Ordinance> was passed and land use planning which was functional as comprehensive plan and regulatory detailed plan was incorporated by strategic planning, finally developed into “Hong Kong 2030”. Then OZP (Outline Zoning Plan) became the statutory plan for land use and development control.

As to planning tool system, the sequence of “planning strategy-planning control-development control” is established from macro level to micro level which has already been discussed in chapter 2. Additionally, for urban planning administration system, OZP empowers the Town Planning Board certain level of agent’s judicial discretion. The land use specification in notes of OZP is divided into two columns: column 1 and column 2. Column 1 lists the land use always permitted, while column 2 lists the land use required application for approval. During planning application process (figure 6), private developers need to not only apply for planning approval, but also apply for land use and building approval to attain certificate of compliance, occupation permit and other building licenses.

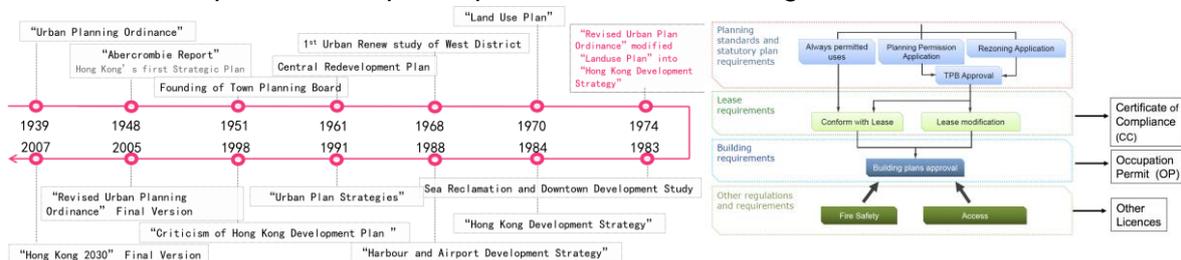


Figure 5: History of Hong Kong planning system. Source: drawn by the author Figure 6: Hong Kong planning application system. Source: drawn by the author

6.2 Land supply system

For Hong Kong land lease system, the land rental is divided into lease in batches and annual lease since 1985. So the revenue for residential land consists of the rental paid at beginning and the rental paid every year at certain percentage of estate rate evaluated every year. The land price in this paper is the rental paid in batches. Estate rate is also considered

as the spatial economic factor for ensuing correlation analysis. The residential land supply in Hong Kong is rigidly restricted in response to “high land price” policy. Thus the high-density development mode is applied that the developed urban area only takes up 24% territory and the population density in metropolitan area is 27000 persons per square kilometer. The percentage of the existing residential land is 6.9%. However, the intentional “land scarcity” policy renders the insufficient land supply for housing units. The new residential land supply in future indicated in OZP (2012) is 952 hectares with only 392 hectares suitable for development. This is even insufficient to meet the needs for 480 thousands new public housing units in the next five years proposed by government, let alone the need for private housing development.

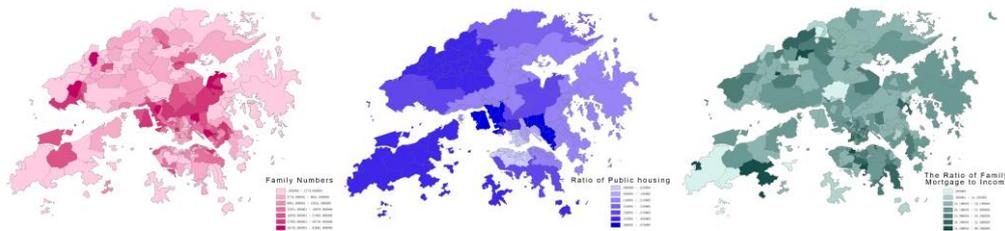
7. Housing spatial structure

.1 Social structure

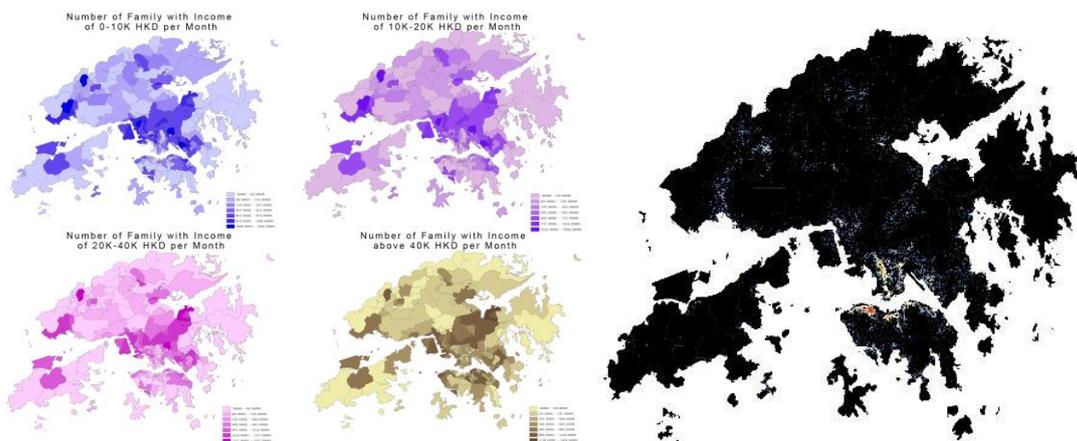
In family density spatial structure (figure 7 (a)), Hong Kong is in “one core-two belts-multicenter” spatial pattern. For public housing density, new towns and traditional community centers are high in percentage (figure 7 (b)). Family income spatial structure is polarized geographically, but new towns are better in wealth-integrity (figure 7 (c)). Figure 7 (d) shows the rate of family mortgage to income, which reflects the consumption capability level. It is illustrated that some new towns suburbs and south Hong Kong island are low in consumption level.

.2 POI point of interest Kernel density of private housing

Figure 7(e) shows the POI Kernel density of private housing, It still follows the population pattern of “one core-two belts-multiple centers”. The core is Central area, and the two belts are two MTR railway corridor. The multiple centers are scattered in the new towns.



(a) Family number (b) Ration of public housing (c) Ration of family mortgage to income



(d) Family income (e) Family income

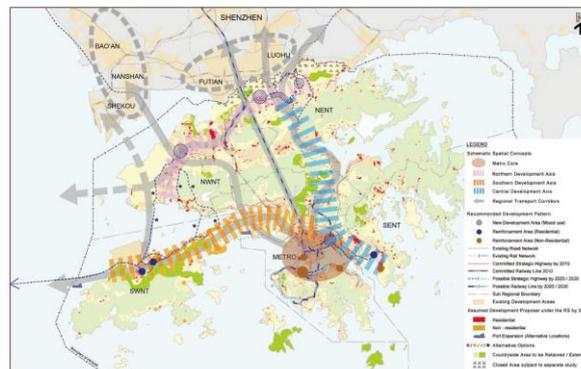
Hong Kong spatial location structure. Source: drawn by the author, with data of 2011 census and crawled from Gaode Map.

8. The impact of urban planning on housing land supply

8.1 Residential spatial structure in "Hong Kong 2030"

"Hong Kong 2030" is the strategic spatial planning, passed in 2007. It sets the goal of developing Hong Kong into a global city, oriented with finance, trading, tourism, communication technology and logistics. It stresses the importance of husbandry of land utilization, to keep balance between environment protection, centralized urbanization and stable land supply. It is estimated that in 2030, population would reach 8.4 million and GDP growth rate would maintain 3% with the increasing employment rate of 1.2%. The demand for residential building area is 1680 KM² which is equal to 5000 hectares given the average FAR of 3.4.

"Hong Kong" 2030 also comes up with optimal spatial strategies (figure 8) through comparative scenario forecast modeling and simulation. It proposes the "one core-three belts-two points" future spatial structure. The one core is the metropolitan area to consolidate its business and high-density residential function. The three corridors include west corridor for logistics and tourism; middle corridor for community housing, innovation technology and professional service; north corridor for middle-density business and high added value manufacturing industry. The two points are Tong Chung new town and Junk Bay new town for intensification of community housing development. It is also required that before 2020, development priority is given to already developed area and suburbs to maximize its land efficiency and increase existing density; then after 2020, the north New Territory could be developed gradually as the "new development zone". But no more new town would be developed, only slight urban expansion of north New Territory is permitted.



Optimal spatial strategy of "Hong Kong 2030".

Source: http://www.pland.gov.hk/pland_en/p_study/comp_s/hk2030/eng/home/

8.2 Residential land supply potentiality in OZP

8.2.1 Residential land supply quota

Table 1 shows the future population control, building height control, residential land use quota in OZP. The total residential land for housing A to E is 2987 hectares, 963.45 hectares, 1321.84 hectares, 471.31 hectares, 79.82 hectares respectively, which takes up 10.58% in total of the Hong Kong territory.

Comparison of index of OZP and current condition. Source: drawn by the author.

Land Use Control in OZP (2030+)			Current Land Use (2015)		
Index		Contents	Index		Contents
Population		9185412 persons	Current Population		7035265 persons
Building Height Lower Limit		22.57 meter			
Building Height Upper Limit		76.87 meter			
Residential Land Area	Housing A	2987 hectare	Residential Land Area	Private Housing	2600 hectare

	Housing B	963.45 hectare		Public Housing	1600 hectare
	Housing C	1321.84 hectare			
	Housing D	471.31 hectare			
	Housing E	79.82 hectare			
	Sum	5823.42 hectare		Sum	4200 hectare

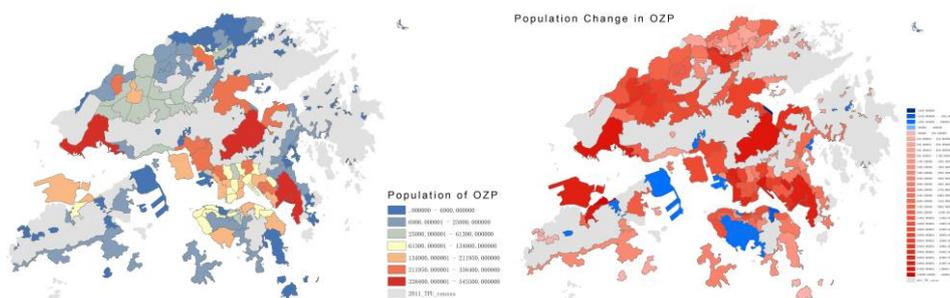
As is shown in table 2, in reference to current population and residential land use condition, it could be seen that residential land supply increase is faster than population growth, implying the improvement of living quality and increase of average unit floor area. In comparison to the residential land supply index of "Hong Kong 2030", which increases by 19.3% in residential population, 19.04% in residential land supply, it could be drawn that current demand for residential land is much higher than the time when "Hong Kong 2030" was made in 2007.

Comparison of index of OZP, "Hong Kong 2030" and current condition. Source: drawn by the author.

Index for Comparison	Base year 2015	"Hong Kong 2030"	OZP	Growth Rate in "Hong Kong 2030"	Growth Rate in OZP
Residents	7035265 persons	8400000 persons	9185412 persons	19.3%	30.5%
Residential Land	4200 hectare	5000 hectares	5823.42 hectares	19.04%	38.6%
Industrial Land	439 hectare	500 hectares	521.3 hectares	13.9%	18.75%

8.2.2 Population control in OZP

There are 143 OZPs (including Rural Outline Zoning Plans) in total for controlling land use and development pattern in Hong Kong island, Kowloon and New Territory. Figure 9 (a) shows the future population control of each OZP district, and figure 9 (b) shows the population change of each OZP by subtracting existing population from the future population. It is clearly seen that "Hong Kong 2030" has been well implemented on OZP level, and it is the construction land expansion that has led to the population density increase of OZP. The region of potential significant population inflow is around Junk Bay, Tong Chung and Tuen Mun new towns while the region of obvious population outflow is around suburbs in country park preservation zones.



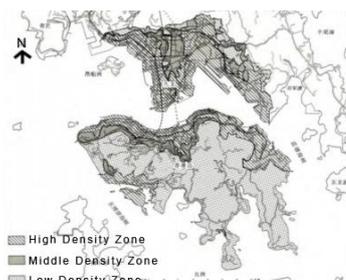
a Future population control of OZP.

b Population change of OZP

Population factor of OZP. Source: drawn by the author, with data adapted from notes of 143 OZPs.

8.2.3 Spatial location structure of residential land stock in OZP

Figure 10 illustrates the density zoning and housing density control details of "Hong Kong planning guideline and standards" of metropolitan Hong Kong. The metropolitan area, new town area and rural area in New Territory are divided into different zones with different maximum FAR quota.



Density Zone	Type of Area	Location	Maximm Domestic Plot Ratio	Notes
R1	Existing Development Area	Hong Kong Island	8/9/10 (depends on Site Class A, B and C respectively)	(i) (ii)
		Kowloon & New Kowloon	7.5 (according to OZPs and site class is not relevant)	(iii) (iv)
		Tsuen Wan, Kwai Chung & Tsing Yi	8	(ii) (v)
	New Development Area and Comprehensive Development Area		6.5	(vi) (vii)
R2			5	(viii) (ix)
R3			3	(viii) (ix)

Density zoning of metropolitan Hong Kong.

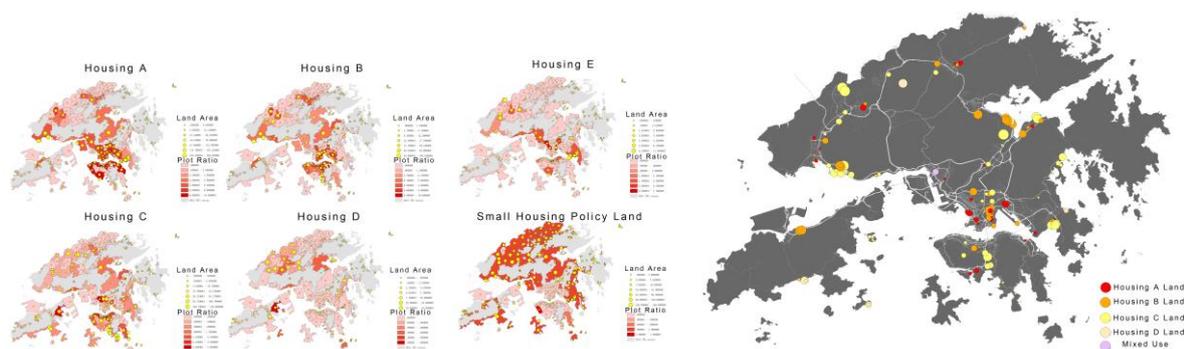
Source: http://www.pland.gov.hk/pland_en/tech/doc/hkpsg

The residential land is divided into five types in OZP for various housing density, which ranges from housing A to housing D. Housing E is the flats converted from industrial land or estates under special design guidelines and standards. Figure X illustrates the quantity and location of five kinds of residential land stock in OZP. Housing A land is the highest in density, and tends to centralized in the zone 1, zone 2 of the metropolitan area, zone 1 of the core area of new towns, zone 1 of the rural area in New Territory with the FAR gradient of 10, 8, 7.5, 6.5, 5, 4.5, 3.5, 2. Housing B land is mixed with housing A land in OZP, more inclined to locate at south Hong Kong island, zone 2 of Kowloon districts, zone 1 of new towns with FAR gradient of 5, 4.5, 3, 2. Housing C land tends to locate in zone 3 of metropolitan area, zone 2 and zone 3 of new towns with FAR gradient of 5, 3, 2, 0.8, 0.6, 0.4, 0.3. Housing D land is the lowest in density, most of which is in zone 3 of new towns and in rural areas with FAR gradient of 0.6, 0.5, 0.4, 0.2. Housing E land is in medium density (FAR of around 1), distributed at Junk Bay, Tsuen Wan, Shen Shui Po, Wong Tai Sin, which are either the traditional industrial community for manufacturing, or the new industrial harbor zones. There is still another kind of housing land other than the major five kinds: small policy housing land. This is only for local residents in New Territory whose ancestors settled there before 1950s. Each male adult resident could apply for a piece of residential land to construct one three-storey apartment once within his life. And most of this kind of residential land (figure 11) tends to locate at rural area or part of the new town area, with low FAR (usually below 1).

8.3 Residential land lease during 2006-201

Figure 12 shows the location and amount of all leased residential land during 2006-2015. It could be seen that the majority is the residential land for housing B and housing C. And in metropolitan area, the leased land is centralized at urban renewal area of Kowloon, most of which is for housing A. In new town area, the leased land is mainly distributed at Sha Tin, Tun Mun, Yuen Long and Junk Bay.

When compared to spatial structure of "Hong Kong 2030" and land supply potentiality of OZP, the structure of leased land during 2006-2015 is in much consistency with north and middle development corridor, but it does not follow up in west development corridor. And due to the high demand for residential land, the land leased every year is distributed both in metropolitan and new town area, despite the development priority of metropolitan region.



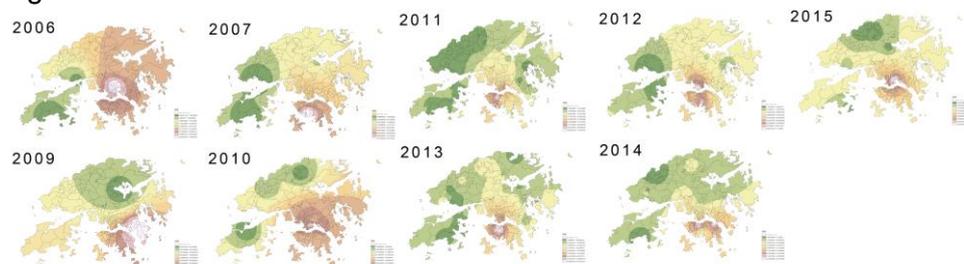
Six kinds of residential landuse area and FAR volume of OZP. Source: drawn by the author, with data adapted from notes of 143 OZPs. Residential land lease amount during 2006-2011 . Source: drawn by the author, with data adapted from Hong Kong Lands Department.

9. The interaction mechanism between outline zoning plan, land lease, housing spatial location structure and housing price

.1 Housing spatial economic structure of 2006-2011

This paper makes statistics of a sample of 30% of all the sold housing units during 2006-2015 including the exchange price, unit area, and geographic location. There are 517 residential buildings in the whole Hong Kong, and 30% units of each building are counted as statistic sample, adding up to roughly 50,000 housing units. ArcGIS is applied here for Kriging interpolation of the housing unit exchange price per square meter (HKD/m²). There are 5000 interpolation points every year, and figure 13 shows the housing price Kriging interpolation mapping result of year 2006-2015.

It could be found that the spatial price gradient remains stable where Central, Wanchai are the highest, Kowloon is in middle, and Taipo, Shatin are the lowest. As to exchange quantity, Tung Chung remains at lower level except the year 2010; the north new territory is active and frequent in exchange during 2010-2012; but private housing exchange tends to centralizes at Hong Kong island, Kowloon, Taipo, Shatin, Tsuenwan and its neighboring suburbs.



Residential land lease price during 2006-2011 . Source: drawn by the author, with data adapted from Hong Kong Lands Department.

.2 Housing price's determining factors (Spatial dimension)

(1) Factors selection

The multiple linear regression is conducted to identify the significant factors of housing exchange price, wherein Y is the housing unit exchange price per square meter of the year 2015, X consists of 5 dimensions including 14 factors, ranging from spatial location structure, consumption capability, residential land supply potentiality in OZP, land price, and other factor.

a) Spatial location structure

F1-The travelling time cost to the nearest MTR station (subway station)(unit: minute)

F2-POI (point of interest) Kernel density of private housing

F3-POI (point of interest) Kernel density of life services including canteen, cultural facility, education facility, shops, etc.

F4-Public housing ratio of 18 administrative districts

F5-Job housing balance ratio of 18 administrative districts

F6-Residential population density of TPU (tertiary planning unit) (unit: persons/KM2)

b) Consumption capability

F7-Ratio of family mortgage to income

c) Residential land supply potentiality in O P

F8-Future population density in constructed area of OZP (unit: persons/KM2)

F9-Future population in OZP (unit: persons)

F10-Future housing building area in OZP (unit: hectare)

F11-Population change in OZP (unit: persons)

F12-Future maximum FAR (floor area ratio) of residential land

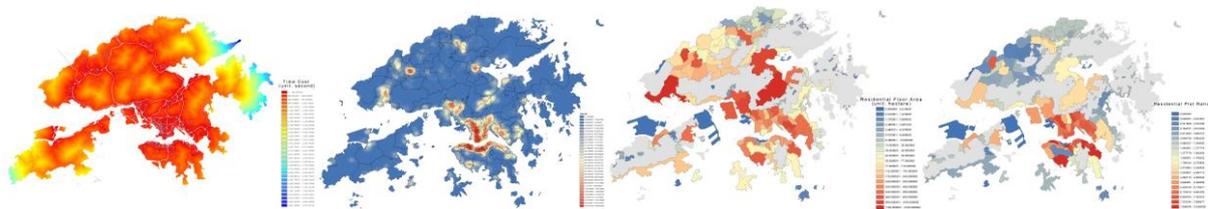
d) Land price

F13-Residential land leasing price in 2015 (10000HKD/M2)

e) Other factor

F14-Housing unit area (unit: square feet)

As to the map of F1 (travelling time cost to the nearest MTR station) shown in figure 14 (a), the road network data is crawled from the "Open Street Map" website, and the vehicle speed is defined as followed: Motorway: 120KM/h; Trunk lane: 100KM/h; Primary lane: 80KM/h; Secondary lane: 60KM/h; Tertiary lane: 40KM/h; Residential lane: 20KM/h; Pedestrian lane: 5KM/h. Then the ArcTool cost distance analysis is applied to calculate the travelling time cost of each point in Hong Kong to its nearest MTR station. In addition, F3 (POI Kernel density of life services) is shown in figure 14(b). F10 (Future housing building area in OZP) is shown in figure 14(c). F12 (Future maximum FAR) is calculated through dividing the whole residential maximum floor area by site area, shown in figure 14(d).



a The travelling time cost to the nearest MTR station. b POI Kernel density of life service. c Residential floor area of OZP. d Residential land FAR of OZP.

: Factor selection for linear regression. Source: drawn by the author, with data adapted from Hong Kong Lands Department.

(2) Research district division

According to the geographical characteristics of 18 administrative districts in Hong Kong, the whole city is divided into 4 research regions:

Region1: Hong Kong island in Outline Zoning Plan

Region2: Kowloon in Outline Zoning Plan

Region3: New territory in Outline Zoning Plan (new towns)

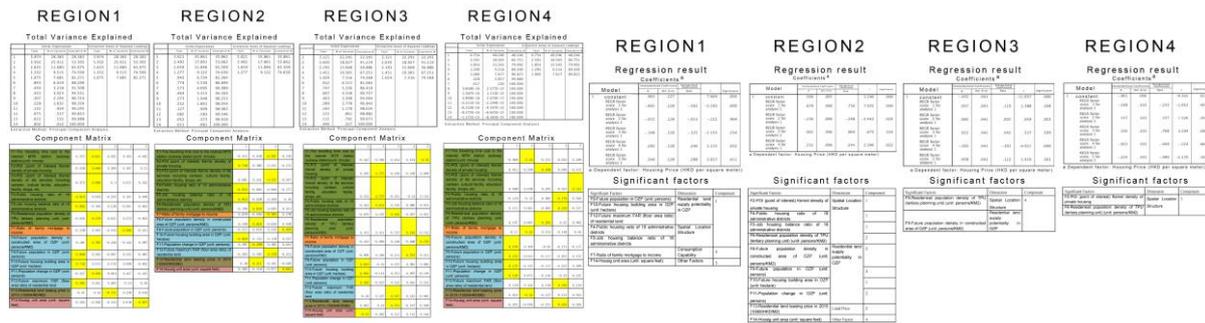
Region4: New territory in Rural Outline Zoning Plan (villages and towns)

(3) Principal component analysis

Before the multiple linear regression, principal component analysis is conducted to exclude the collinear problem between 14 factors. The total variance explained and component matrix for four regions is shown in figure 15. It is seen that there are five principal components for region 1, 3 and 4. And there are 4 principal components for region 2.

(4) Multiple linear regression of principal components

Figure 16 shows the regression result and the major significant factors affecting housing price after synthesizing the regression result of four regions.



: Total variance explained and component matrix of four regions. Source: SPSS analysis results done by the author. : Regression result and identification of significant factors of four regions. Source: SPSS analysis results done by the author.

(5) Summary of significant factors affecting housing price in four regions in spatial dimension

Figure 17 shows the major contributing factors of housing price in four regions. In region 1 (Hong Kong island in Outline Zoning Plan), the housing price is majorly influenced by land supply potentiality in OZP, consumption capability and spatial location structure. In region 2 (Kowloon in Outline Zoning Plan), housing price is influenced by land supply potentiality in OZP, spatial location structure, and land price. Both in region 3 (New Territory in Outline Zoning Plan) and in region 4 (New Territory in Rural Outline Zoning Plan), the housing price is majorly influenced by land supply potentiality in OZP and spatial location structure.

In sum, future population control in OZP, land supply potentiality in OZP, current population density, life service Kernel density, and public transportation accessibility are the key factors for all regions.

.3 The correlation of residential land supply quantity and market factors land price, housing price, vacancy rate in temporal dimension

Figure 18 show the variation of average housing price, amount of leased residential land, average land price, housing unit stock, housing vacancy rate and newly constructed housing units from year 2006 to year 2015.

(1) The change of housing stock

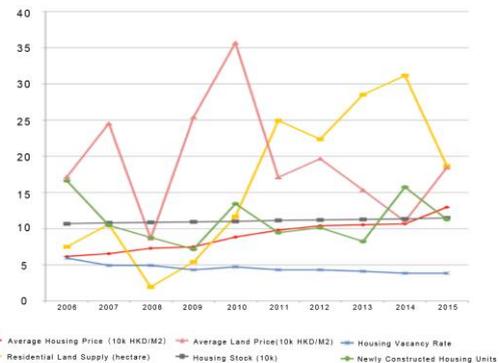
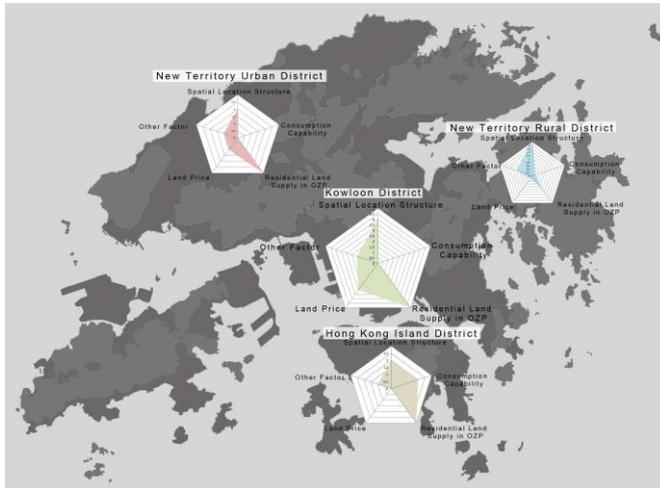
During 2006–2015, the variation of number of housing units constructed every year is in parallel to amount of residential land leasing. But the former keeps lagging behind the latter for 3 years, which is just the span for construction timing. In spite of the number fluctuation of the newly constructed housing units, the housing stock increasing rate remains 1% every year, indicating that the newly constructed housing units only have marginal effect on the whole stock. In addition, the vacancy rate decreases from 5.9% to 3.8%, implying that housing rigid demand increases with the slow down in investment need.

(2) The relationship between residential land supply amount and land leasing price

Due to the financial crisis in 2007 and 2008, the land price plummeted when residential land leasing amount was shrunk sharply. However, the housing price kept growing at that time. In financial recovering period from 2008 to 2010, the land price began to increase with the increasing residential land lease. In sum, during 2006-2010, the land price tended to be influenced by economic factors and demand side factors. However, during 2010-2015, land price was in negative correlation to land supply amount, and land price was influenced by supply side factors.

(3) The relationship between residential land supply amount and housing price

During 2006-2015, the housing vacancy rate decreased steadily despite the growth of housing stock and the housing price. Nevertheless, the growth rate of housing price is in negative correlation to residential land supply amount: housing price grows faster when residential land supply is restrained, and vice versa.



Major contributing factors of housing price in New Territory rural region. Source: drawn by the author. Housing relevant index statistics. Source: statistics made by the author with data from previous chapters.

.4 The correlation of land price and housing stock, land supply factors in temporal dimension

Time series analysis is conducted in SPSS model to analyze the correlation of housing price and residential land supply, land price, housing stock, housing vacancy rate, newly constructed housing units. The result is shown in table 3. According to the significance analysis, the yearly housing stock, vacancy rate and newly constructed housing units are significant factors affecting housing price, which implying that the direct housing supply contributes more to housing price than indirect residential land supply and land price.

Time series analysis result in SPSS. Source: SPSS analysis results done by the author.

ARIMA Model Coefficient					
		Estimation	Standard Error	t	Significance
Average Housing Price (10k HKD/M ²)	Residential Land Supply (hectare)	-134.325	13.376	-10.042	.001
	Residential Land Price (10k HKD/M ²)	.001	.014	.068	.949
	Average Land Price (10k HKD/M ²)	.018	.012	1.488	.211
Housing Stock (10k)		12.347	1.074	11.497	.000
Housing Vacancy Rate		1.777	.447	3.972	.017
Newly Constructed Housing Units (TK)		-.141	.041	-3.409	.027

The correlation of housing price and land price of various districts in spatial-temporal dimension

There are 307 residential buildings the units of which keep being exchanged each year during 2006-2015. The ArcTool Kriging interpolation method is applied to map out the residential leasing price of the whole Hong Kong during 2006-2015. Then the exact land leasing price value is extracted to each residential building through the ArcTool "extract value to point" in ArcGIS, thus forming the 10-year building price and housing price panel data of the whole 307 buildings for correlation analysis. Table 4 shows the distribution of 307 correlation coefficients of each building. Usually, the absolute value of coefficient below 0.1 indicates the non-correlation relationship; the absolute value of coefficient between 0.1-0.3 indicates the weak correlation; the absolute value of coefficient between 0.3-0.5 indicates the medium correlation relationship; and absolute value of coefficient between 0.5-1 indicates high correlation relationship. It could be clearly seen that the number of coefficients in weak

correlation take up 81.3%, showing that housing price is in high correlation to land price for most of the residential buildings.

Percentage of correlation coefficient at different levels. Source: SPSS analysis results done by the author.

Coefficient	-1~-0.5	-0.5~-0.3	-0.3~-0.1	-0.1~0.1	0.1~0.3	0.3~0.5	0.5~1
Percentage	9.3%	20.4%	22.8%	18.7%	17.9%	10.6%	0.3%

In addition, the software POWERMAP is applied to display the correlation coefficient (figure 19). The height of the blue bar represents the significance level of correlation coefficient. The blue bar is above horizontal surface if the coefficient is positive number; and it is below horizontal surface if the coefficient is negative number. The larger the absolute value of the correlation coefficient, the higher the blue bar. The more detailed spatial pattern could be generalized that:

In Hong Kong island and Kowloon, most of the buildings are in medium positive correlation coefficient. But in the south of Hong Kong island, the buildings are in weak or even non-positive correlation coefficient. In the new towns (Junk Bay, Kwun Tong, Kwai Tsing, Tsuen Wan) close to the downtown area, most of the buildings are in weak positive correlation coefficient. In the west development corridor (Tuen Mun, Tong Chung) for transportation and logistics proposed in "Hong Kong 2030", most of the buildings are in medium or weak positive correlation coefficient. In the middle corridor proposed in "Hong Kong 2030", such as Sha Tin and Tai Po new towns, most of the buildings are in weak negative correlation coefficient. But as to the north corridor, most of the buildings are in medium or high negative correlation coefficient. For part of the rural area, the buildings are in medium positive correlation coefficient.

It could be further concluded that the fully developed district including metropolitan area and west developing corridor proposed by "Hong Kong 2030" tends to be in high positive correlation coefficient, where the land price and housing price are equally high. The reason might be that the higher the housing price, the more developers would like to pay for land leasing fee with higher future profit expectation, thus increasing the land price. However, the north and middle developing corridors proposed by "Hong Kong 2030" including Fanling and Shueng Shui oppositely tends to be in high negative correlation coefficient. In reference to the land lease list, it could be founded that most of the residential land leased during 2006-2015 is for middle and low density housing development (housing C and housing D), the leasing fee of which is relatively lower. But most of the housing units exchanged during 2006-2015 are high density housing units (housing A), which are the most expensive, implying that the housing market in north and middle developing corridor is mainly second hand housing market. Additionally, the every-year residential land supply only makes marginal contribution to housing stock due to its low FAR volume, and thus the slow land supply renders high exchange housing price in market.



Correlation coefficient of housing price and land price shown in POWERMAP. Source: converted from SPSS analysis results done by the author.

.6 Summary of the interaction mechanism between outline zoning plan, land lease, housing spatial location structure and housing price

The figure 20 illustrates the interaction mechanism between outline zoning plan, land lease, housing spatial location structure and housing price to reflect the impact of urban planning, land supply to housing spatial structure.

(1) For urban planning factors, the residential land supply potentiality and future population control in OZP are the major factors in spatial dimension affecting housing spatial economic structure through influencing future development potentiality.

(2) For land supply factors, the yearly land leasing influences housing price by adjusting vacancy rate, housing stock and newly constructed housing units number. In newly developing and less developed area, the restrict of high density residential land supply leads to insufficient housing supply, further stipulating the housing price increase. In fully developed area in metropolitan regions, housing price reversely determines land price by affecting future profit gain.

(3) For housing spatial location factors, POI kernel density of life service, population density, transportation accessibility are the major spatial factors influencing housing price.

10. Space shaping of power and capital

Figure 21 shows the institutional framework of Hong Kong urban planning and its functioning market system. Under the shaping force of power and market, the visible hand urban planning is implemented through the planning application system to control the invisible hand land supply, and the spatial results including spatial location structure and spatial economic structure is formed and further influence urban planning and land supply by social and economic feedback.

(1) Land monopoly by government leads to artificial residential land scarcity

Hong Kong government is the actual landowner of all lands (except Saint John's Cathedral), which guarantee its authority for land use through urban planning making and implementation. The so-called "land scarcity" in Hong Kong is just nominal, since nearly 76% of Hong Kong land is kept for nature preservation under "Country Park Ordinance". So it is government who restricts residential land supply intentionally for various purposes that legal land for residential use is scarce.

(2) Government has compulsory restriction on private development through the planning tool of O Z P

Despite the non-statutory strategic plan "Hong Kong 2030", OZP implements its upper spatial requirement with detailed land use plan, population control, and development control. OZP has become the core planning tool for guiding urban development through its significant political power. Thus by controlling long term and short term residential land supply in terms of location, amount, development mode and development sequence, governmental development framework could strictly control private development.

(3) Governmental power and market connect to each other by planning application system with reference to O Z P

As already mentioned above, planning application system is the only channel to connect governmental urban planning and private developers in market. Town Planning Board is the executive organization to implement planning approval process with reference to OZP.

(4) Government applies the mechanism between four factors to control land use condition and achieve social and economic development goals

With exercise of the interaction mechanism between urban planning, land supply, housing spatial location structure and housing spatial economic structure, market and power are synthesized to mediate various stakeholders. And as the land monopolist, government has the supreme power for controlling the whole system to achieve development goals even with "little intervention" policy.



Interaction mechanism between outline zoning plan, land lease, housing spatial location structure and housing price. Source: drawn by the author. Institutional framework of Hong Kong urban planning and its functioning market system. Source: drawn by the author.

References

- Cheung, Yuk-yi. "Land supply and housing price of Hong Kong: implication for urban planning." HKU Theses Online (HKUTO) (1996).
- Tang, Bo-sin, and Roger MH Tang. "Development control, planning incentive and urban redevelopment: evaluation of a two-tier plot ratio system in Hong Kong." Land use policy 16.1 (1999): 33-43.
- Tang, Bo-sin, and Lennon Hung-tat Choy. "Modelling planning control decisions: a logistic regression analysis on office development applications in urban Kowloon, Hong Kong." Cities 17.3 (2000): 219-225.
- Tang, Bo-sin, and Chung Yim Yiu. "Space and scale: A study of development intensity and housing price in Hong Kong." Landscape and Urban Planning 96.3 (2010): 172-182.
- "Hong Kong 2030-Planning Vision and Strategy" :
http://www.pland.gov.hk/pland_en/p_study/comp_s/hk2030/eng/home/
- "Our Foundation Report" : <http://ourhkfoundation.org.hk/>
- Statutory planning portal 2 : <http://www2.ozp.tpb.gov.hk/gos/default.aspx?>
- Hong Kong lands department : <http://www.landsd.gov.hk/sc/landsale/records.htm>
- Hong Kong 2011 census : <http://www.census2011.gov.hk/en/index.html>
- Gaode map : <http://gaode.com/>
- Hong Kong census and statistics department:
http://www.censtatd.gov.hk/hkstat/sub/sp452_tc.jsp?productCode=D5250007
- Open Street Map : <http://www.openstreetmap.org/>
- Midland reality website : <http://proptx.midland.com.hk/utx/default.jsp?lang=zh>
- Hong Kong rating and evaluation department:
http://www.rvd.gov.hk/sc/property_market_statistics/
- Hong Kong planning department: http://www.pland.gov.hk/pland_sc/index.html
- Town planning board: http://www.info.gov.hk/tpb/sc/whats_new/whats_new.html
- "Hong Kong Planning Standards and Guidelines":
http://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/index.htm

The urban conundrum in defining smartness city en or technology: a critique into the Indian Idea of smart city

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Abstract

The penetration of neoliberal capitalism into the veins of developing countries has manifested a deep urge to become technologically and economically smart in line with their western role models. It is in this context of technologically thirsty liberal economy, the borrowed idea of smart cities takes its root into the developmental paradigms of developing countries like India. In this part of the world, India, the connotation 'Smart' evokes a kind of disconnect and somewhat reveals a westernized picture of digitally smart urban population raised above the clutches of its inherent religious superstitions on one hand and on the other a failed attempt to clinch on its age old cultural heritage. This created notion of 'smart' actually oscillates between the contradictions of the westernized notion of smart and the indigenous notion of smart.

This research tries to decipher the contextual and non-contextual notions of smartness and the idea of smart-cities giving emphasis to the announced 100 smart-cities project by the Government of India evaluated under the concept of spaces of capital accumulation, exclusion, control, monotony, and exploitation. It also identifies the polemic between government's un-proclaimed paramount interest in realizing these cities and the life of the future residents in these invited spaces. By exemplifying the case of Indian cities, the paper tries to bring out the vast contextual and evolutionary differences among them and also the feasibility and acceptance of the idea of smart city. The primary focus of government has been on making smart buildings and infrastructure instead of taking cognizance with indigenous socio-cultural contexts in creating an environment for smart citizens at first place. The paper hence analyze some of the smart city proposals to bring out these inherent contradictions in the formation of urban commons, Right to the city and urban rural conflicts.

Introduction

Virtual and physical integration of global economies are the growing syndrome of penetration of neoliberal capitalism into the veins of developing countries and as its corollary there is a continuous effort to redefine space and an incessant push to accept the newer fundamental and multifarious wide scale impacts of these neo-spaces. It has altogether led to a paradigm shift in urban studies and discourse, towards understanding the nuances of 'Global Cities', 'World Class Cities' and 'Smart Cities'. However, among these typified urban nomenclatures 'Smart Cities' is a relatively newer subject in developing countries.

The rapid pace of embracing the idea of 'Smart Cities' has manifested a deep urge within developing nations to become technologically and economically smart in tandem with their western counterparts. The developed nation's idea behind pushing through such strategized developments into the urban system, of their developing counterparts, was analyzed by Saskia Sassen in her book 'Global Cities', through the seven hypotheses of Global City model. The comprehension of this model formulates the base for critical analysis of the Smart City concept. As per Sassen(2005); one, the dispersal and integration of global

economic activities are the key factors for growth and maintaining the significance of central corporate functions, which continues to be located in developed countries. The physical manifestation of diffusion of such economic activities in developing countries required more independent, exclusive, technology-driven appropriated spaces, explaining the onset of radical change in urban planning strategies and management of these states. Secondly, the complexity of the central functioning by corporate in developed countries has led to more and more outsourcing, which found its niche in developing countries, due to provision of cheap labour, new 'greener' spaces for investments and relatively low hassles for setting up business. However, "for running these highly specialized and networked service sectors, well spread out and efficient physical and social infrastructure are mandatory", which are being incessantly developed under the guise of providing easy connectivity to its citizen in the form of both virtual and physical infrastructure like toll expressway, flyovers and exclusive townships, malls, business parks, sidelining the fundamentals of the cost-benefit ratio or social inclusivity of infrastructure networks in a city. In the quest for becoming global, more and more cities, especially ones in the developing world are crumbling under the pressure for adopting the exclusive technologically intensive spaces for investment. These thoughts will help us establish that the exclusive- technology dependent spaces are likely to be created through Smart Cities in Indian context. This shall constitute the first section of the paper.

Another way of explaining the growing acceptance for Smart Cities is through the writing of David Harvey, who explains expansion and interlinking of global economies are imperative for the survival of capitalism, manifested through redefined space, social relations and behavioral patterns. Paramount is redefining citizenship through direct and indirect measures and will form the crux of the second section of this paper.

The urban conundrum in defining smartness

The juxtaposition of varied contexts and status quo of Indian cities in its preparedness for a smart city challenge decipher an urban conundrum prevailing in defining 'smartness' and forms the base of the study. Since the paper revolves around Indian context, the examples cited below are in tandem to it.

One; The First Five Year Plan of the freshly independent state of India, focused on agricultural development with a substantial chunk of the budget earmarked for dam and canal construction. These dams were constructed with a view to develop multipurpose river valley projects, in which the primary focus was flood control and irrigation. Presently, almost 69 years since its inception on Indian soil, dams of different capacity, size and focus have dotted the country's map. Mega projects like dam and canal network was considered as smart solution of that time and years ahead to come. However, the recent water crisis across states, which were almost at a brink of a water riot, has once again blurred the perspective and future of such mega projects. The wide spread drought of 2016 has paralyzed approximately ten states of the country, some of which are the highest canal networked States. The stored water from the dams has ceased to reach the agricultural fields mounting the plight of approximate two million farmers in the country of which, approximately 2,000 farmers have committed suicide in 2015 and 2016(PTI .2016) more in the first four months of 2016 in these effected states. Experts not ready to accept this as a mere climatic failure have described it as an "ideological failure, in the part of the nation which has forgotten its farmers" some others have called it "the biggest policy failure" because in Maharashtra, one of the worst hit state "in the last 10 years, INR70,000 crores had been spent on canals and

dams, this however, has added a mere 0.1% percent to the area under irrigation” (Mehta,T. Fernandes,J.2013).

Two, Bengaluru, the capital city of the southern state of Karnataka has been boasting it's never ceasing IT boom since the last two decades and is poised to be known as the Silicon Valley of India. Smartness in the city is confined to exclusive enclaves like IT parks and the smart/green buildings in it, once out of it the residents are facing increasing un-smartness in basic service provisions like garbage disposal, un-manageable traffic and pollution which are detrimental to the quality of life. Especially significant in this regard are the lakes of the city. Bengaluru, once known as the 'City of Lakes', 'Pensioner Paradise', 'Air-conditioned city of South India' (Mani, 1985:2) contributed its salubrious climate to the innumerable natural and man-made lakes in and around it. However, rapid unplanned urbanization has encroached upon these lakes and surrounding green belt of the city to make way for the smart IT hubs. As per a study conducted by the Indian Institute of Social Science (IISC), the number of lakes in Bangalore declined from 51 with 321 ha in 1973 to 17 with only 87ha in 2007 in the city area. "Similarly, the lakes declined from 159 with 2003ha in 1973 to 93 with 918ha in 2007 in greater Bangalore" (Ramchandran & Kumar,U. in Thippaiah,P. 2009). Another comparatively recent study by IISC shows the city has lost 79% of its lake in the last four decades, during the same time the build-up area has grown by 52% and the lost in vegetation stood at 78% (Satish,D.P. 2016). Professor TV Ramachandra of the Centre for Ecological Sciences at the IISc posed a serious question by questioning the fundamental principles of modern day's development and the rhetoric's of smartness "What's the point of earning better when the food that you eat is adulterated?" he added "As a result of unplanned urbanization, Bengaluru is going to be unlivable and dead city in the next five years".

Three, one of the worst floods witnessed by the city of Chennai in 2016 drowned significant parts of it and brought everything to a standstill. The death toll has been more than 200 with different offices quoting different numbers. The city had a significant area under wasteland which acted as a natural drainage network to the high rainfall prone city, siphoning the excess water to replenish ground water levels. This not only protected the city from flooding it also provided storage of drinking water, which is a major issue in the city. However, much of the wetlands have been reclaimed to create infrastructure and high-rises permanently sealing off the natural drainage. As per a leading daily "A report quoting National Institute of Disaster Management (NIDM) report stated that about 650 water bodies, including big lakes, ponds and storage tank, have been destroyed in Chennai city alone and the current number stands at around 27. It added that the city has only 855 km of storm drains against 2,847 km of urban roads" (Narasimhan,T.E. 2015). This exposes the vicious cycle of electoral politics, which requires you to do something immediately in a span of five years to convince voter of their worthiness without much consideration about the future of such projects, secondly; significant amount of tax payers money earmarked for mega infrastructure projects benefits private corporate. They are destroying the city's natural drainage system by filling lakes and tanks to build infrastructure and township projects and thereafter spending millions of dollars to create an artificial drainage network for the same city; this exposes the vicious cycle of urban conundrum.

Four, rising pollution rate has been choking the city for quite some time; Delhi the capital city of India has been witnessing a persistent growth in particulate matter in its air. This situation became worst during the winter of 2015, when the government decided to shut schools for

about two weeks to tackle pollution (Biswas,T. 2015). A study conducted by the Indian Institute of Tropical Meteorology (IITM) has revealed rising air pollution is likely to shorten the longevity of its residents by 6.3 years. The worst effected among them are the vulnerable, who are more likely to stay outside due to lack of proper housing facilities or those making their living on the streets. The urban conundrum in defining smartness in this case however lies in the fact that the same government who had once encouraged people to buy more and more private vehicles by making it unfathomably affordable is now planning to impose taxes on the sale of vehicle. The long-term vision for the city, if perceived correctly at the right time in the past would have been to create more Mass Transit Systems (MTS), which not only makes travelling easy and cheap but also environmentally less disastrous, given the urbanizing pace of the city.

Five, the landfills of Mumbai have been smoldering, choking and unbalancing normalcy in citizen's life. The largest and oldest, Deonar dumping ground, originally mangroves, was established by the British in 1927, it was then located miles away from the city. However, rampant urban expansion has currently brought it within the ambit of the formal city and therefore, it is believed to reside five million people within a radius of 10km (Subramaniam,M. 2016). While, the Central Governments Swatch Bharat Mission entirely revolves around making toilets and cleaning roads, the basics remain unattended. This action is pointing towards the short sightedness and loopholes in policy making. Most likely a plan of setting up composite plant at Deonar and buying more land to dump outside the city is likely to cost the government \$355million (Shrivastava,B.2015), however the basic knowledge of household level waste segregation and door to door collection continue to pose as an enigma.

Smartness has been redefined on the lines of making cities globally acceptable. Economy generation at the cost of parameters like social, environmental and physical factors has changed the behavioral pattern and outlook of city dwellers towards aestheticism. However, the global perspective of approximately 175 hectare of land in the heart of the city of Mumbai has changed when, the slum of Dharavi won the accolade of being the green lung of the city. Dharavi gives a new life to approximately 80% of Mumbai's waste. Also known as the recycle miracle of India, Dharavi has been the bone of contention for past several years due to the lucrative land on which it is located. There is an approximately USD 5.25 billion redevelopment plan which is likely to wipe out the recycle industry (MCDougall,D. 2007). Therefore, which citizens are smart? The ones who are creating an economy by recycling the mounting waste or the ones who are constructing concrete jungles and then sinking under the pressure of their own creation. The greatest conundrum in defining smartness lies in the understanding of the term smartness, which has been altered to suite narrow political and corporate means without taking into account the broader perspective or common interests.

Inception and formulation of the concept in India

Investments, urbanization, growth, development and ICT are the key words of neo-liberal societies in developing countries. Space has been at the center of contention because of its increasing exchange value over use value and manifestation of all the above on it. In India, the focus on development and gentrification of cities has been a key electoral strategy of 2014 general elections. The current incumbent's in their electoral strategy assured to create` 100 new cities, enabled with highly westernized technologies to run them. The conceived

central idea for these 100 new cities at a later period of time(Srivathsan,A. 2015), that is; after coming to power, morphed into the present 100 Smart City Project, with every state getting at least one piece of the cake. The reason behind the idea was to account for the recurring needs of urbanizing India; nevertheless, the hidden agenda was to create investment friendly cities to attract private domestic and foreign enterprises remains apprehensible. Another rationale for its development being, with metro cities already reaching saturation, there is need to invest in uncharted areas, it is easier to establish them as desired cities as they have still not witnessed the complexities encountered by mega cities in order to open new avenues for investment.

However, in this context it is ineludible to understand the 'real' inception of the concept of smart cities in India. It is not an indigenous idea and has been doing the rounds since mid 2000. During the 2008 economic recession in the UK it was IBM's initiative to sell the idea of smart cities in a big way as a strategy to stabilize and manage their balance sheet during the economic debacle. Empirically proven IBM's performance during the same period, that is 2008-2012, was declared to have not only eluded the downswing faced by the technology business but also have improved steadily (Paroutis,S. Bennett,M. Heracleous,L.2013). The Bharatiya Janata Party (BJP) led Gujarat government realized this dream during their incumbency in 2012 in the form of GIFT City (Gujarat International Financial Tech City). The Green Field development project, GIFT is "designed as the hub for the global financial services sector. More particularly, state-of-the-art connectivity, infrastructure and transportation access have been integrated into the design of the city" (GIFT-city portal), everything that it required to make it lucrative for private investment. The presence of the word "financial" in its name is indicative of the idea of attracting foreign and private enterprises to invest in the global GIFT City.

The prompt flip-flop in Smart City concept, from what was initially envisaged by the government bears testimony to the actual intentions behind this Project. It was to create new upgraded spaces to attract investments. The government's initial concept, which took mentions in Finance Minister's maiden budget in 2014, was to create satellite towns for large cities with modern information technology to accommodate the ever-growing urban population, which otherwise will have adverse effects on the livability of existing cities(Srivas,A.2014). This idea came under acute criticism forcing the government to revisit the proposal and unveil a modified convincing optional plan, to either create new centers or upgrade social and physical landscape in existing cities for the Urban Local Bodies(ULBs) to choose from. Therefore, Brownfield and retrofitting were the new strategies introduced by the government along with the existing Greenfield development, which continues to remain in the proposal.

Brownfield and Greenfield development will breath fresh life into the veins of real estate development in the city, which will create new 'controlled spaces' of exclusion. This is unavoidable because of the project cost, which can only be recovered from the sale of real estate. At the same time, retrofitting, as a strategy is nothing new and our cities have already been coping with the havoc created by metro rail, flyover (Doctor,V. 2014), laying underground electric cable and construction of such infrastructure, which are mostly short-lived because of extreme mismatch between expected and actual population for which it is planned.

The perils of technology

No matter how superficially inclusive the current development paradigm dominated by Information and Communication Technology (ICT) might appear to be, whose roots are deeply embedded in exclusivity. "In the post-Wiki leaks and post-Snowden era it has become apparent that urban digital networks and ICTs ought not to be seen as neutral, banal, benign or external, hidden infrastructures - but rather as power webs that play a vital role in the co-construction of our daily lives and urban polity." Revisiting Saskia Sassen's Global Cities and relating it to the current ICT discourse in the context of Smart cities, promoting ICT is primary for expansion of economies across geography which rightly explains the logic behind our keenness to include the ICT component in city planning, these new spaces are in the global run for becoming Global Smart Cities. It is because of this "rise of the networked society, networked cities and networked governance associated with ICTs (Castells, 2008), including fixed and mobile technologies and the ever-expanding 'internet of things' has driven a persistent interest in Smart Cities"(Townsend, 2013 in Sadoway and Shekhar).

Global cities like Bengaluru, Mumbai or a Shanghai cannot be the prototype for 100 Smart Cities across a country, variation in city's scope is of utmost significance to ensure sustainability. A holistic idea of sustainability ensured by higher quality of life, economic, social and cultural harmony. Changes in various aspects of a city/region (like, economic structure, territorial endowment, human resource and institutional milieu) (Webster,D. Muller,L. 2000) have positive impact in enhancing the competitiveness of an area/region, thereby pushing the city up the value chain. Here again the value chain is not only pointing its vocabulary to economics but also to the qualitative, emotional, collective and cultural structure of the chain. Moving up the value chain is crucial for a city to grow, which otherwise leads to stagnation and going forward stimulates decay. New cities developed with little compatibility to the surrounding region have a short lived future because while trying to clone prototypes the true essence of the historical city is lost rendering it lifeless and mechanical. Moreover, Greenfield and Brownfield development are type of inducements in which the city is bereft of the experience of its historical evolution and the compatibility which it has attended with its surrounding region, while moving up the value chain.

The glaring inequality and disconnect

Smart technologies are not only altering the urban landscape but also, the social, political and economic linkages of cities. In the case of Indian Smart cities the proposal is extremely questionable because the proposed smart cities are likely to take up any one 'intervention' amongst, retrofitting, urban development or green field development along with compulsory pan-city strategy (application of selected smart solution to the existing city wide infrastructure). Firstly, this can be rightly decoded as 'A smart space in or around an un-smart city' because the type of interventions proposed will upgrade only a particular selected area and not the entire city. For e.g. upgrading the drainage network in selected areas for new development raises questions of how shall this advanced network merge with the existing surrounding network, which was previously of the same system. This will lead to what urban scholars describe as "Juxtaposition of the citadel and the Ghetto" (Ravindran,S 2015). Also, the type of areas selected for this type of development is important. There can be two possibilities for this, one that the already posh localities be selected for up gradation ,where the people living in it has a dominant hold in the political and economic scenario of

the city or the selection of an extreme dilapidated area. In the second case people living in those areas will not only lose their livelihood but also a complete transformation in the way of life is likely to occur. Raising questions if these regenerated areas will camouflage with the urban fabric of the city (economic, social and cultural fabric) or create a disconnect picture. It is more likely to create a city with two contrasting urban spaces manifesting as a divided city or a conflict-prone cities.

A city without a history

A City is an assemblage of reflection of its people, unique culture and history which together has woven myriad stories in every corner of it. These stories are of its people, their evolution, struggle, failures, victories, which have infused life and dynamism into the heart of cities. Thus, cities have evolved with encounters and experiences witnessed by it. What if we delete the entire evolution of a city and only leave behind edifices and inhabitants? How would a city without a history or a culture look like? That is exactly what a Smart City is likely to be or are we looking forward to reach the epitome of smartness towards a climax of a Spielberg movie with created virtual history to the entire city and embed that in the brain of the so called smart citizens? This is in contrast with the natural process in which cities have evolved naturally when people settled on river banks or other favorable locations and gradually expanded on space with population growth and economic prosperity. Smart City project, however, is likely to alter this natural process and build cities which are corpses of neo-liberal capitalism manifested as invited spaces. These spaces are not organically developed by citizens; rather citizens are invited to live in these controlled spaces. Little success has been achieved in the case of similar kind of developments across the globe. Additionally, smart cities are spaces of the future with little or no scope for future changes leading to monotony and constancy. As urbanist Richard Sennet points out, "smart cities" incorporating information technology to improve delivery of services for residents could be a good thing. But if a city is so overly "smart" that it doesn't allow any change or future flexibility in its land use, it won't ultimately deliver residents' needs for community or belonging (Stokols, A). A real smart city should be flexible to changes, a dynamic space with abilities to adopt to physical, social and economic changes in terms of relative needs of its residents, because a city cannot be an absolute space, from a Lefebvrian sense, and when it tends to move towards absoluteness, it is likely to be a failure from the very start or in the near future. Therefore, the plan of creating 100 new smart cities in a limited span of 5 years can be lapped with Harvey's idea of creative destruction in which he states 'urban transformation entails repeated bouts of urban restructuring through Creative destruction' (Harvey, D. 2008).

Technology, control and commons

This 'Creative Destruction' Harvey says has a clear class dimension in which marginalized from economic, social and political power suffers foremost. However, Shakespeare writes:

"What is a city, but the people; true the people are the city"

This parallel views on commons, from two different points of time, is pertinent to the Smart City discourse and compels us to rethink the current urban transformation paradigm. The lack of perception, foresightedness or hastiness of urban policy makers are likely to reiterate the urban dichotomy currently faced by the nation and further draw the urban life into a

deadly vicious cycle of social and political upheaval. A smart city can truly be called smart when it is inhabited by smart citizen or smart commons. However the changing priorities and characteristics of the commons, influenced by capitalist ideologies are modifying their ideas and creating a class of new commons. This idea has been put forward by Harvey in his Rebel City where he says "The recent revival of emphasis upon the supposed loss of urban commonalities reflects the seemingly profound impact of the recent wave of privatization, enclosure, spatial controls, policing, and surveillance upon the qualities of urban life in general, and in particular upon the potentiality to build or inhabit new forms of social relations (a new commons) within an urban process influenced if not dominated by capitalist class interests"(Harvey,D. 2012). Thus, from social perspectives smart cities, are nothing but ramifications of neo liberal ideas in which, capitalist orientations are likely to redefine the idea of commons with morphed social interests, values and ideologies.

Harvey writes "the question of what kind of city we want cannot be divorced from the question of what kind of people we want to be, what kinds of social relations we seek, what relations to nature we cherish, what style of daily life we desire, what kinds of technologies we deem appropriate, what aesthetic values we hold"(Harvey,D.2008).

A country where, 300 million people live without electricity and more than double without access to proper toilets(Rani,D. 2015), renders more focus to comparatively trivial aspects like smart traffic management, smart metering, and surveillance cameras is nurturing inequality and raises questions on the priority and focus of the government. It is unclear for whom are we managing traffic or spending tax payer's money to improve facilities like installing surveillance cameras. Is it only for people who can afford a car or stay in a posh locality accessorized with surveillance cameras? In this context it is significant how we define the commons for whom we are planning. Is it the 'new commons' inhabiting these capitalistic spaces and constituting only 1% of the nation's population or 'the commons' living their life in the true sense of the term and struggling to attain the basic requirements? The next question which comes to our mind is with widening social and economic gaps how long can these two classes co-exist in harmony? This has already been explicated by Lefebvre in his theory of Space (Lefebvre,H. 1991), which when lapped with neo-liberal smart spaces explains that these new spaces are "abstract spaces" which are cradles for "differential spaces" or spaces of conflict in the form of protest and social turbulence. According to Laveesh Bhandar (Ravindran,S. 2015) "smart cities are "special enclaves" demonstrating various control mechanism to keep the poor people at bay or else they are likely to nullify the efforts of maintain such pricey infrastructure".

Harvey discusses how control mechanism adopted by capitalists is absolutely important to enjoy the fruits of neo-liberalism. Capitalism is meaningless without control. However, the idea of control in the case of smart cities is a slightly complex one. A dual control mechanism will prevail in these smart spaces. The dichotomy of control has already been well depicted in Palava 'smart' City, which is being developed with state of the art infrastructure and the technology for it is being furnished by the international technology ace IBM, initiator of the Smart City concept. Palava City is likely to hand over identity cards (Smart Identity Card) to its citizen, which is to be furnishing for entry to the city. Therefore, the space is forbidden from entry by one group of people by using identity card as a control mechanism. Likewise, 24*7 surveillance cameras are set up to monitor every activity of the residents. This raises questions on the right to privacy of the citizens. Where on one hand surveillance has proved efficient in crime management to some extent, on the other the control of surveillance

system in hands of government or private entities has exposed the risk of infringement into personal space and security. National Security Agency, USA whistleblower Edward Snowden in a chat session highlighted how overarching surveillance measure designed to improve security is actually eroding the freedom of those it is suppose to protect:

“The worst and happening-right-now harm of bulk collection - which again, is a euphemism for mass surveillance - is two-fold. The first is the chilling effect, which is well-understood. Study after study has show[n] that human behavior changes when we know we're being watched. Under observation, we act less free, which means we effectively *are* less free. The second, less understood but far more sinister effect of these classified programs, is that they effectively create 'permanent records' of our daily activities, even in the absence of any wrongdoing on our part. This enables a capability called 'retroactive investigation,' where once you come to the government's attention, they've got a very complete record of your daily activity going back, under current law, often as far as five years. You might not remember where you went to dinner on June 12th 2009, but the government does” (Lee,M. 2014)).

The Supreme Court has recently curbed the Indian government's initiative to make Aadhar Card (UIDAI-Unique Identification Authority of India) compulsory for multifarious government and non government facilities because of its breach of Right to Privacy (Anand,U. 2015). Standing at this threshold the usage of surveillance cameras to record citizen's activities is also under the scanner. Existence of database on citizen's activities with a private entity is a serious threat and breach of personal security. These data can be easily manipulated against anyone with display of power and wealth. Thus the poor are being controlled, from entering the space, for their lack of ability to pay for these services; on the contrary the rich are being controlled for their ability to pay for the same.

Conclusion

The minimum condition of providing basic services to its entire population is still a distant dream for India. Expenditure on public health has continued to remain excessively low over the years. During 2014-15 budget there has been a further cut of approximately 20% in the healthcare budget citing issues of a fiscal strain(Kalra,A.2014). However, in the same year big-ticket urban regeneration projects like Smart City was launched. The extravagant budget for these projects comes at the expense of essential services for the poor, who constitute the majority of the country's population. Above All, there was a 30% slash in the country's HIV/AIDS programme in the same year (Kalra,A. 2015). On similar lines in 2015-16 the health care budget continued to remain stringent, while corporate tax was reduced by 25%, leading to 17% less burden on corporate and therefore magnifying the role of private players in all sectors including healthcare (Iyer,M.2015). The smart city project is an initiative to further increment the profitability of the private players across sectors through service provision for these smart spaces. It is hardly unknown to anyone that all services in smart city will come for a pay, which is barely affordable for the masses who are struggling to get basic services like food, clothing and shelter. People giving up their land for re- development will look for profit and not for the betterment of the condition of the vulnerable. Meanwhile, green field development will fix a hefty price for anything in it which is out of the league for the poor. Smart cities are likely to contribute little to shorten the 114 million demand supply gap of housing unit's by 2018(Khan,Y.Z. 2015). Even though the policy writes down the plan of creating 15% affordable housing in smart cities(Government of India), given the unclear

definition of affordable housing in India these too are likely to be priced to fit the budget of the lower middle class and remain unaffordable for the masses living without shelter. The discussion on priority Vs. profitability of smart cities also holds good in the case of internationally purpose-built smart cities, for e.g. according to Antony M Townsend, in his 2013 book smart cities, Songdo was originally conceived as “a weapon for fighting trade wars”; the idea was “to entice multinationals to set up Asian operations at Songdo ... with lower taxes and less regulation” (Poole,Steven. 2014).

From all these discussions of defogging the idea of smart cities, the essence of smartness which government tries to portray is at a nascent stage. It is just prefixing or suffixing the so called jargon “Smart” in front of the layman’s vocabulary, which inturn creates a virtual pool of sophisticated imaginations to render the smart cities as the only future of developing India. ‘Smartness’ can rightly be defined as a process rather than a goal. The idea for smart cities should be to attain holistic smartness, where paramount are smart citizens. It is fundamental to understand the role of a citizen in making a city. Roads, bridges, transport networks, buildings and sewage processing machines will have no meaning without citizen. It will not only widen the existing inequality among classes but also, enhance fundamental issues of lack of contiguity, capital accumulation and social, cultural disconnect. Developed as consequences of privatization, surplus accumulation, control and surveillance, these impeccable spaces or so called smart cities are distant from the familiarity of the commons and it is impossible to permanently bridge the gap between the familiar and the unfamiliar. These spaces will alter the history of city formation and thereby the idea of livability, community, neighborhood and public spaces; thereby creating ‘special enclaves’ of exclusion. Just as democracy is fundamental to development, undemocratic means are fundamental to capitalism and by falling prey to such measures we are sowing the seeds of a debacle or apocalypse.

Reference

1. Anand,U. (2015) SC refuses to modify order on use of Adhar card. The Indian Express, 8th October. Available from: <http://indianexpress.com> (Accessed on 25/4/2016)
2. Andrade,S.(2015). India’s economy recovering, reforms vital-IMF. Reuter.11th March. Available from <http://in.reuters.com> (Accessed on31/5/2016)
3. Ambit Capotal Pvt,Ltd. (2015).Real Estate: The unwind and its side effect. 14th July. Available at http://reports.ambitcapital.com/reports/Ambit_Economy_Thematic_RealEstate_14Jul2015.pdf
4. Appadurai,A.(2001). Deep Democracy: urban governmentality and the horizon of politics. Environment & Urbanization, Volume 13 (October 2001), pp.23-43
5. Biswas,T. (2015)Delhi asks schools to shut as city tackles alarming pollution. Ndtv. 12th December. Available from: <http://www.ndtv.com>(assessed on 13/6/2016)
6. Boyce,J.K. Shrivastava, A.(2016)Delhi's air pollution is a classic case of environmental injustice. Theguardian. 9th March. Available from <http://www.theguardian.com>(Accessed on 13/6/2016)
7. Census of India. 2011
8. Doctor, V. (2014) Is it time to stop the endless building of flyovers in India? The Economics Times, 6th April. Available from <http://articles.economictimes.indiatimes.com>(Accessed on 25/4/2016)

9. Khan, Y.Z. (2015) Smart City "A Dream to be true". International Journal of Linguistic and Computational Application (IJLCA). Volume 2. Issue 1(January-March 2015)
10. Graham,S. Marvin,S. (2001)Splintering Urbanism. Routledge, London
11. Gujarat International Financial Tech-city portal. Available at <http://giftgujarat.in>.
12. Harvey,D.(2012). Rebel Cities, From the right to the cities to urban revolution. Chapter 3. Creation of Urban Commons
13. Harvey,D. (2008).Right to the City. NLR 53, September-October.pp23-40
14. Iyer,M.(2015) Budget 2015:Experts slams government for slashing health budget. The Times of India. 28th February. Available from <http://timesofindia.indiatimes.com> (Accessed on 27/4/2016)
15. Kalra,A.(2014) Govt to cut health budget by nearly 20% for 2014-15. Business Today in. 29th December. Available from <http://www.businesstoday.in>(Accessed on 28/4/2016)
16. Kalra,A.(2015) India slashes health budget, already one of the lowest. Reuter. 23rd December. Available from <http://in.reuters.com>(Accessed on 2/5/2016)
17. Lefebvre, H. (1991). *The production of space*. Oxford, OX, UK, Blackwell.
18. Lee,M.(2014) Snowden: Not all spying is bad but indiscriminate mass surveillance is a problem. Naked Security. 24th January. Available from: <https://nakedsecurity.sophos.com>(Assed on 15/6/2016)
19. Malik,B.(2016)Delhi's air pollution reduces six years from the lifetime of its residents: Study. International Business Times. 7th June. Available from
20. Majumdar,S,N. (2016) Does Modi even know how to make Banaras a smart city?DailyO,Open to opinion. 6th January. Available from: <http://www.dailyo.in/> (Accessed on 15/6/2016)
21. MCDougall,D. (2007) Waste not, want not in the £700m slum. Theguardian. 4th March. Available from: <https://www.theguardian.com>(Accessed on 3/6/2016)
22. Mehta,T. Fernandes,J.(2013) Crores spent, but where are the dams? Auditor slams Maharashtra government. NDTV. 18th April. Available from <http://www.ndtv.com>(Accessed on 13/6/2016)
23. Ministry of Urban Development, Government of India.(2015)Smart Cities. Mission Statement and Guidelines. June.
24. Narasimhan,T.E.(2015) Floods expose how Chennai killed its drains. Business Standards. 25th November. Available from <http://www.business-standard.com>(Accessed on 13/6/2016)
25. Narasimhan,T.E.(2015) Chennai highlights floods are a man-made urban disaster. Business Standard. 19th November. Available from: <http://www.business-standard.com>(Accessed on 13/6/2016)
26. Paroutis, S. Bennett, M. Heracleous, L.(2013) A strategic view on smart city technology. The case of IBM Smarter Cities during a recession. Technology Forecast and Social changes. Available from <http://thirdworld.nl> (Assed on 3/4/2016)
27. Poole, Steven. (2014) The truth about smart cities: 'In the end, they will destroy democracy'. The guardian. 17th December. Available from : <https://www.theguardian.com>(Accessed on: 12/5/2016)
28. Government of India, Available from : <https://secure.mygov.in/>
29. PTI .(2016)116 farmers committed suicide in 2016; 10 states reeling under drought. Hindustan Times. 28th April. Available from <http://www.hindustantimes.com>(Accessed on 12/6/2016)

30. Rani,D. (2015) Smart Cities Needs and Challenges. Advances in Economics and Business Management (AEBM).Volume2.Number 9 (April-June, 2009).pp 897-900
31. Ramchandran & Kumar,U. in Thippaiah,P.(2009) Vanishing Lakes:A Study of Bangalore City. Institute for Social and Economic Changes, Bangalore. September.
32. Ravindran, S. (2015) Is India's 100 smart cities project a receipt for social apartheid? Theguardian. 7th May. Available from <http://www.theguardian.com> (Accessed on 31/5/2016)
33. Sassen,S. (2005)The Global cities: Introducing a Concept. The Brown Journal of World Affair. Volume XI, Issue 2(Winter/spring 2005). pp 27-43
34. Satish,D.P. (2016)Bengaluru Will be Unliveable in Five Years, Warns IISC Study. News 18. 2nd May. Available at: <http://www.news18.com>(Accessed on 7/6/2016)
35. Sharma, B. (2016) Don't Just Blame Climate Change, India's Drought Is Born Out Of Apathy For The Poor. Huffpost India. 9th April. Available from <http://www.huffingtonpost.in> (Accessed on 12/6/2016)
36. Shrivastava,B.(2015)Mumbai Is Being Buried Under a Mountain of Its Own Trash. Bloomberg. 16th March. Available from <http://www.bloomberg.com>(Accessed on 4/6/2016)
37. Srivas,A. (2014) Rs. 7,060 crore for 100 smart cities. The Hindu. 11th July. Available from <http://www.thehindu.com>(Accessed on 3/6/2016)
38. Srivathsan, A. (2015) A Trip Down the Rabbit Hole of Modi's Smart Cities Wonderland. The Wire. 5th June. Available from <http://thewire.in>(Accesses on 1/6/2016)
39. Stokols, A. Exploring Korea's "Smart City".Available from <http://andrewstokols.com>
40. Subramaniam,M.(2016)The Burning Garbage Heap That Choked Mumbai. The New Yorker. 29th February.Available from <http://www.newyorker.com>(accessed on 1/6/2016)
41. Parussini,G.(2016) Mumbai's Vast Garbage Dump Catches Fire Again, Covering City in Smog. The Wall Street Journal. 2nd March. Available at <http://blogs.wsj.com> (accessed on 1/6/2016)
42. Webster, D. Muller, L. (2000) Urban Competitiveness Assessment in Developing Country Urban Region: The Road Forward. Paper for Urban Group, INFUD, World Bank, 17th July.

Intelligent Cities for local growth. Smart City in Liguria region, Italy. The case of the Municipality of Genoa, Savona and La Spezia

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Synopsis

In Italy during 2016, 158 Municipalities have worked on the issue of Smart City and prepared 1,800 projects. Some large Municipalities like Genoa have worked on the issue of Smart City using a holistic approach, which considers the city as a system that is able to support and spread innovation.

1. Introduction

Due to the very rapid growth in many urban areas all over the world in the past few years, national regional and local institutions have dealt with the need to create new strategies for sustainable development. Both emerging and industrialised countries have been involved. These problems could not be solved through a traditional approach based on massive public and private investments for the development of new infrastructures, new industrial and business areas, new residential districts and facilities for public health and education.

It is about making huge private and public investments available, which today would be very difficult to implement both in most industrialised and emerging countries.

A growing number of Municipal Administrations of big and medium-sized cities have decided to rethink traditional territorial policies through the systematic use of information and communication technologies. This kind of approach has been defined by a very famous expression: Smart City.

The systematic use of these technologies should help Municipal Administrations to enhance infrastructures and services as well as assign new functions to a great number of urban districts.

Since the implementation of the first models of Smart City in 2000 up to now there have been a lot of changes. Data published by the European Parliament show that within the European Union in 2014 at least 240 cities with more than 100,000 inhabitants have worked to change their urban and territorial management system into a Smart City. Results obtained by some big cities in the EU area very interesting: Amsterdam, Barcelona, Copenhagen, Helsinki and Manchester.

Despite the great number of cities working to become a Smart City, there are difficulties in outlining principles for the scientification of Smart City model.

2. European Union Smart City

The European Union has developed a work programme on energy to combine initiatives for reducing the effects of climate change with policies for the implementation of a European energy system based on high efficiency and low emissions of climate altering gases. The aim

is substantially to create a European Union for Energy. The timeframe defined for this important programme is based on these deadlines: 2020, 2030, 2050. The tools to implement this programme consist in Integrated Plans for energy and climate of the 28 Member Countries until 2030, revision of some EU Directives, considerable incentives just like those contained in the EU programme Horizon 2020. Within 2030, the objectives concerning climate and energy of EU Countries are the reduction by 40% of greenhouse gases, increase by 27% of renewable energy and by 27% of energy efficiency. The need to rethink urban planning and management models is highlighted because about 70% of energy is consumed by urban centres. For this reason the building becomes the core of a wider urban upgrading plan.

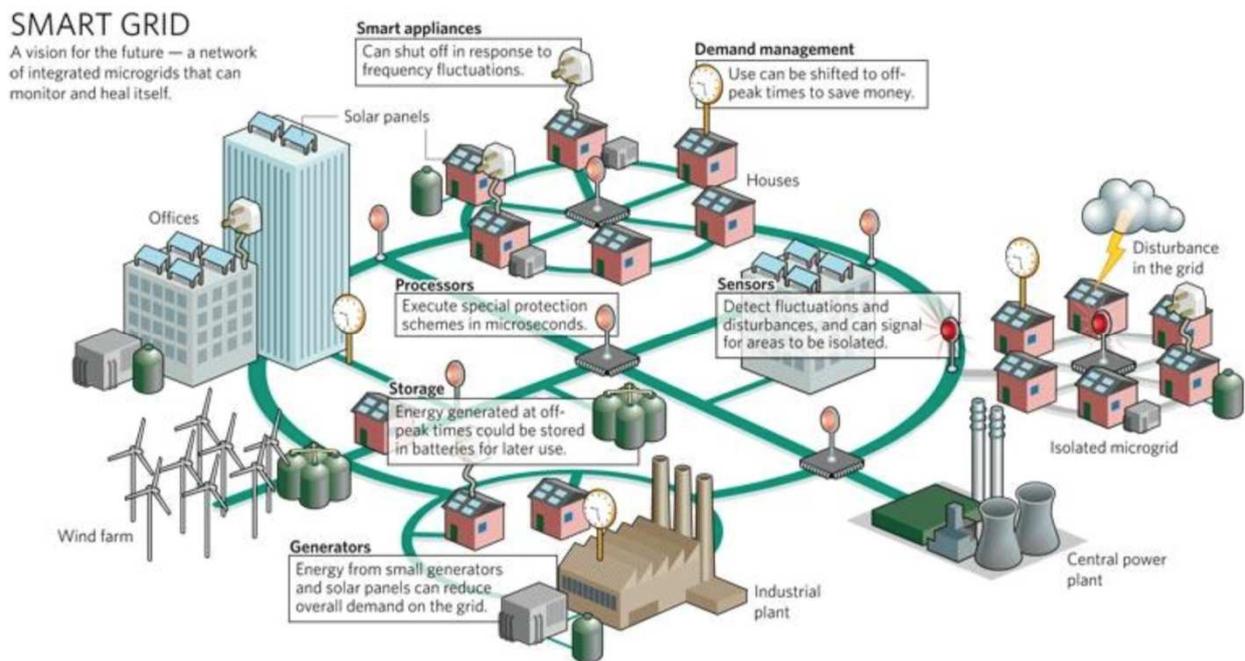


Figure 1: Scheme of a Smart Grid, image published in the Consumer Energy Report <http://www.consumerenergyreport.com/wp-content/uploads/2010/04/smartgrid.jpg>

Programmes developed for the European Union for Energy highlight the need to follow an integrated approach similar to the one implemented for a Smart City where each sub system: infrastructures, mobility, building, governance and social inclusion is dealt with through synergies within an integrated system.

The development of Smart Cities together with technologies such as smart grids and digital infrastructures can become a fundamental element for the development of our Country as a whole. They can contribute to important projects aiming at modernising our territory and promoting economic growth.

3. The Italian experience concerning Smart Cities

The Italian experience concerning Smart Cities can be summarised by saying that at the beginning of 2016, 158 Italian Municipalities where 15 million people live, started working on the issue of Smarty City. These 158 Municipalities have developed 1,308 projects whose

implementation would require 3.7 billion Euro. The sectors involved in the projects are mobility, environment and participation of citizens.

It can be said that at the beginning the projects on Smart Cities concerned the idea to include new technologies to increase the efficiency of some urban components. In a second phase Italian national, regional and Municipal Institutions identified new technologies as one of the elements to develop new models of economic development and welfare.

For some years there has been a debate in Italy on Smart Cities involving research bodies, universities and leading companies in the field of advanced technologies. This debate has highlighted some interesting experiences in Italy as well as the difficulty in outlining a holistic approach for this very complex issue.

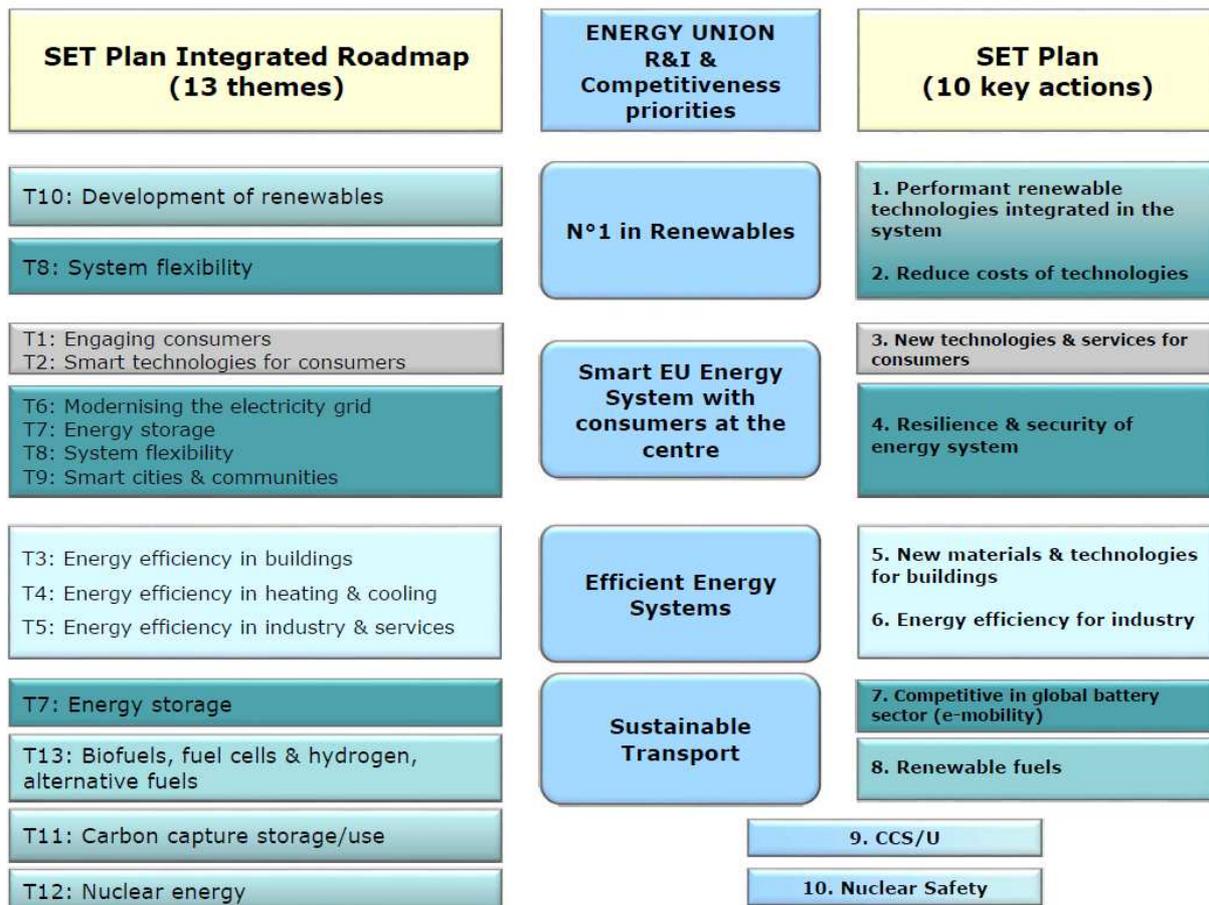


Figure 2: SET Plan Strategic plan for energy technologies aiming at developing an economy based on low coal consumption. It was presented by the European Commission in November 2007

In Italy we can identify two different approaches followed by Regional and Municipal Authorities towards Smart City.

The first and most widespread approach faces one or more specific sectors of the urban system: mobility, environment, energy, economy etc. The second approach, that we may define as holistic, considers our city as a system able to support and spread innovation. The analysis of several case studies available in Italy highlights that the idea to change the traditional management model of a city according to the model of Smart City requires, as proved by some recent success stories, the need to identify both a shared scenario of future urban development and an internal or external body able to work and promote the development of a Smart City.

The role of this body, that may be a department of the Municipal Administration or an Association or Foundation of which the Municipality is part, is to outline an organisational structure, operational methods and objectives by involving institutions, research bodies, industrial and financial players interested in participating in this new development model for urban and territorial policies.

A group of big cities like Genoa, Turin, Bari, Milan, Florence launched structured paths towards the Smart City based on a holistic approach to network projects and measures, as well as multi-level governance arrangements among representatives of businesses, banks, research and culture.

The Italian Ministry of Economic Development MISE created in 2015 a working group for Smart City in order to implement an effective industrial policy and overcome implementation-related problems of projects concerning Municipalities. A guideline by MISE dated 25 February 2016 was approved to develop the industrial policy on Smart Cities. Three priorities are identified. First priority: promote, through the Smart City, competitiveness, growth, employment and sustainable development. Second priority: make Italy an attractive country to implement the most modern models of Smart City. Third priority: increase synergy in the use of financial resources and improve the regulatory framework for Smart Cities. To implement this programme 14 new metropolitan Cities were selected together with a pilot neighbourhood within each of them. The initial funds amount to 65 million Euro. This programme aims at improving, in the selected pilot neighbourhoods, infrastructures and energy services as well as spread ultra-wide band technology. These projects must be able to cope with market demand. Big tenders are envisaged to meet the innovation needs of local administrations in metropolitan cities.

4. Genova Smart City

4.1 Organisation and objectives of the Association Genova Smart City

In 2010 the Municipality of Genoa, 586,655 inhabitants in December 2015, created the Association Genova Smart City after confirming that the world of research, industry, institutions and finance shared the concept of Smart City.

The Association was created upon initiative of the Municipality of Genoa, University of Genoa and Enel Distribuzione spa. Today it has ninety private and public members. The Municipal Administration referred to the concept of Smart City "Genova Smart City to improve the quality of life through economic sustainable development based on research, innovation, technology and local leadership in a process of integrated planning."

The Association Genova Smart City has the following objectives:

1. Improvement of the quality of life
2. Environmental protection, compliance with and overcoming of the environmental and energy objectives of the Kyoto Protocol
3. Economic development and employment growth
4. Support of research and cooperation between research, innovation and businesses
5. Contribution to the compliance with the Covenant of Mayors promoted by the EU
6. Contribution in the participation to European calls for proposals through the cooperation with companies members of Genova Smart City
7. Promote the sharing and pursue of the objectives set by the Association Genova Smart City by companies and other economic and institutional players
8. Promote the implementation of projects by the members of the Association.

The Municipality of Genoa signed in 2013 a Memorandum of Understanding with the Municipalities of Milan and Turin to cooperate on a process to develop a Smart City. The

three Municipal Administrations developed a document called "Growing Together. Smart City main case studies and experiences" that shows the main results obtained by the three Municipal Administrations in this field. These Municipalities have identified the field of Smart City as a technologically advanced sector that can create opportunities for Italian companies with highly-technological products to become leaders in Italy and abroad.

The Municipality of Genoa signed some Memorandum of Understanding that involve some companies in the feasibility study of specific projects.

1. Asea Brown Boveri ABB: smart healthcare facility, transparent laboratory of technologies, green port 2. Elkrom: small wind turbines and smart sport facilities 3. Enel: development of smart grids, smart energy meters, renewable energy sources 4. Ericsson: Smart Mobility 5. Selex ES: study of energy consumption by the skyscraper in Genoa called "Il Matitone", safety study with the voluntary participation in the area Maddalena of the old town centre, testing of the hydrogeological monitoring of landslides 6. Siemens: smart historical buildings, green airport, green harbour, urban mobility 7. Telecom Italia: smart school, micro trenching for the installation of optical fibre networks 8. Toshiba Transmission & Distribution Europe: energy optimization of waterways, museums and smart sport facilities.



Figure 3: The skyscraper called "Il Matitone" that hosts some offices of the Municipality of Genoa was built in 1992 and is located close to the Ferries Terminal in San Benigno district. The Association Genova Smart City promoted, through the local company Selex ES, a study to optimise energy consumption by the building. Source: G. Sergi, 2016

4.2 Tools for financing the activities of Genova Smart City

The Association Genova Smart City has worked to take part in national and International calls for proposals on projects concerning the issue of Smart City. These calls for proposals are published by Italian Ministries, the EU and other International bodies. This activity is based on technical skills of the Municipal Administration as well as on the cooperation with the local engineering firm D'Appolonia spa of the Group Registro Navale Italiano Rina which has a great experience in the participation in EU calls for proposals. Up to now the Municipality of Genoa has taken part in 50 projects launched and funded mainly by the EU and concerning the Smart City.

4.3 Some of the most meaningful projects concerning Genova Smart City

"Decision Theatre" start of the project in 2014 and completion in 2015. It concerns the field of planning. The aim of the project is the creation of a cloud platform to support the practices of Smart Government. The aim is creating models that can use the database of the Public Administration to support strategic planning of development policies for Smart Cities. The project "Decision Theatre" therefore aims at developing a support system for strategic planning in the medium and long-term for Smart Cities in the areas of energy, welfare and safety. The Municipality of Genoa is one of the project partners, the Municipality of Turin is the reference Municipality and the lead partner is the USA company SAS Institute having his Italian seat at Milan. The overall cost of the project is Euro 8,875,000. Financing source Call for Proposals by the Ministry of University Smart Cities and Communities 2012.

"Transform" beginning of the project in 2013 and completion in 2016. It concerns the area of planning. The aim of the project is to identify a method to change a city into a Smart City, based on strategic planning and practical experience, to develop a handbook of Smart Cities. The Municipality of Genoa is partner of the project, the lead partner is the Municipality of Hamburg. The overall cost of this project is Euro 5,611,852. The Municipality of Genoa has obtained an amount of Euro 674,000. Financing sources: EU 7th Framework Programme on Research and Technological Development.

"R2Cities" beginning of the project in 2013 and completion in 2017. It refers to the area of energy. The Municipality of Genoa has identified three settlements of public residential housing built years ago on an overall surface of 57,000 square meters. The aim of this project is to develop a method for the energy upgrading of buildings that allow them to become near zero energy buildings. Pilot project in the residential complex "Le lavatrici" in Genova Prà with 370 apartments. Genoa is a partner of the research project coordinated by the Spanish Foundation Cartif. Overall cost of the project Euro 15,000,000. The Municipality of Genoa obtained an amount of Euro 2,486,000. Financing sources: EU Funds 7th Framework Programme Research and Technological Development.

"Radical" beginning of the project in 2013 and completion in 2016. It concerns the area of planning. This project will allow the development and implementation of services using Internet technologies aimed at Internet of Things and Social Network. The platform Radical will develop and implement pilot projects in the following areas: cycling safety; green products management; data journalism; participatory urbanism; augmented reality; eco-consciousness; commercial and transactional data for pedestrian flows. The Municipality of Genoa is a partner of the project, the lead partner is Atos, a local economic entity. Overall

cost of the project: Euro 2,751,000. The Municipality of Genoa obtained an amount of Euro 205,000.

"Electra" beginning of the project in 2013 and completion in 2017. It refers to the area of mobility. Through this project they intend to test an innovative model to develop sustainable mobility in areas where there is a widespread use of motor-vehicles, mainly scooters, for example Genoa, to give solutions for the mobility of inhabitants and businesses. Promote and create the conditions for the development of electrical mobility, promoting the market of two-wheel vehicles. The objective is to raise the awareness of citizens, tourists, workers and students about the use of electrical scooters.



*Figure 4: Genoa - parking area for scooters in Dante square. In the background the medieval town.
Source: G. Sergi, 2016*

Sharing systems will be studied and economic operators will be involved to implement medium and long-term hiring systems. The number of charging points for electrical vehicles will be increased and shopping centres, large retailers will be involved. The lead partner is Genoa Municipality. Overall cost of the project: Euro 1,266,186. Financing sources EU Programme Intelligent Energy Europe.

5. Savona Smart City

The experience of Smart City in Savona was launched to allow the Municipality, 61,000 residents in 2016, to coordinate and integrate several initiatives and improve dialogue as well exchange of information with citizens, involving them in choices to be made through the new municipal tool "Insieme per Savona Smart".

The objective of this tool is to start a dialogue with all stakeholders in this territory concerning the possibility to analyse different proposals based on municipal, provincial and regional planning documents. Issues that are regarded as a priority by the Municipality of Savona for

the realization of a Smart City are: implementation of the Digital Agenda, implementation of programmes concerning Smart Energy, in relation to which some projects have already been launched, included in PAES Action Plan for Sustainable Energy.

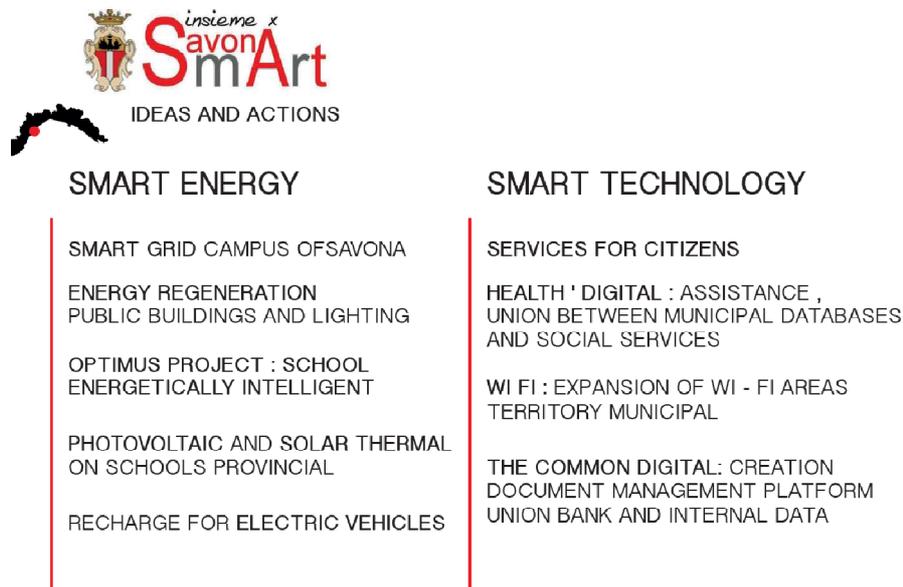


Figure 5: Ideas and actions for Savona Smart City, Municipality of Savona

The Municipality of Savona has obtained important results in the area of Smart Energy Grid and some projects in the area of Smart Technology: Infomobility and so on.

The Municipal Administration has started a path towards Savona Smart City in cooperation with IPS Savona Production Sites.

5.1 Smart Environment: Smart Polygeneration Microgrid

The Smart Polygeneration Microgrid SPM concerning the University Campus in Savona, in Liguria, is one of the first pilot systems of smart grid in Europe, developed by Siemens Italia based on an agreement signed with the University of Genoa, funded by 2,4 million Euro by MIUR – Ministry of University and Research.

The area chosen by the project is occupied by three university departments: engineering, science of communication and sports science and attended by about 2,000 people: students, professors and technical-administration personnel covering an overall surface of 60 thousand square meters. The microgrid is an experimental infrastructure consisting in a highly-efficient gas micro-turbine for the simultaneous production of electricity and thermal energy, a photovoltaic plant on the roof, a concentration thermodynamic solar plant, two recharge stations for electrical vehicles and a system for electrochemical storage consisting in a container equipped with high-performance batteries.

This system will have positive effects on the environment thanks to the overall reduction of CO₂, as well as economic benefits since, as a result of produced thermal and electrical energy, it will be possible to reduce supplies from external providers.

The whole area is characterised by sustainability as a result of the Smart Microgrid, which manages the production of needed energy, and through the Decentralized Energy Management System Dems monitors the overall consumption and generation from renewable sources, in order to plan the functioning and manage the available generating

units in the best way. The Smart Polygeneration Microgrid in Savona is included among the 100 energy landmarks presented at the Conference on Climate in Paris in 2015 and is a laboratory to test the Smart City that can be introduced in the future on a wider scale in an urban area with differentiated functions, that can be independent in terms of electrical and heating consumption.

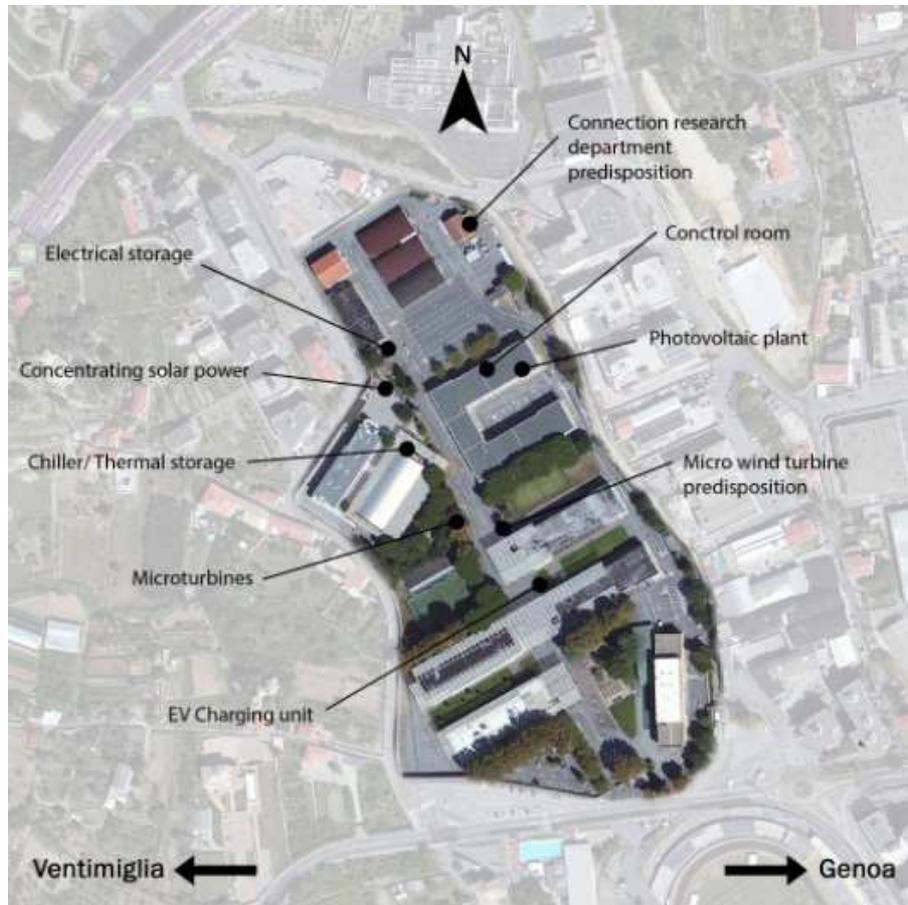


Figure 6: Campus of Savona, University of Genoa. Source: F. Granara, 2016



Figure 7: The trigeneneration plant, Campus of Savona University of Genoa. Source: F. Granara, 2016

The Municipal Council of Savona, considering the excellent results of this projects, approved the revision of the Municipal Urban Plan in order to test the Micro Grid in the residential area "Binario Blu" to optimised the management of energy produced from renewable sources and high-efficiency systems.

6. La Spezia Smart City

The Project "La Spezia 20.20 – La città diventa smart" presented in November 2015 is included in a framework for strategic planning that the Municipal Administration launched in accordance with the main planning tools: Integrated Plan for Mobility, Energy Plan, Covenant



Figure 8: The structure of Masterplan "La Spezia Smart City", 2015

of Mayors and PAES, New Construction Regulations and Amendments to PUC City Urban Plan along a path of integrated sustainable planning. As of today the Municipality of La Spezia, 94,000 residents in 2014, has started a planning activity that has led to the drawing

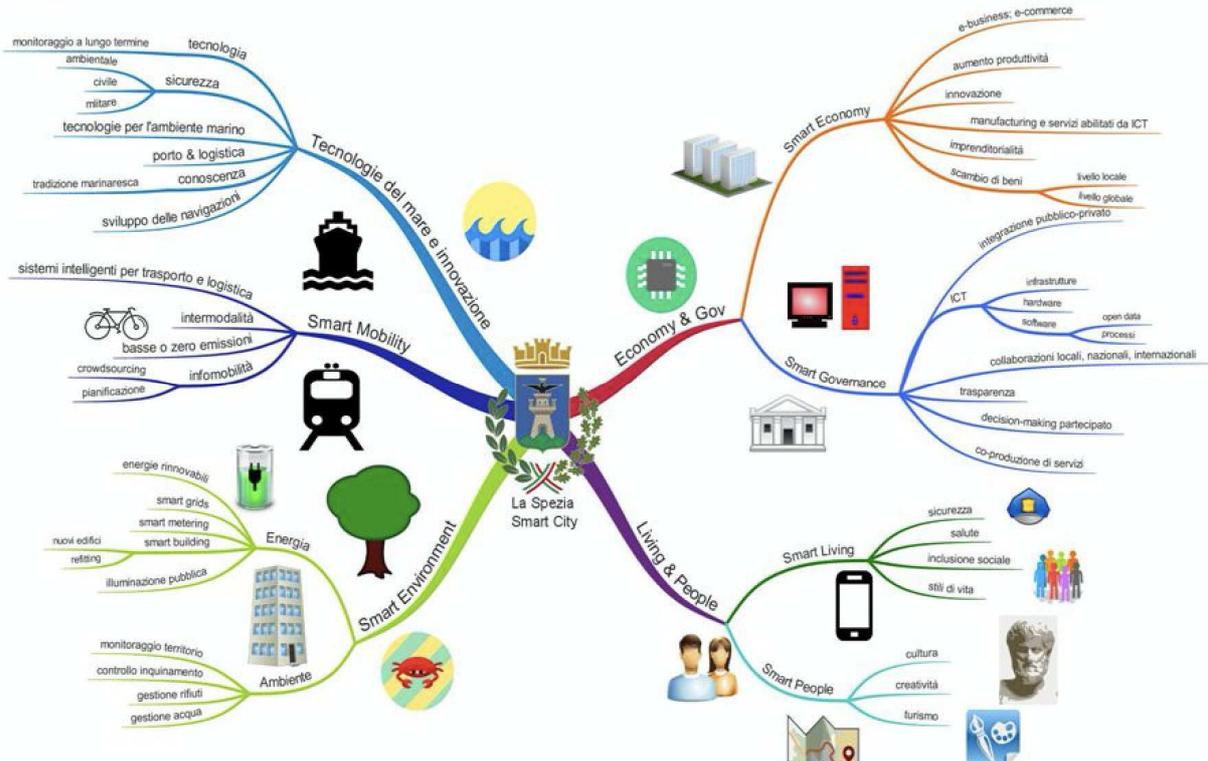


Figure 9: La Spezia Smart City Masterplan, 2015. The structure of work groups

up of the La Spezia Smart City Masterplan, in cooperation with research bodies, public institutions, businesses and associations to change the city and its wider area into a smart city. Through the project "La Spezia 20.20" the Municipality has defined a new development model based on innovative technologies and good practices, acting as a model for medium-sized Municipalities in Italy. The Municipality of La Spezia has started an important process aimed at defining a new vision of sustainable and smart territorial development, identifying six factors for development: mobility, environment, economy, technology, welfare and governance.

6.1 Smart Mobility: Project E Bike 0 and Project Seabus

The Municipality of La Spezia has joined the experimental project regarding high-efficiency e-bikes E Bike 0, getting permission to realize four racks for parking bikes and twenty prototypes of electric bikes, useful for employees' mobility. The bikes are equipped with a GPS Global Positioning System to track travels for statistical purposes and mainly addressed to directors and municipal employees who need to travel short distances to carry out their job.

The Seabus project is an innovative transport system by sea based on a hybrid engines, whose aim is to contribute to passengers' travels from local maritime Municipalities to La Spezia on for working, as well as to promote the tourist sector attracting a great number of tourist to the most fascinating areas.

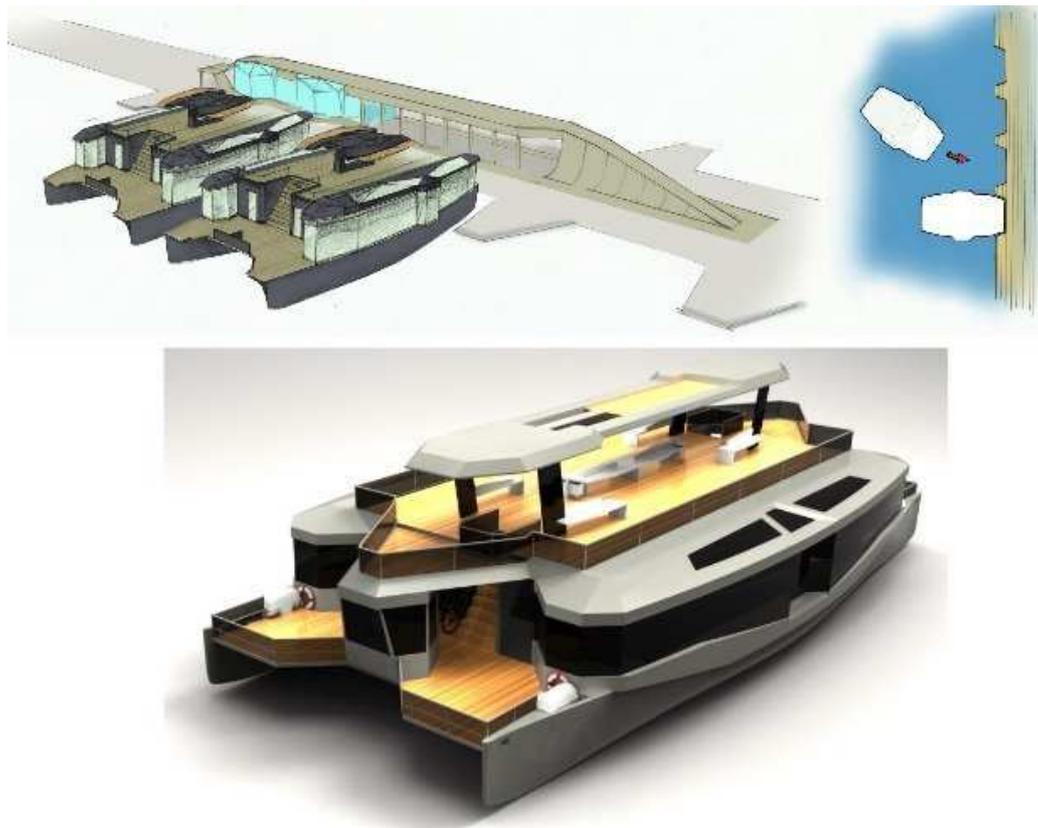


Figure 10: Project Seabus promoted by Promostudi La Spezia. It is a cooperation between the university centre G.Marconi of the University of Genoa and the Polytechnic University of Milan. People in charge: Prof. M. Musio-Sale and Prof. M.I. Zigniego, 2014

The system has turned out to be applicable to any port cities and it therefore raised considerable interest during MariTech in Vancouver and also during Electric and Hybrid Marine Expo in Amsterdam. The project Seabus was included in the programme UE Horizon 2020 in 2014 and last year it was selected among the most interesting 50 projects.

Both projects aim at increasing the level of sustainable mobility by reducing emissions into the atmosphere of polluting substances and reducing road traffic.

6.2 Smart Energy: Project Smart Energy Community and Project Green Port

The Project Smart Energy Community aims at creating a community model on an urban scale able to organise power utilities as unities of production, consumption and storage, in an efficient way thus reducing supply from external sources of energy.

Technologies involved in the project for the production of renewable energy, such as photovoltaic thermal cogeneration plants, solar cooling, new generations of accumulators, are developed within a community that can dynamically interact with the platform favouring self-consumption and increasing comfort in apartments. This measure will be beneficial in terms of urban upgrading and energy efficiency of buildings as well as a general increase in safety and virtuous behaviours like reduction of consumption and an aware use of energy.

La Spezia is included in the project Green Port that will make it become the first Italian "green" port together with Venice, through the electrification of docks for power supply to ships, the reduction of environmental and noise pollution, mobility by electrical vehicles and means of transport in the port areas as well as the reduction of energy consumption through led low-consumption lighting systems.

In particular the project provides for the installation of special sound-absorbing barriers in places close to the operational area of the port as well as the electrification of the dock in order to switch off on board generators. The project Green Port includes the study of electrical mobility systems as well as the development of renewable sources, solar and wind energy, to become a sustainable model to be implemented in ports.

References

Asea Brown Boveri e European House-Ambrosetti (2012) Smart Cities in Italia. Available at: <http://www.ambrosetti.eu> (accessed 13 June 2016)

Riva Sanseverino, Eleonora et alii (edited by) (2012) Atlante delle Smart City, Milano: F. Angeli

Anci Osservatorio Nazionale Smart City (2013) Vademecum per la città intelligente. Available at: <http://osservatoriosmartcity.it/> (accessed 13 June 2016)

Comune di La Spezia (2015) La Spezia Smart City Masterplan. Available at: <http://www.comune.laspezia.it/> (accessed 13 June 2016)

Testoni, Chiara (2016) Towards smart city. Amministrazione pubblica e città di media dimensione: strategie di governance per uno sviluppo intelligente sostenibile e inclusivo dei territori, Milano: F. Angeli

Ernst&Young (2016) Italia Smart. Rapporto Smart City Index 2016. Available at: <http://www.ey.com> (accessed 13 June 2016)

Smart Mobility: Opportunities and Challenges of integrating intelligent transport systems for enhanced transportation systems performance

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Abstract/Short abstract *Smart mobility can be argued to be one of the critical components for the functioning of urban areas. The integration of intelligent transport systems (ITS) into transportation demand and supply management is instructive in efforts aimed at securing better transportation and land use planning responses in the built environment. However, despite the promise that appropriate application of intelligent transportation systems hold for cities, mixed results exist in terms of experience from both developing and developed countries. Making use of the case study methodology drawn from both developing and developed countries, opportunities and challenges of integrating intelligent transport systems in cities are presented. The study findings indicate critical success factors necessary for successful intelligent transportation systems deployment. Lack or absence of these critical factors constitute challenges that needs to be overcome if the full benefits of intelligent transportation systems are to be realised. The major threats to intelligent transportation systems relate to addressing systematic and systemic issues of systems interdependency, lack of sustainable funding models, political leadership, transportation network optimisation and institutional strengthening. In making recommendations, we suggest strategies and a framework for enhancing the performance of transportation systems through the use of intelligent transport systems.*

1. Introduction.

Mobility is an essential aspect in the functioning of urban areas; unfortunately the mobility systems of major urban areas are under strain. In the face of the mobility challenges, urban areas need to develop and adopt new strategies for management of traffic and thus the introduction of smart mobility (Clara.2009.p.67). The world population is becoming increasingly city based, with 50% or 3.5 billion people living in urban areas. It is expected that by the year 2050, 70% of the world population will be living in urban areas. As a result, urban mobility is one of the toughest challenges that cities face (Jean-luc.2002.p 13). Improved accessibility requires innovative and smart solutions to remove economic and social barriers that improve access to regular services in all appropriate transport modes for all people including disabled and elderly. Easy access to efficient transportation services is essential to the quality of life in urban areas. The integration of intelligent transport system (ITS) into transport planning as response to the challenges of transport, it has been hailed as

tool for achieving smart mobility as an objective of smart cities. Intelligent transport systems (ITS) are those in which information, data processing, communication, and sensor technologies are applied to vehicles (including trains, aircraft and ships), infrastructure, operating and management systems, to provide benefits for transport service users (Sanchyen,2011,p.32). There are various challenges and opportunities that can be encountered in the integration of intelligent transport systems in transport planning for enhanced transport systems performance.

1.1. *Definition of key terms.*

In order to avoid confusion and improve clarity of the paper, it was seen prudent to provide common definition of the usage of key terms used throughout this paper.

Smart mobility can be defined as the use of information and communication technologies to improve the mobility systems, enhancing their efficiency and improving their competitiveness (Dirk.and Enrica, 2015, p. 2)

Intelligent Transportation Systems (ITS) can be defined as the application of advanced information and communications technology to surface transportation in order to achieve enhanced safety and mobility while reducing the environmental impact of transportation (Lelitha ,2010.p. 6)

Transportation systems can be defined as facilities consisting of the means and equipment necessary for the movement of goods and passengers (Mathew, 2014, p. 13)

2. General objectives

The aim of the study upon which this paper is based on is to evaluate the challenges and opportunities of integrating intelligent transport system into transport planning for achieving smart mobility.

2.1. *The specific objectives*

These were namely;

- To investigate the procedures to adhere to for integrating intelligent transport systems into transport planning;
- To review case studies of successful and failed integration of intelligent transport into transport systems to draw lessons from; and
- To recommend strategies for better improved integration of intelligent transport systems into transport planning for enhanced transport systems performance.

It is prudent to note that transport systems are evolving continuously and rapidly. Today's

transport system differs greatly from the transport systems of a few decades ago. The shift in the transport systems paradigm is also clearly emerging.. Transport is no longer seen as a value in its own right but rather as an enabler for people mobility and logistics. This shift of paradigm poses challenges but it also opens great possibilities for society and businesses. These possibilities create niches for new innovations and services that different stakeholders (public and private sector, transport users, etc.) should pursue from their respective positions (Dameri, 2014. p. 44).

3. Methodology.

The empirical data used in this study stems from the review of case studies of the opportunities and challenges of integrating intelligent transport system into transport planning. A qualitative comparative analysis (QCA) methodology was used for the study. Various case studies from developed and developing countries were reviewed to acquire an understanding of the opportunities and challenges of integrating intelligent transport systems into transport planning. Various literature reviewed were obtained through several sources which included Database such as Sage, directory of open access journal, web of knowledge, JSTOR, SCOPUS, SABINET, Thomson Reuters and science direct. Internet website of companies such as ARUP,IBM were visited to access additional secondary data on the study topic.

4. Literature review

Intelligent transport system can offer a wide variety of opportunities in enhancing transportation system performance. However to fully benefit from those opportunities, there are challenges that have to be overcome in the deployment of intelligent transport system aimed at achieving smart mobility. These challenges have to do with social, economic, spatial, environmental and political reasons.

Nevertheless, Smart mobility integrated various intelligent transport systems infrastructure such as physical infrastructure, operational technologies, and communication and information technologies for improved transportation systems (Charbel, 2013, p.25). Figure 1 illustrates the structure and interconnection of smart mobility and intelligent transport systems.

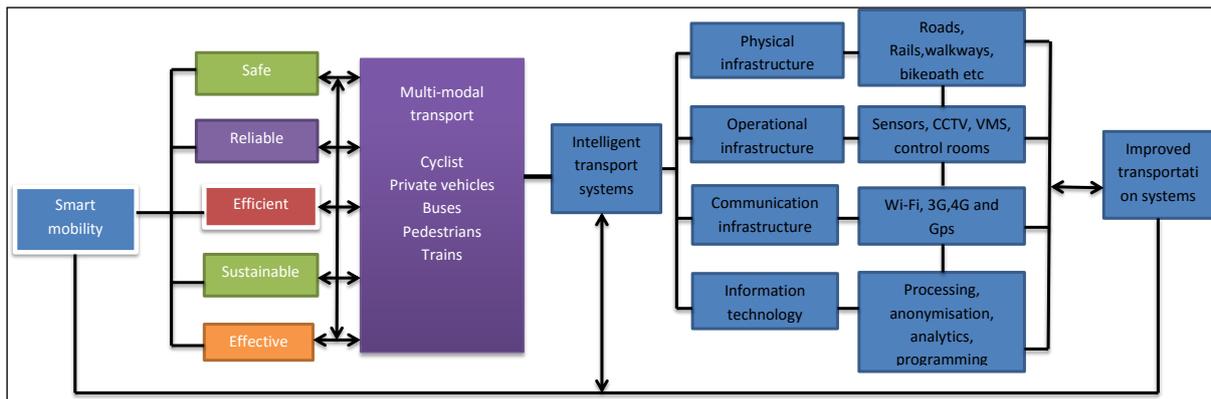


Figure 1. Smart mobility framework

Source (Author conceptualization, 2016)

From Figure 1 we can deduce that there are strong links between smart mobility, transportation systems performance and intelligent transport systems. Furthermore, Figure 2 outlines the implications of integrating intelligent transport system for transport management. In Figure 2, we can deduce the associated benefits and challenges that can be achieved in pursuit of the goal to promote smart mobility in urban areas of developing and developed countries.

Authors	Geographical scale	Smart mobility implications	Transport system performance	Intelligent transport system	Remarks
Dirk L. and Enrica.P .2015	Belgium	The evolution of smart mobility through technology centre and consumer centre approach.	A smart integrated approach for the governance of smart cities.	Need for radical changes in innovations for ITS to be consumer oriented.	To achieve smart mobility there is a need to radically change ITS so that it is designed for mobility and systems are consumer (users) oriented than infrastructure oriented.
Tierra B, Kelvin C, Domenica C, Andre D, Andrew R, Rick R and Tim S.2016	Austria, China, Japan, Latvia, Nigeria,Poland and Uganda.	The global smart urban mobility infrastructure and services market is expected to grow from \$5.1 billion in 2015 to \$25.1 billion in 2024.	Improved funding models for transport systems need to be put in place.	The implementation of ITS infrastructure will be easy as over time economies of scale will make the costs of acquiring ITS affordable	The development of the smart urban mobility infrastructure will result in developing countries acquiring ITS infrastructure with ease and thereby achieving transition towards smart mobility scenarios.
	Copenhagen	Various modes of transport use various set of data and reforms in policy development need to take that into account.	The limited interconnection of various systems of ITS makes it difficult to provide integrated strategic management of traffic.	ITS is central element in the concept of Smart mobility, where data from a variety of sources can be linked and used for new solutions and services.	The integration of data from various modes of transport is the core of the development and implementation of smart mobility through ITS.
Rajnish Tiwari.2012	India	Lack of effective and efficient mediums of mobility causes loss of productivity and stifles economic growth and thus need for smart mobility solutions.	The management of public transport can be enhanced through ITS solutions.	The development of affordable-driven frugal innovations presents an excellent opportunity for Indo-German collaboration in open global innovation networks.	The mobility challenges in India provide opportunities for ITS innovations that can be implemented in developing countries.
John Walker.2013	America, India and China	The improvement of reliable connections for enhanced multi-modal transport is the key to achieving smart mobility.	The use of cloud based or managed smart city services, is likely to be more cost-effective than deploying the City's own dedicated infrastructure.	Mobile operators and vendors have an important role to play in ITS and would encourage the ITS ecosystem to engage with their local mobile operators.	Mobile devices allow for easy access of transportation data and thus are important for integration into ITS development.
Andrew Pickford.2011	London	Smart mobility master plan with the integration of ITS is necessary for transportation management.	The move from integrated transport systems to integrated transport services is expected to lead to an upgraded transport system performance.	The need for broad integrated deployment of ITS for improved mobility is a critical and catalytic initiative..	Disintegrated deployment of ITS leads to ineffective transportation systems.
Pat Weston.2010	Caltrans	The use of location efficiency models as the framework of smart mobility is fundamental in moving towards a green economy in future.	Transportation systems should influence the reduction of overall carbon development footprint of urban areas	ITS needs to improve regional accessibility and community design through easy dissemination of information.	Land use efficiency is significant in smart mobility as it allows for improved regional accessibility with less travelling required.
Wolfgang S, Michael K and André K.2014	Paris	A smart mobility approach based on the concept of sharing-instead –of owning is a viable option in tackling modern commuting challenges in cities.	Lack of modelling studies providing impacts on transport demand compromises efforts aimed at improving system performance.	ICT technologies deployed on front-end applications (smart-phones, key card systems for vehicles) and on back-end (reservation and payment systems) are available for the smart transport sharing concept.	The concept of sharing transportation services such as cars, bikes and bicycles underpins the concept of smart mobility.

Figure 2: Linkages between smart mobility, transportation and systems performance: Evidence from Literature.

Source (Author conceptualization, 2016)

Project name	Project description	Success	Obstacles	Opportunities	Remarks
SIRIUS/IPER	The SIRIUS was aimed at improving advanced traffic management and information services. This project incorporated real-time systems condition data collection and advanced traffic management models in TDM.	Energy saving are in the order of 0.5 million euros per year. Benefits of incident detection can be estimated at 1.5 M euros per year. Time saving due to congestion information on change able signs.	Cost overruns due to length project/project duration. Lack of human capita with adequate skills. Public-private partnership not clearly outlined.	Skills empowerment in ITS can lead to better management of traffic. A comprehensive framework/policy for PPS in ITS should be developed.	The use of real-time traffic conditions allows Sirius to manage traffic effectively, efficiently and respond to incidents in a much more timely manner than what manual systems can achieve
Lepilote/loreiv (Marseilles)	Lorieiv is an advanced transit management program, internal primary bus/tram/metro operator in the marseills region-RTM. Le pilot is a multi-modal trip planner with links to loreiv. Some applications are still evolving but in use (even if manually).	More efficient internal management. Reduced travel time for buses. Better and more timely response to over-demand situations. Improved customer services and satisfaction.	Dis-integrated systems for management of various modes of transport. Lack of awareness of the system by users. Covers a few urban areas in the Marseilles region.	Reduce cost in response to incident management. Energy efficiency of public transport due to reduced travel time. A fast and reliable multi-modal transport due to pre-planning .	Multi-modal transport can be better managed and their efficiency increased with the utilization of ITS as a management tool.
T-card. Trondheim (Norway),	T-card is an electronic smart card for public transport in Trondheim. This is a region-wide scheme in which customers can use one smartcard for all the modes of public transport.	Reduction of boarding and paying time by 6.8 seconds per passenger An average 10% reduction on travel time a benefit-cost ratio of 1.5 (meaning that 1€ spent generates benefits of 2.5€)	Increased technical faults with increased use of the system. Intrusion on privacy of citizen. Change of commuters travel behaviour.	Use of mobile applications as method of payment. Innovation in smart technology. The use of credit card for payment on various modes of transport within the same city.	The system allows for easy collection of data of commuters. This allows mass transit operators to improve their services to meet the needs of commuters with ease.

Figure 3: Case studies related to ITS.
Source (Author conceptualization, 2016.)

5. Discussion of results and findings.

There are various challenges and opportunities that are associated with the integration of intelligent transport system into transport system management. These will be outlined and discussed in this section.

The identified opportunities and challenges in using the intelligent transport system, have led us to develop a framework of analysis as depicted in figure 4.

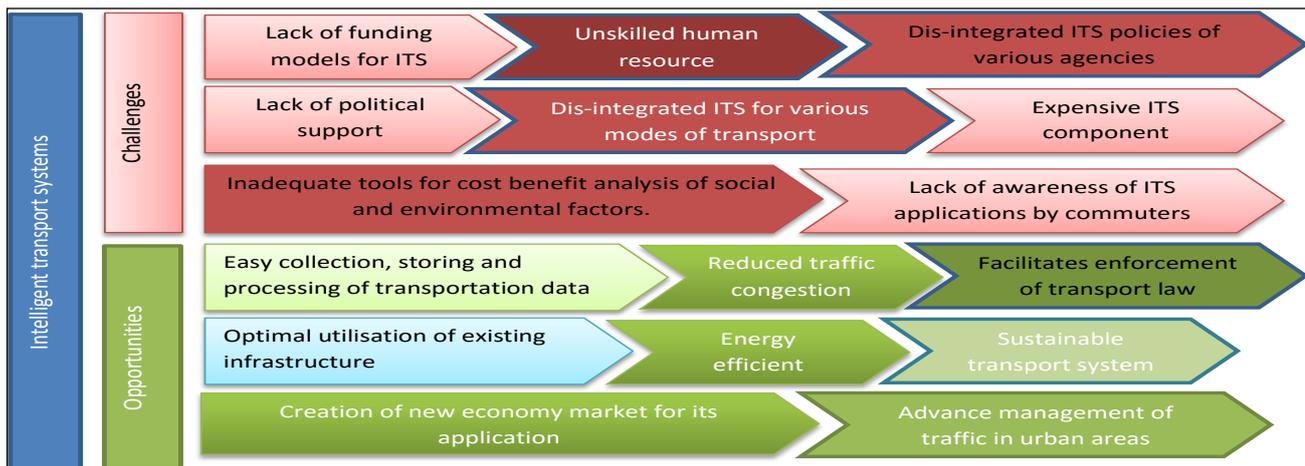


Figure 4 Framework of analysis for ITS
Source (Adopted from Tefo, 2015.p.19)

From figure 4, we can deduce that an ITS framework of analysis is made up of a number of systems. These systems are dependent and inter-linked for performance.

5.1. Discussion of challenges.

The study findings indicate that most previous implementation of intelligent transport systems in urban areas have not integrated the individual ITS component's. The study found that transportation agencies were implementing intelligent transport system to improve the efficiency of their agencies but were not integrating these technologies with other transportation agencies.

Since individual and private manufactures can also pay for a substantial portion of the deployment of intelligent transport system cost, the creation of viable public private partnership in intelligent transport is recommended. However, the study found that partnership can sometimes be ineffective, inflexible and vulnerable to pursuing stakeholders own interest. Acceptance by consumers in the market is crucial in the fate of intelligent transport user's service. Yet efforts have not been sufficiently made to evaluate the user acceptance of these technologies. It is partially due to the fact that most suppliers of these technologies are public official who tend to have less understanding concerning the market mechanism and knowledge of marketing issues.

Another issue critical in achieving smart mobility through the integration of intelligent transport systems into transport planning is the lack of knowledge and awareness on intelligent transport systems. Most of the public officials being in charge of transportation do not have the technical knowledge and skills required for operating and managing the information and computing technologies. Furthermore, a lack of awareness about intelligent transport systems among politicians and agency managers is identified as a barrier to successful intelligent infrastructure deployment at the local level.

The lack of analysis in measuring the cost and benefit of integrating intelligent transport systems in urban areas is a major concern. In addition there has been little effort to address the socio-economic and environmental issues associated with intelligent transport systems. Most of the intelligent transport infrastructure evaluations projects have been predicted on micro-level transportation network simulations which are sometimes unreliable. If there are no adequate and clear explanations on economic, social and environmental benefits, it is difficult for transportation managers to justify expenditure on intelligent transport system deployment in urban areas.

Another major problem is the lack of funding at the national and local level for integration of intelligent transport systems. It is interconnected with other obstacles and so is particularly important for adequate funding to be provided. Adequate funding will provide technical training for the officials, to conduct studies about the impacts on urban area and disseminate the information to service users. In many urban areas, due to the need to maintain the deteriorating roads and bridges, local governments are left with little funding to actually implement intelligent transport systems projects. In addition to that, the local government would not want to make large capital investment in the implementation of the intelligent transport projects as they would struggle with acquiring the funding for the maintenance of the project.

A cost-effective ITS deployment can be fostered by (cost-sharing) public-private partnerships, targeted at creating market opportunities for the deployment of multi-purposes equipment and applications. Moreover, using joint public procurement and innovative procurement can help authorities to generate cost savings (e.g. obtain lower prices, and save administrative costs) and contribute to capacity building (e.g. via sharing of skills and expertise among authorities).

A non-discriminatory access to traffic and travel data, notably via multimodal transport databases, and clear rules for data sharing among public and private stakeholders constitute a facilitator to a number of ITS applications (e.g. multimodal information, traffic management). It can also stimulate the emergence of new business opportunities and new

services for citizens, enhance data quality, and support sustainable urban mobility policy making, implementation, monitoring and evaluation.

5.2. *Discussion of opportunities.*

Real-time multimodal travel and traffic information can help in achieving a better modal integration, and optimising freight routing and deliveries. This is important in alleviating serious bottlenecks along the networks, reducing congestion, improving air quality and quality of life as a whole. Such ITS applications can also help to better manage demand and network capacity, with benefits for end-users (i.e. better services) and operators (i.e. optimisation of performance and better cost efficiency).

Traffic management measures can help to reduce congestion through better management of traffic operations. In this context ITS can help to reduce emissions and save energy through better demand management. While access management schemes (including road user charging) can be implemented without an ITS component, intelligent systems allow for more efficiency and a better return on investment, through automation of processes and better enforcement of rules.

Multimodal smart ticketing when integrated with information services could be used to provide statistical data on passengers' trips to transport operators (duly respecting privacy and anonymity requirements), in order to optimise networks' usage and public transport operations. For instance, smart ticketing solutions help collecting fares more efficiently, thus reducing fraud, and contribute to the increase of the commercial speed of public transport, through the optimisation of loading times. The new ticketing channels are generally cheaper to operate than the traditional ones, if deployed following a well thought migration strategy. Furthermore, smart ticketing can be used to improve parking management (i.e. booking, access and payment).

ITS tools such as CCTV and ANPR technologies can strongly facilitate enforcement. These tools have also made electronic tolling, road user charging and low emission zones viable options, helping to achieve reduction of congestion, promote modal shift and improve air quality within the largest urban areas..

New in-vehicle safety and driver assistance systems intervene before the accident happens. Given that more than 90% of all accidents are caused by human error, in-vehicles devices, potentially able to communicate with the surrounding environment/ infrastructure (i.e. cooperative systems), are essential to enhance road safety.

6. Recommendations.

The key factors for successful ITS deployment are co-operation, partnership and interoperability. Other issues that needs to be addressed include productive project management; organisational issues that need to be addressed; how ITS can be used to provide good quality and targeted information to individual travellers, which, in turn can help to optimise network performance; balancing automated processes with human intervention; and the role of standards and harmonisation.

The recommendations for success are the following:

- The need for effective multi agency co-operation is critical in devising an ITS traffic management project. Any organisation wishing to establish a project should seek the active and productive participation of all relevant organisations, as often ITS projects can be complex and costly to procure and implement in isolation. Political problems associated with policy formulation and project implementation are often more challenging than technical problems.
- It is also essential to identify, define and allocate those management and project related tasks that are essential to the process of delivering a successful project.
- The most successful ITS traffic management policies, projects and systems are those that are focused on delivering relevant services and information to individual end users. In this regard, try to structure projects and channel resources that are bespoke to individual end users. In this way operation of the urban road network will also be optimised.

The effectiveness of ITS in urban traffic management and logistics can generally be increased by adoption of automated systems which are better equipped than humans to perform basic operational functions. Transport authorities are encouraged to try to identify and select those systems which maximise the potential for automated ITS systems to take on functions such as routine data processing and interpretation, which will allow human participation to be focused at the more strategic level.

Usage of standards can only be beneficial when implementing ITS traffic management projects. Standards are most productively used when they are not onerous but lead to the creation of features such as open platforms for IT technology, which are central to the successful development and future adoption of ITS based traffic management projects. The challenge is to balance the benefits that can be derived from application of standards without those standards being unduly proscriptive and stifling the creativity that ITS solutions can offer.

Developing countries are often at a disadvantage, relative to developed countries, in constructing the basic infrastructure that provides the foundation for building their economies and societies. This is largely due to the limited financial, technical, and engineering resources that developing countries have available. However, developing countries also have some advantages relative to developed countries, particularly when the infrastructure to be constructed has high IT content and the following specific recommendations are focused on developing countries. Figure 5 presents a summary of recommendations generated from this study for both developed and developing countries.

Institutional recommendations	Technical recommendations
New procurement rules are required for the purchase of software and electronic devices which are different from the rule for procuring generic infrastructure development	ITS application that need wired or wireless communications may use existing communication infrastructure to reduce the time and cost to introduce ITS.
ITS needs to be coordinated with existing laws and regulations and in some cases, new regulations and institutions have to be created.	A common data model is significant as ITS application is often comprised of systems that gather data from many sources and distribute results to many sources.
Provision must be made for training human resources to develop and administer ITS.	Communication standards for data exchange are needed, including data dictionaries, messages sets and protocols. These need to be firm enough to promote interoperability and flexible enough to accommodate rapid technological changes.
The viewpoints of consumers and other users need to be understood and incorporated into ITS deployment.	Standards, developing countries should look primarily to international standards programs as sources of ITS standards to adopt.
The cost of software and systems support from overseas is costly and cannot always provide adequate response time. Therefore, local software companies should be used as much as possible.	
Public-private partnerships should be considered as they provide an opportunity to pool resources to introduce ITS quicker than it would otherwise come about.	

Figure 5; Recommendations

Source (Adopted from Toshiyuki, 2014.p. 11)

7. Conclusion.

In conclusion the integration of intelligent transport systems into transport planning for achieving smart mobility require a rigorous approach if the full benefit from implementing the system is to be achieved. Various interesting findings emerged from the study such as lack of funding, lack of political support as key challenges acting as barriers in promoting the integration of intelligent transport systems for improved performance of transportation system in both developing and developed cities of this World. Thus it is necessary to develop strategies that a tailor made for developed and developing countries in the integration of intelligent transport systems into transport systems for achieving smart mobility.

8. References

Arena, M., Cheli, F., Zaninelli, D., Capasso, A., Lamedica, R., Piccolo, (2013) A.: Smart mobility for sustainability. In: AEIT Annual Conference 2013: Innovation and Scientific and Technical Culture for Development, AEIT (2013)

Clara B, Renuts P.D, Beatrice D. (2009) Smart mobility in smart cities. Action Taxonomy, ICT and public benefits. Department of economic and Business studies. University of Genova. Geno. Italy (2009).

Dameri, R.P. (2014): Comparing smart and digital city: initiatives and strategies in Amsterdam and Genoa. Are they digital and/or smart? In: Dameri, R.P., Rosenthal-Sabroux, C. (eds.) Smart City. How to Create Public and Economic Value with High Technology in Urban Space, pp. 45–88. Springer, Heidelberg (2014)

Enrica Papa and Dirk Lanwers, 2015. Smart mobility, beyond technological innovation : mobility governance for smarter cities and smart citizen. Department of civil engineering. Centre for mobility and spatial planning. Ghent University.

Jean-Luc (2002). Institutional, organisational factors for successful deployment of intelligent transport system (ITS). Pat conroy. University of California. (2002)

Kazimil Mzee and Emmanuel (2014). ITS Applications in Developing Countries: A Case Study of Bus Rapid Transit and Mobility Management Strategies in Dar es Salaam – Tanzania Philemon .Demzee Transportation Management College Dalian Maritime University, Dalian PR China (2014)

Nam, T., Pardo, T.A. (2011): Smart city as urban innovation: focusing on management, policy, and context. In: Proceedings of the 5th International Conference on Theory and Practice of Electronic Governance. ACM (2011)

Pearce, Vincent (2000). What have we learned about freeway, Incident and emergency management and electronic toll collection? In what have we learned about intelligent transport systems. che.U.S department of transport. December. (2000)

Rajnish Tiwari 2012 Smart Mobility for India: Needs, Opportunities & Challenges 1 Hamburg University of Technology Institute for Technology and Innovation Management Schwarzenbergstrasse, Hamburg, Germany

Sanchyen Cheon (2011). The deployment efforts for intelligent infrastructure and implication and obstacles: focusing on metropolitan intelligent transport system infrastructure. Department of transport engineering. University of Texas. (2011)

Urban core health vulnerability: assessment of carbon monoxide level in bida. Niger state.

'52ND ISOCARP CONFERENCE 2016'

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Abstract

Urban health challenges remain unquenchable in the cities of developing nations because of the continuous urbanisation experienced by these cities; yet urbanisation is not a bad phenomenon. Wilson (2015) submitted that unplanned urbanization brings risks of profound social instability, critical infrastructure, environment and health vulnerabilities. Carbon monoxide emission has been seen as a major environmental pollutant and a threat to health in urban core of developing nations. Carbon monoxide (CO) is one of many ubiquitous contaminants of our environment that requires prevention and control measures to ensure adequate protection of public health (James et al, 2000). Literature reveals that the health effects associated with long exposure to CO ranges from the more subtle cardiovascular and neurobehavioral effects at low concentrations and at high concentration. This leads to unconsciousness or death in the individual or groups of exposed people (WHO, 2000). The study aims at examining spatial differences in health vulnerability with the level of exposure to Carbon monoxide (CO) emission in the urban core of Bida, Nigeria. The study employs random sampling in selecting respondent from 8 locations that are spatially sampled from the core of the town. CO meter was used in the study and was mounted at safe places for duration of 8 hours for 3 days out of the days of the week. Mondays, Wednesdays and Saturdays were picked for carrying out the test. ArcGIS 10.0 software was used in buffering a radius of 200 meters that makes the sample jurisdiction for sampling of respondent from the location to determine the health characteristics of the dwellers and business owners. Spatial Auto regression was used in determining the most contributing effect and spatial variation of factors that determines dwellers health status. The result reveals that the average CO level from each sampled location in the urban core ranges between 37ppm to 65ppm against the recommendation of World Health Organisation (WHO) as cited by (James et al, 2000) which puts multi-hour ambient air-quality standard of 9ppm (10 mg/m³) CO at 8 hours which is intended to protect susceptible population groups from adverse effects resulting from CO exposures in the outdoor environment. Headache and dizziness were reported as the common health challenge symptoms by the dwellers from the sampled location as revealed by the outcome of the findings. The recommended limits for occupational exposure, ranges from 25 to 50ppm according to World Health Organisation. The study reveals that on street parking is a major contributor to the mass content of CO in the atmosphere of the location and thereby recommends that on street parking

should be checked and controlled so as to encourage the free flow of traffic. The vehicle Inspection officer should do more in restricting chronic polluting vehicle from plying the core of the city.

1.0 INTRODUCTION

Urban Centres are said to offer the highest and lowest quality of health for its inhabitants (WHO and UN Habitat, 2010) and yet health is valued universally as an essential prerequisite for a fulfilling and productive life (WHO, 2010b). Although it takes time to transform an urban health status, it could be achieved. Urban health challenges remains unquenchable in the cities of developing nations because of the continuous urbanisation experienced by these cities, yet urbanisation is not a bad phenomenal. Wilson (2015) submitted that unplanned urbanization brings risks of profound social instability, risks to critical infrastructure and environmental and health vulnerabilities which is as a result of varying short and long time effect of unplanned urbanisation.

The dynamic and complex natures of urban centres remain a reservoir of challenges. Most urban cores of developing nations are characterised by high population density leaving the cores to be slum within slum. Urban centres of developing cities have complex nature which is also characterised by the ambiguity of the facility shortage and uneven distribution of social amenities, lack of smart attribute and with little or no attention by stakeholders to checking the quality of livelihood in such cores. This has impacted the quality of life in the cores negatively. Facility layout and its utilization are characterised by lack of sustainable approach in these cores which turned this location to be highly vulnerable to the adverse effect of its 'planlessness'. WHO and UN Habitat, (2010) reported that recent rapid increase in the number of city dwellers has a great way and is a source of issues in global health status in the 21st century.

The vulnerability of most cores remains alarming and puts a demand of prompt attention as urban cores are believed to house more than half of the world's population. WHO and UN Habitat (2010) reports that a proportion of urban dwellers recently experienced continuous growth with less than 4 out of 10 people in urban area in 1990, whereas in 2010 it increased to more than 5 and expectation and projection that by 2050 it will grow to 7 of 10. This number was reported to be growing by 60 million annually and with the believe that much of these population will initially settle in the core of the urban areas.

The enormous population that finds livelihood within these cores that are characterised by pollution calls for a great need to see to the health quality of this dwellers. Environmental quality has been identified as a major determinant of human health and its effect has a long way to predict the quality of life in an environment, Akinyemi and Osikalu, (2013) submitted that the wellbeing of inhabitants of a community is the replica of the health quality of the environment.

Vulnerability dynamics has been identified to vary spatially, the experience in the core remains a challenge that demands a prompt attention as urban core is believed to house

more than half of the world's population and yet has high tendency of being more vulnerable in majorly developing nations.

Aron et al (200?) described urban air pollutants to be one that is derived largely from combustion sources, and as a spectrum of health effects ranging from eye irritation to death. Adike, (2012) also noted that air pollution has been identified to be a promoter of many adverse health effects which could be headache in its slightest form and mortality in its extreme, Further to this, traffic volume has been identified as one of the major contributing factor to air pollution in cores of developing nations. This has been attributed to high density household and housing, poorly maintained vehicles with low fuel quality (Adike, 2012) with large informal commercial floor dominating the major street.

Furthermore, one of the unchecked challenges of urbanisation that tends to pose more threat to lives in core of developing nation is air pollution; Air pollutant has diverse vulnerability effect on human health. They are believed to vary in their capacity of effect on mankind. There are varying air pollutant that ranges from solid to liquid and liquid to gas. Gaseous pollutants are believed to be very dangerous as they most times cannot be seen because of their gaseous state. They include Sulphur IV oxide, Nitrogen II oxide, Carbon Monoxide and many more.

Carbon monoxide (CO) emission has been seen as a major environmental pollutant and health disaster in urban core of developing nation. The severity of CO impacts remains a major challenge in developing nation cities as these cities are characterized by majorly transportation problems. The result of transportation problems has been found to be extreme air pollution which is a major carbon monoxide producer.

James et al (2000) described Carbon monoxide (CO) as one of many ubiquitous contaminants of our environment that requires prevention and control measures to insure adequate protection of public health.

CO often referred to as silent killer (first Alert; 2016) is a colorless, odorless, tasteless and toxic gas produced as a by-product of combustion. Any fossil fuel burning appliance, vehicle, tool or other device has the potential to produce dangerous levels of carbon monoxide gas (Ian 2016) and it is believed to be a major form of public health problem associated with a significant percentage of poisoning death.

The figure from James et al (2000) as he cited (National Safety Council,1982; Cobb and Etzel, 1991; Mathieu et al., 1996).that more than one half of all fatal accident reported worldwide each year are caused by CO poisoning.

The risk associated with the intake of carbon monoxide has been found to encompass all range of human, from adult to young, male and female, healthy and unhealthy. Although, as noted by First alert (2016) that everyone is at risk because everyone needs oxygen to survive. He disclosed that Medical experts believe some people maybe more vulnerable to CO poisoning and the category of these people includes unborn babies, infants, children, and people with heart and lung problems due to higher metabolic rates.

A report by United State department of Labour (2002) disclosed that the possibility of reversing CO is tight and only possible at the early stage only if caught in time , yet it adverse effect after recovery was said to have the possibility of causing a permanent damage of parts of the body of the exposed that needs oxygen such as brain. Also a reproductive risk is said to be significant to its exposure. This is because CO bounds more at 200 to 250 times than

haemoglobin to human blood (Chalonlakou, 2002). And the rate of bounding of CO to haemoglobin is between 80 – 90% of the inhaled volume (Career et.al(?))

The study aims at determining the health vulnerability of Urban Core dwellers along major roads that connects the town to the emission of Carbon Monoxide (CO), the study employed the potable CO meter to determine the spatial variation in the range of CO and residents health challenges.

1.1 Co and Human Anatomy

According to Ian (2016), CO inhibits the blood's ability to carry oxygen to body tissues including vital organs such as heart and brain. He further explains that when CO is inhaled, it combines with the oxygen carrying hemoglobin of the blood to form carboxyhemoglobin (COHb). Hemoglobin has a much higher affinity (240 times) for CO than oxygen (O₂) therefore when you are in an environment that has CO in the air, when oxygen is taking in, there is more likeliness to take in and metabolize CO than O₂. Once combined with the hemoglobin, hemoglobin is no longer available for transporting oxygen as the CO molecules take the space that O₂ should be occupying (2016). Each hemoglobin molecule can hold up to 8 molecules of CO or O₂ or a combination of both.

Carboxyhaemoglobin also has direct effects on the blood vessels of the body - causing them to become porous or 'leaky'. This is seen especially in the brain, causing the brain to swell, leading to unconsciousness and neurological damage (Ian, 2016)

Ian (2016) further suggested that carboxyhemoglobin builds up is a factor of the concentration of the gas being inhaled (measured in parts per million or PPM) and the duration of the exposure. Compounding the effects of the exposure is the long half-life of carboxyhemoglobin in the blood. Half-life is a measure of how quickly levels return to normal. The half-life of carboxyhemoglobin is approximately 5 hours. This means that for a given exposure level, it will take about 5 hours for the level of carboxyhemoglobin in the blood to drop to half its current level after the exposure is terminated.

Ian (2016) identified symptoms associated with carboxyhemoglobin as follows

Table 1.0: Symptoms associated with COHb

% COHb	Symptoms and Medical consequences
10	No symptoms. Heavy smokers can have as much as 9% COHb.
15	Mild headache.
25	Nausea and serious headache. Fairly quick recovery after treatment with oxygen and/or fresh air.
30	Symptoms intensify. Potential for long term effects especially in the case of infants, children, the elderly, victims of heart disease and pregnant women
45	Unconsciousness
50	Death

(Source:Ian, 2016)

2.0 METHODOLOGY

Study area: Bida metropolis is the second largest urban settlement in Niger State, Nigeria, the largest state in terms of land mass in Nigeria. It is characterised by its traditional form that characterise its development and the organisation of space. The town is characterised by the natural formation of traditional urban settlement as it is totally packed together, the structures are with no open spaces or settlement setback from the abutting facades. These are majorly the characteristics of the core of the town.

The core is extremely packed and generally experiencing spatial use changes as most traditional residential dwellings are modified into commercial outfit.

Material

1. Google earth imagery was gotten at 200meters resolution through the help of El shayar software alongside with Google earth software.
2. Gas detector was used to pick the average number reading of carbon monoxide in PPM at the traffic and every location where the respondent were sampled for administration of questionnaires.
3. Open ended and closed ended questionnaire was used to gather information on the status of respondent health and health determining factor towards the detection of the effect of Carbon monoxide.

Method

carbon monoxide data logger was connected to the gas meter and the average reading of each location was determined from the various readings in 5 minutes, this was repeated 8 different hours between 8:00hrs and 22:00hrs of each day. This data logger measures CO and other 4 gases within range of 0 to 1000 ppm measurement. The Google earth imagery gotten at 200m resolution were mosaic and georeferenced using ArcGIS 10.0 and thereby a buffer of 200meters was carried out from the sampled eight (8) points. This buffer makes the sample size. A total of 263 housing units were identified from the housing within the jurisdiction of 200 meters radius from the point of the samples. Questionnaires were administered and a total of 185 respondents gave us responses to the survey which makes a 70.3% retrieval of the sampled size. The selection of respondent from categories of housing unit is presented in table 2.0 below. The Gas meter was used alongside during the questionnaire administration, The CO meter was used in getting the CO meter and a GPS to pick the coordinate of the location alongside with the gas meter. Questionnaires were administered to each respondent to know few socio – economic attributes that have been seen to determine health quality during exposure to CO, questions of the quality symptoms that has been found in the literature and also the warning system were sought after in the questionnaire. Geographic Information System was used in analysing spatial trend of CO monoxide with respect to the points value in the different sampled points and the vulnerability was predicted from this. Spatial AutoRegression analysis was also carried out for the spatial differences in the health vulnerability distribution of the respondents in the core.

reduced traffic of vehicular movement in these locations. They are also the fringe of the core and seem to have a lower CO level compared to other locations at the core of the town.

Table 3.0: Social economical attributes of respondent.

Variable	Frequency	Percentage
Health Status Quality		
Excellent	114	61.6
Good	59	31.9
Average	8	4.3
Below Average	4	2.2
Total	185	100
Rate of feeling Headache		
Daily	101	54.6
Weekly	34	18.4
Monthly	28	15.1
Occasionally	22	11.9
Total	185	100.0
Rate of feeling Nausea		
Daily	51	27.6
Weekly	44	23.8
Monthly	51	27.6
Occasionally	39	21.1
Total	100	100
Rate of feeling Dizzy		
Daily	92	49.7
Weekly	25	13.5
Monthly	39	21.1
Occasionally	29	15.7
Total	185	100.0

Author's (2016)

Table 3.0 above indicate that there are more male respondents than female respondents as the male represent 91.4% of the respondents. The research also reveals that the respondents that have stayed longer than 5 years in the community are more than those that have spent less number of years in the community. The figure from the table represents that the respondents that have stayed are more than the ones with less than 5 years stay; the table presented the figure of respondent with more than 5years to be 73.5%. This shows that the figure will tell truly the impact of the long exposure to CO on the people as we have a better population with a long period of stay in the community. Also, 84.9% of the respondent stays beyond 8hours in the location during the day time hours each day, this will tell of the significance of

the vulnerability on the respondent.

Table 4.0: Health Characteristic of respondent

Variable	Frequency	Percentage
Health Status Quality		
Excellent	114	61.6
Good	59	31.9
Average	8	4.3
Below Average	4	2.2
Total	185	100
Rate of feeling Headache		
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Weekly	34	18.4
Monthly	28	15.1
Occasionally	22	11.9
Total	185	100.0
Rate of feeling Nausea		
Daily	51	27.6
Weekly	44	23.8
Monthly	51	27.6
Occasionally	39	21.1
Total	100	100
Rate of feeling Dizzy		
Daily	92	49.7
Weekly	25	13.5
Monthly	39	21.1
Occasionally	29	15.7
Total	185	100.0

Authors (2016)

From table 4.0, 93.5% of respondent disclosed that their health status is good but did not put into consideration the effect of CO concentration in the location. The inability to see the colour appearance makes its vulnerability to be high, although, the health quality of the respondent may be good, the effect of exposure to CO is said to be irreversible most time only if attention is given to it on time. (US Department of Labour, 2002). More than half of the respondent disclosed to feel headache on a daily basis and cumulated with weekly figure,

the research reveals that more than 70% of the respondent are at the mercy of anti headache solutions. In the same vein, more than 64% respondent have the challenge of feeling dizzy at the least every week.

Table 5.0: Relationship between gender and the rate of feeling Nausea.

Crosstab					
Gender	Rate of feeling Nausea				Total
	Daily	Weekly	Monthly	Occasionally	
Male	39	43	50	37	169
Female	12	1	1	2	16
Total	51	44	51	39	185

Author (2016)

Table 6.0: Chi – Square test.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.057 ^a	3	.000
Likelihood Ratio	18.086	3	.000
Linear-by-Linear Association	10.566	1	.001
N of Valid Cases	185		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 3.37.

Author's (2016)

Table 5.0 and 6.0 above show the rate of gender vulnerability to the occurrence of nausea on the respondents. The result reveals that there is a significant relationship between the nausea occurrence and gender. The research reveals from table 5.0 that the female are more at risk and more prone to nausea when exposed to CO emissions.

4.2 SPATIAL VULNERABILITY MAPPING

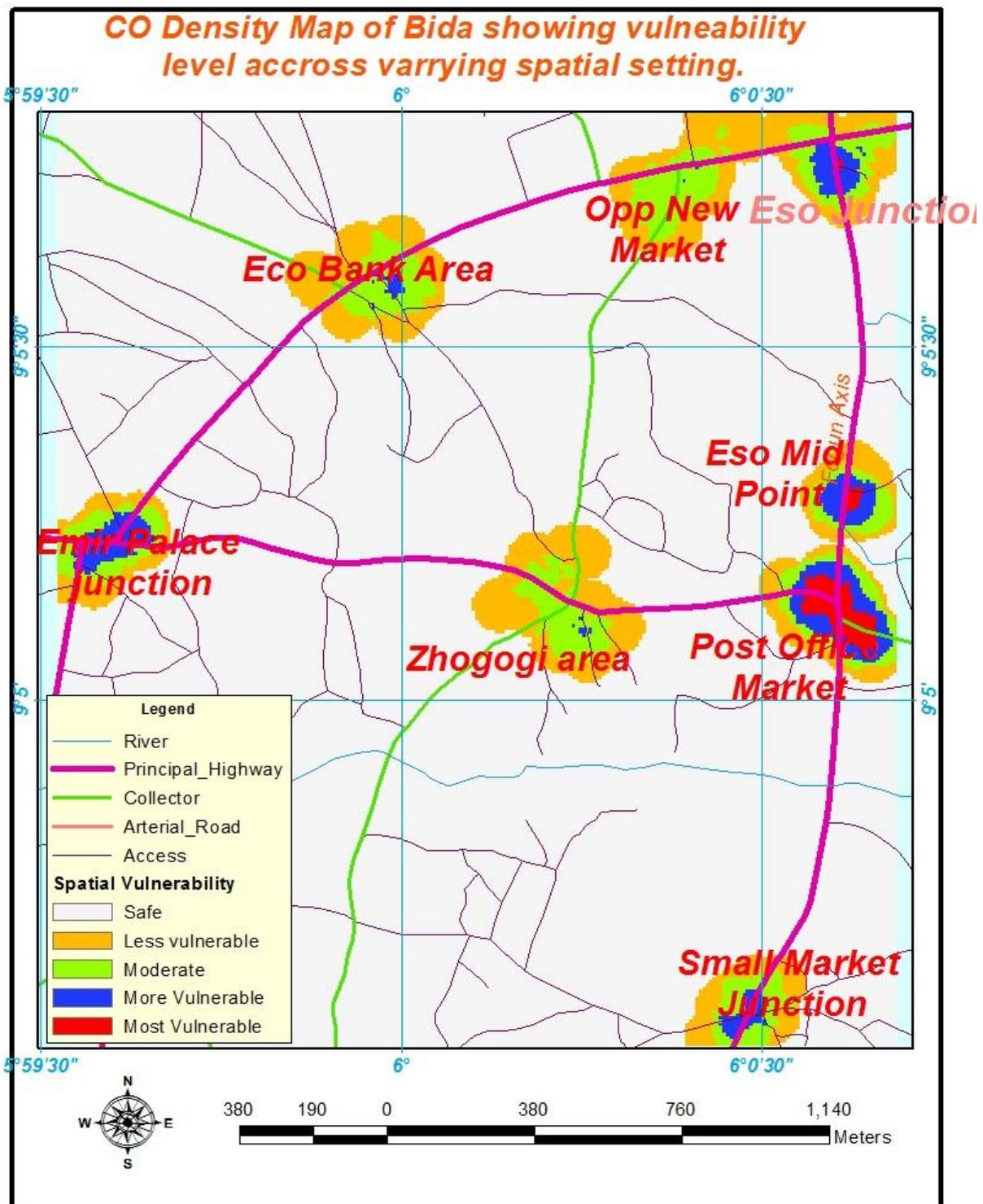


Fig. 2.0: Density Map of Bida core showing the level of vulnerability.

Author,(2016)

From Figure 2.0, it could be deduced that the vulnerability of people in Mid Eso area and Post office market area is very high. Although the vulnerability spreads out from the midpoint as the highest affected points to towards outside road intercessions; Emir's Palace area has a little vulnerable people and Eso Junction. Zhogogi and New Market area are seen to have the least affected area and this could be said to be most conducive area of the core of the town. The nature of the vulnerability experienced here could be attributed to the modern shopping complexes and the low population in the locations.

The data obtained from individual measurement from respondents' location were used in the production of these research outcomes.

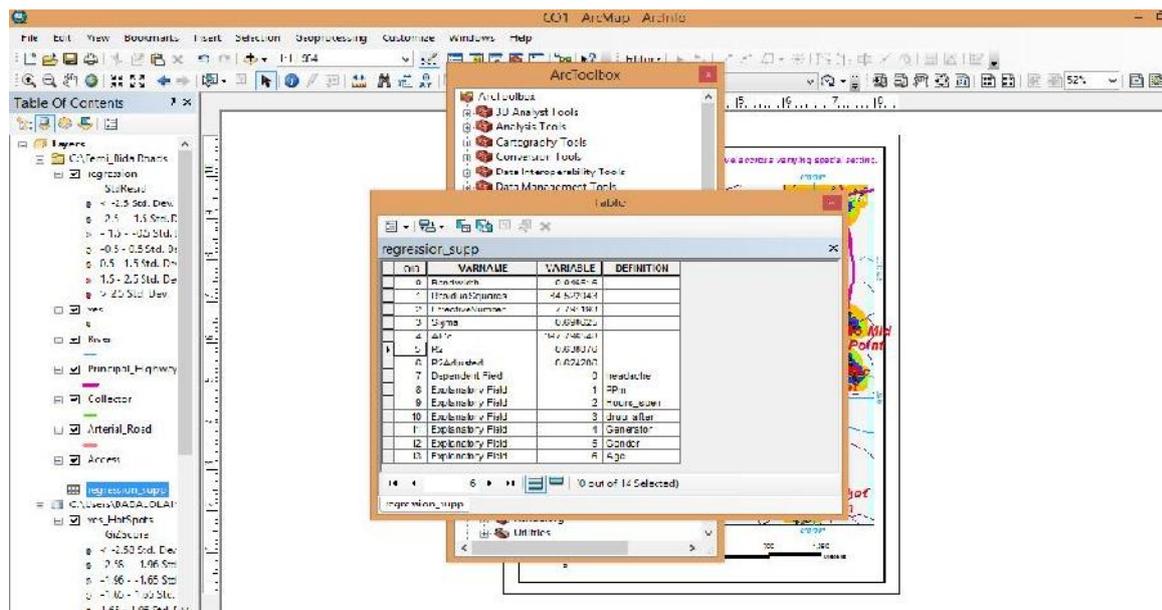


Figure 3.0: Geographically weighted regression window of ArcGIS

Source: Authors, 2016

OID	VARNAME	VARIABLE	DEFINITION
0	Bandwidth	0.046516	
1	ResidualSquares	84.522043	
2	EffectiveNumber	7.791193	
3	Sigma	0.690625	
4	AICc	397.796548	
5	R2	0.638076	
6	R2Adjusted	0.624206	
7	Dependent Field	0	headache
8	Explanatory Field	1	PPm
9	Explanatory Field	2	Hours_spen
10	Explanatory Field	3	drug_after
11	Explanatory Field	4	Generator
12	Explanatory Field	5	Gender
13	Explanatory Field	6	Age

Figure 4.0: Outcome of Spatial Auto Regression

Figures 3.0 and 4.0 reveal the location relationship with which headache was predicted with CO intake, hours spent, taking of drug after daily work, usage of generating set as alternative source of electricity, age. The outcome reveals that the model could be predicted with 63.81 of the independent variables.

4.0 CONCLUSION

The study strongly reveals high spatial variation in the level of health vulnerability of urban core dwellers. Some locations seem more vulnerable than others. Even though the people see headache as a common phenomenon of a daily activities, this shows the quality of the working or dwelling environment. This implies the environment where there is high volume of CO is not secure for living and business purposes.

The points and housing units points with the highest point are the locations in town where the people refuse to leave from their traditional settlement. These locations are characterised by high population and high housing density. Most of the commercial outlet are not ventilated, localising the emitted gas in these respective housing units. The location is also characterised with high vehicular movement and excessive on street parking. The research suggest that the traffic officers should be empowered to monitor the excessive on street parking and also encourage diversion of traffic off these core roads. The government also should seek a means with relevant stakeholders to construct bye pass roads off the grid points of these cores. The autoregression analysis reveals that the location, CO volume, and other factors are great determinant of the daily effects of headache on the residents. This shows the level of vulnerability within the core.

REFERENCE

- Adike J., (2012), Assessment of Carbon Monoxide level in Enugu metropolis monitoring industrial area and residential area, A thesis of the department of Chemical Engineering, Faculty of engineering, Caritas University, Enugu.
- Akinyemi M. and Osikalu M., (2013); Investigation of Carbon Monoxide Concentration from Anthropogenic sources in Lagos, Nigeria. *International Journal of Physical Sciences* Vol. 8(21), pp. 1128-1132, 9 June, 2013, DOI: 10.5897/IJPS12.661, ISSN 1992-1950 Academic Journal <http://www.academicjournals.org/IJPS>
- Aron J., Cohen H., Ross A., Bart O., Kiran D., Michal K., Nino K., Kersten G., Aden C., Isabelle R., Jonathan M. and Kirk R. (200?), Urban Air Pollution, Comparative Quantification of Health Risk.
- Career P., Fanertti C., Schlett C., (?) In focus: Health effect of carbon monoxide intoxication.
- Chaloulakou A., Duci A., Spyrellis N., (2002), Exposure to Carbon Monoxide in enclosed multilevel parking garage in central Athens urban area. *Indoor and built environment*.Vol.11
- First Alart. (2016), Carbon monoxide facts. First Alert Carbon Monoxide Alarms and Carbon Monoxide Detectors <http://www.firstalartstore.com/store/category/carbon-monoxide-alarms-and-detectors.htm>
- James A., Monique M., Neil B., Stephen R.,(2000); Carbon monoxide poisoning: a public health perspective *Toxicology* pg145 www.elsevier.com:locate:toxicol.
- Ian M.,(2016), Carbon Monoxide and its effect on body. *Paranormal research association of Boston*
- World Health Organisation and United Nation Human Settlement, (2010), Hidden cities: unmasking and overcoming health inequities in urban settings. ISBN 978 92 4 154803 8 (WHO), ISBN 978 92 1 132271 2 (UN-HABITAT).
- United State Department of Labour, Occupational Safety and Health Administration, (2002), Carbon monoxide poisoning fact sheet. *Title 29 of code of federal legislation*.

How integrated is the airport in the production of space?

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Synopsis

The study explores the movement of goods through airports in order to understand the relationship between flows and the production of space, and specifically how integration occurs between modalities and land uses within the context of the Dube TradePort case study. The initial review finds that the fields of transportation geography and logistics provides some useful insights for understanding airport related development within a planning perspective.

Introduction

The international movements of goods start and terminate in cities at either port terminals or international airports, and these act as the nodes where international trade interfaces with regional and local trade flows (Cui et al., 2015, Rodrigue et al., 2013). The complexity of these global and regional flows across multiple locations and modes of transportation impacts on cities, with challenges for better planning for the movement of goods around airports (Schaafsma, 2010). Historically, the focus of international trade flows on urban development relates to ports. However, air transportation has grown internationally over the past two decades and airports play a more critical role in the internationalization and globalization of trade (Button and Taylor, 2000, Dicken, 1998), particularly related to the relative value versus volumes of goods handled by air as opposed to maritime shipping. The integration of global flows with city flows, presents complexities for both the distribution of goods and the logistics activities on urban development and land use.

The main argument in this paper is based on an extensive literature review and finds that, while airports shape the production of space across a range of scales, conceptually it is helpful to understand these processes in terms of their connectivity to broader markets and integration with land uses, rather than through models of airport centred development. The initial findings from a case study of an emerging greenfields cargo and passenger airport in Durban, suggests that airport related development should be understood within broader scaled contexts to understand processes shaping space. The literature review provides the context for the introduction of the case study and the paper concludes with some of the preliminary findings based on the literature review, policy review and initial interviews.

This paper is the first part of a broader research project focuses on the role of airports to support the efficient movement of goods between the global and regional economies, through improved logistics at the local scale. The main research question is concerned with how in fact airports, as precincts containing specialised infrastructure and related uses, interact with the flow of goods distributed across different transportation networks. Then there are there are derived planning implications for land uses across local, regional, national and global scales, within a normative, inclusive growth framework. The broader study focuses on the case study of Dube TradePort, incorporating the King Shaka International Airport.

Defining logistics

The definition of logistics from a transportation geography perspective has relevance for this study and the framing of the research questions. Logistics according to Hesse and Rodrigue (2004) refer to *'the wide set of activities dedicated to the transformation and circulation of goods, such as the material supply of production, the core distribution and transport function, wholesale and retail and also the provision of households with consumer goods as well as the related information flows'*. The definition implies two major interrelated functions of logistics. The first relates to the physical distribution function, with the derived transport segment, and secondly the materials management function with the induced transport

segment (Hesse and Rodrigue, 2004). Physical distribution is the *'movement of goods from the point of production to the point of consumption and materials management includes all the activities related in the manufacturing of commodities in all their stages of production along a supply chain'* (Hesse and Rodrigue, 2004). The definition of logistics suggests the consideration of both the physical distributions of goods and flow of goods in the production process, requiring interventions to minimise *'logistic friction'* that impede flows (Hesse and Rodrigue, 2004).

Inherent in this spatially constructed notion of logistics is the idea of pursuing optimal integration between modalities as one layer and the integration between places of production distribution and consumption as another layer. The framework allows for a relational understanding of how infrastructure, designed to interact with the flow of goods across networks, holds possibilities; and how these flows can integrate with broader land use processes.

Hesse (2008) argues in the context of Western European and the United States case studies, that modern logistics are shaping urban development patterns due to changes in supply chain management practices. On the basis of empirical studies, Hesse (2008) identifies *'new geographies of distribution'* attributed to changes in supply chain management and logistics management design, with impacts on urban places. Transformations include the redevelopment of warehouse districts, railway yards and freight consolidation facilities by more competitive uses and secondly the relocation of logistic services related to the storage, consolidation and distribution of goods, towards strategic places outside of the urbanised centre (Hesse, 2008). Hesse (2008) identifies the locational requirements of relocating logistics firms to include the availability of land, access to transportation and distribution networks as some of the factors behind the suburbanisation of logistics related uses. However, there are exceptions where customers of intermodal services have fixed locational behaviour and require close access to ports, railyards or airports (Hesse, 2008). O'Connor (2010) in his study of global city regions and the location of logistics activity, looked at the combined analysis of both sea and air freight activity on city regions. He explored the particular effect of infrastructure on logistics locations and concludes that global city regions with multiple seaport and airports play a particular role in attracting logistics firms and the dynamics of these places create challenges for strategic urban planning policy (O'Connor, 2010). However, much of the research on airports is based on the developed world, yet in developing countries the impact of these flows, particularly those related to the production of goods, require further exploration in South Africa.

Defining Integration

Air transportation forms part of the networks and nodes in the physical distribution and the materials management function and would need to integrate with other modes of transportation and production, storage and distribution uses in order fulfil this logistic function. Rodrigue et al. (2013) define networks, nodes, flows and argue that transportation networks underlie the territorial organization of economic activities in space. Networks provide the *'framework of routes within a system of locations, identified as nodes. A route is a single link between two nodes that are part of a larger network that can refer to tangible routes such as roads and rails, or less tangible routes such as air and sea corridors'* (Rodrigue et al., 2013). The impact of hub and spoke networks versus point to point networks have implications for how and where goods move. Freight and passenger services tend to hub and spoke models and while there are efficiency arguments, places outside the hubs have additional transshipment costs and hubs experience congestion issues (Conventz and Thierstein, 2015). A recent review of urban logistics and airport centric development, has argued for the emergence of city logistics to deal with the congestion challenges of growing demands for freight transportation and distribution within city regions (Boloukian and Siegmann, 2016). The Europe based study also identified complexities and conflicts between city logistics with broader national, international logistics, making the case for the convergence between logistics and airport centred development on issues of urban

competitiveness (Boloukian and Siegmann, 2016). However, in the context of a secondary South African city, firmly outside of main air hub and spoke, but acting as a major port and container gateway to south Africa, the dynamics of integration pose broader issues than the physical dimension to integration. How does the city region interact with the movement of goods to balance strong integration with local employment creation and yet promote a more optimal modal split to ensure broader national efficiencies and competitiveness, and all with in a normative sustainability framework?

The integration is more than the physical infrastructure and efficient goods handling in distribution process, but also includes the spatial dimension of how the distribution of goods integrate with the production of goods and ultimately with places of consumption. The location of land uses and activities that deal with distribution, production and consumption processes have implications for the field of planning. Planning, as a practice, attempts to mediate private and public investment and locational decisions in the public interest. The formal scope of the planning system in terms of the Spatial Planning and Land Use Management Act No 16 of 2013, includes the preparation of future spatial development frameworks by government based on principles, norms and standards that guide planning and land development, as well as the management of land use and the procedures and processes for approval of future land development (Republic of South Africa, 2013). While the framework for planning suggests a rational process, the practice of planning deals with the unintended consequences and impacts of land use decisions. The impact of airports and logistics have significant impacts on adjacent land use, to warrant planning decisions that balance social, environmental and economic interests through a normative framework.

The Challenge

Growth in the quantity of freight traded internationally, combined with the complexities of goods moving between dispersed origins and destinations, points towards an important role for international transportation in supporting the global economy (Rodrigue et al., 2013). Approximately 90% of global trade volume is handled by ports and maritime shipping. However, although airports handle 0.2% of global tonnage they account for approximately 15 percent of the of global trade value (Rodrigue et al., 2013). Road and rail infrastructure play a marginal role in international trade, but are critical in moving goods to and from port and airport terminals with the challenge of integration between modes of transportation at the city scale. With improved technologies and changes in the supply chain, airports have become important nodes in, not only in the movement of people, but specifically high value and perishable goods (Charles et al., 2007). However, despite the well reported environmental externalities of aviation (Charles et al., 2007, Kivits et al., 2010, Hesse, 2013), the use of airports continue to grow and provide the infrastructure to deal directly with international trade with the potential for regional economic growth (Schaafsma, 2010). With the reported growth in passenger and freight airports and their contribution in regional and national growth, there has been academic and practical interest in issues related to airport development (Hesse, 2013).

Airport led development, as a planning concept, is associated with strategies to engage with global economies. Underlying the relationship between airports and economic developments, are claims of regional growth and employment associated with airports. Green (2007) argues that airports may be a function, as well as a cause, of economic growth. However, passenger activity as opposed to cargo activity, is a better predictor of economic growth. Brueckner (2003) in his study on traffic and urban economic development found a link between passenger numbers and increase in employment in service related industries. However, airline traffic was shown to have no effect on manufacturing and goods related employment (Brueckner, 2003). Reductionist claims that investments in airport infrastructure will lead to agglomeration of firms with increase in employment and growth, often overlook the complexities of context dependence. The direct, indirect and multiplier links between airports and economic development is shown in the literature as complex depending on the split between passenger and cargo focused operations, connectivity,

economic growth (Green, 2007, Kasarda and Green, 2005, Brueckner, 2003). The questions for Durban, particularly on cargo focused operations, relate to determining growth over the relatively short, six year operations and whether this growth translates into employment and how much of the growth is new as opposed to displaced development.

There are complexities in the integration between the airports and other modalities in the distribution of goods (Rodrigue et al., 2013). Rodrigue et al. (2013) argue that these relate to the interface between global trade with city logistics, where cities have their own dislocation between production, distribution and consumption, combined with globally dispersed places of production and consumption. The lack of integration is reflected in the transportation geography literature that tends to focus on specific modes of transportation rather than in the linkages between multiple modes in the distribution side of logistics (O'Connor, 2010, Hesse, 2013). Similarly, in the field of planning there is a siloed approach where the planning and provision of transportation infrastructure (ports, rail, road and airports) and related land use planning are planned separately. However, the practice of logistics involves and requires the coordination of activities and integration between multiple modes of transport (sea, land air and rail) depending on the goods and value chains (Rodrigue et al., 2013). There is agreement in the literature that airports and the associated development of broader than aeronautical services, that airports are not just transportation infrastructure but play a part in the production of urban space across scales. Airports are places that interface between global and local movement of goods and people, or "spaces of flows" (Castells, 1996) within a city region. Freestone and Baker (2011) in their review spatial planning models of airport driven development identify topologies of airport city regions with models for development and review the implications for planning. They conclude arguing for better balance between local sustainability, national interests and international dynamics, stronger alignment between city and airport planning alignment and a more collaborative approach between local and regional interests

While these conclusions are relevant for Durban, particularly while the space for planning the airport region are still fluid, there are a few strategic issues that can also shape some of the regional impacts. The questions for Durban are how does the airport integrate with established port related infrastructure, largely road based movements, and established rail infrastructure on the one hand, and exactly what types land uses integrate with the Airport and why.

Literature Review

The purpose of this section is to review a sample of literature relating to the transportation of goods and the relationship to space, largely within the field of transportation geography and planning and to review literature on the concepts that link the economic processes to the movement of goods, in order to provide a context for logistics broadly. Secondly the literature is examined from the perspective of how prominently airports feature in physical logistics and how integrated are logistics with other modes of transport and land uses in the movement of goods at a range of scales.

What are the relationships between transport and urban development across global, national, regional and local scales in the context of globalization?

Theoretical insights into the interplay between transportation, economic activity and urban development are complex and straddle a range of disciplines (Hoyle and Knowles, 1998). However, the common element in these relationships relates to how the reciprocal interactions between transport and urban development are expressed across space and at various scales. The emphasis on multiple scales are a common concern for planning and geography, particularly in the context of globalization and the impacts on contemporary cities.

The review of the link between the economic activity, the movement of goods and space is located within the contemporary period of globalization. The impacts of internationalization

and globalization on economic activity have profound spatial implications for the relationships between producers and consumers and the transportation intermediators that connect them (Hall and Jacobs, 2010). However, despite the long distant spatial extent of these relationships, the increasingly integrated nature of the supply chain systems also characterise how the production, consumption and distributions of goods relate. Dicken (1998) in his discussion on the *'global shift'* in the world economy makes the distinction between *'internationalization'* and *'globalization'* processes at work in contemporary economies (Dicken, 1998). Globalization is defined as a *'complex of interrelated processes, rather than an end state'* (Dicken, 1998). Internationalisation processes are simply the *'extension of economic activities across national boundaries'* whereas *'globalization processes are qualitatively different'* and relate to the *'functional integration of such internationally dispersed activities'* (Dicken, 1998). In this research, specially relating to the transportation of goods by air, the context of globalization is important to understand the role of transportation in globally dispersed production processes. However, the interest is not on a national scale unit of analysis but at a local site level, where an understanding of how transportation relates to the location of production chains or commodity chains, and expressed as site level land use.

Production chains are defined by Dicken (1998) as a *'transactionally linked sequence of functions in which each stage adds value to the process of production of goods or services'* and these chains are increasingly global in the location of these functions, and where transnational corporations increasingly play a role in the coordination and control of operations in more than one country, even if they do not own them (Dicken, 1998). The review on production chains is limited to understanding the role of transportation and airports in relation to how goods move within supply chains. The debate on how globalization relates to regional development from the perspective of new regionalism or from the perspective of global commodity chain/global value chains (GMC/GVC) have been excluded from the review. The new regionalism literature has been critiqued for the preoccupation with local transactions and institutional forms at the expense of connections beyond the region, while GMC/GVC have been critiqued for the preoccupation with the national scale (Coe et al., 2004).

The review of the link between the economic activity, the movement of goods and space is located within contemporary period of globalization. The impact of internationalization and globalization on economic activity have profound spatial implications for the relationships between producers and consumers and the transportation intermediators that connect them (Hall and Jacobs, 2010). However, despite the long distant spatial extent of these relationships the increasingly integrated nature of the supply chain systems also characterise how the production, consumption and distributions of goods relate. Dicken (1998) in his discussion on the *'global shift'* in the world economy makes the distinction between internationalization and globalization, where the former relates to the extension of economic activities across national boundaries and where globalization is the functional integration of internationally dispersed activities. Rather than study a global city region to give insight into the role of the airport, this research will be approached from the role of the airport in the context of the city region to provide insight to the functional region serviced as well as integration with other modalities (Hoyle and Knowles, 1998).

What are the conceptual dimensions of 'flows'?

An understanding of how the globalization of economic activity in contemporary cities has impact across scales draws from the work of Castells (1996). The concept of flows contained in the work is useful to understand how networks of flows operate at multiple scales and how flows can be applied to distinguish between physical and functional definitions of cities or regions (Castells, 1996). This is important as the functional flows provide an argument for why the analysis of goods flow relates to the city, regional, national and global scales. Castells (1996) makes a useful conceptual distinction between *'space of places'* and *'space of flows'*. The *'space of place'* is a physical *'locale whose form, function and meaning are*

self-contained within the boundaries of physical contiguity (Castells, 1996), and where the *'space of flows'* is more functional and relates to the *'material organisation of time-sharing social-practices that work through flows'* and networks (Castells, 1996). Furthermore, the work of Castells (1996) also clarifies various dimensions to flows and assists with a narrow focus for the study on how goods flow as the physical expression of flow. Flows in the broader sense refers to the *'flows of capital, flows of information, flows of technology, flows of organizational; interaction, flows of images, sounds and symbols'* and *'representation of processes dominating'* the economic, political and symbolic life (Castells, 1996). In this study flows relate to the observable movement of goods, while recognising that other flows may accompany these flows.

What are the relationships between the airports and urban development across global, national, regional and local scales in the context of globalization?

The linkage between investment in transportation infrastructure and spatial and economic development of regions are widely accepted at a broad level. However, within the context of globalization and changes in contemporary cities, the methods for analysing the linkages between transport and urban development are contested (Banister, 1995). In the contemporary context of air transportation and economic development, it is argued that the direction of the linkage is also sometimes unclear, particularly when considering local pollution and congestion concerns against positive regional benefits (Conventz and Thierstein, 2015). This study will attempt to shed light, from the perspective of a case study, on how investment in air transport infrastructure impacts on economic activities related to logistics.

In a quantitative study by O'Connor (2010) on the importance of airport regions in logistics activity, where the global city regions provided the unit of analysis rather than the port or airport, it was found that regions containing multiple sea and airport cities played a more significant role. The study suggested the importance of infrastructure capacity and accompanying hub role, as a critical factors in shaping the location of logistics activity (O'Connor, 2010). The quantitative study by Wandelt and Sun (2015) on the evolution of international air transportation country network from 2002 to 2013, also emphasises the importance of air connectivity. The study, using physical and functional topologies, provided some useful insights on the roles of countries in international air transportation flows. Despite relatively low air passenger volumes, according to the study South Africa plays an internationally significant role topologically due to the number of inter-continental air connections.

Internationally, and in South Africa, substantial contributions to the business case for airport development are based on the concept of *'Aerotropolis'* developed by John Kasarda (Kasarda and Lindsay, 2012). Much of the practice led research, led by Western European examples, tends towards the use of concepts such as *'airport cities'* and *'airport corridors'* and *'airport regions'* where the airport is viewed as an economic generator or catalyst for growth. However, the debate on airports has shifted away from the role of the airport as a generator of growth, particularly when linked to a rationale for airport expansion, to questions about the role of the airport in shaping the city region structure (Conventz and Thierstein, 2015). This study will contribute to this debate from a perspective of a case within the developing context of the Global South.

Methodologically there are challenges in a study to establish or monitor the clustering of economic activity in response to an airport. In an established airport region, the sequencing of firm locational decisions before and after the infrastructure are difficult to isolate in a quantitative study. In the case of Dube TradePort site, incorporating the King Shaka International Airport, which opened in 2010, evaluative studies would find it difficult to monitor the economic impact of new development over this relatively short time period of five years. There are several reasons for this, including that relocation and investment decisions of firms would have been made prior to the approval of the airport relocation decisions.

The theories that inform the relationship between transportation and spatial development

Traditional spatial theory has been broadly concerned with the role of transportation costs and the exchange of goods and the related impact on urban development (Hesse and Rodrigue, 2004). The study will review traditional spatial theory, focusing on transportation and spatial development, while being mindful of the contextual shift of contemporary cities with globalization. Early spatial theories include work by von Thünen (1826) on land value (Knowles et al., 2008), Burgess' concentric model (1925) (Rodrigue et al., 2013) and the work by Christaller (1933) on central place theory (Herbert and Thomas, 1997). This research draws on locational theory to draw the broad linkage between economic activities, the use of space and transportation costs. Early location theories were influenced by the work of von Thünen (1826) who provided a model to understand how the economy organises the use of space and considers transportation costs through an analysis of land rent and use (Krugman, 1991). Central place theory also assisted locational theories to explore how economies of scale and transportation costs interact to produce a spatial economy through the work of both Christaller (1933) and Lösch (1940) (Krugman, 1991). While these models are useful in terms of relating transport, economic activity and urban development, they should be understood within their historical context.

Locational theories can be applied to explain the links between transport and urban development. Classic locational theory assumes that accessibility determines the value of land in particular locations and that as transport costs change so do rent levels (Banister, 1995). The classic locational theories are now critiqued for limited explanations afforded and a simplification of time (Banister, 1995).

Krugman (1998) argues that within locational theory, transportation costs are a consideration in locational choices of firms. Economic geographers however tend to assume the iceberg effect with respect to transportation costs. The argument is that transport costs are incurred at a constant rate when goods move and that a portion of the goods' value simply 'melt away' in transit (Krugman, 1998). New economic geography seeks to explain the spatial structure of the economy through modelling the concentration of economic activity (Krugman, 1998, Fujita et al., 2001). The new economic geography marks a departure in the 1990s from location theory and the work is primarily led from the writing of Paul Krugman on geography and trade. New economic geography argues that '*better and cheaper transport will generally promote concentration of economic activity in favoured locations*' (Knowles et al., 2008). While the new economic geography may provide insights into concentrations of economic activity in contemporary economies, there are critiques on the assumed role of the state to promote a free market. Peck and Yeung (2003) critique the new economic geography approach as associated with neoliberal policy implications of the discourse. The debate on competition and competitiveness between city and regional economies is polarised between Krugman (1998) who argues that places and regions do not compete but firms do; and Porter (1998) who argues for the clustering of companies in particularly cities and regions. The latter view creates a strong argument for transport and ICT infrastructure to support the development of regions through the flow of goods, services, information and people (Docherty, 2004).

Despite the extensive literatures on the shifts in organization of economic activities within the context of globalization, the field of transportation geography partially addresses concerns related to the physical distribution of goods related to economic activities on space and urban development (Hesse and Rodrigue, 2004). Transportation geography emphasises the movement of passengers over the movement of goods. Over the past decade a number of academic contributions have responded to this gap and the transportation geography of logistics and freight distribution has emerged albeit with a developed country context bias (Rodrigue et al., 2013).

The development of large scale transportation infrastructure to facilitate the flow of goods, and industrial land uses that generate and depend on the flow of goods, is an enduring

feature in the planning and development of cities across history (Hesse and Rodrigue, 2004). However it is interesting that the field of planning, and particularly local planning research, is relatively silent on the substantive issues related to logistics infrastructure more broadly and airport development in particular. The planning literature tends to equate investment in airports and ports as mega projects invoking critiques framed as the consequence of neoliberal discourse. In the built environment, the local contributions to airports literature tend also to be project-specific critiques of broader neoliberal discourses (Robbins, 2014, Todes, 2014). However, these critiques do not necessarily reflect on the practice of how airports relate to local or regional spatial economy in order to inform and change planning contributions; neither do they engage with the dynamics of connectivity between global and local economies. Mokhele (2016) in the context of South Africa has contributed towards a framework that describes and explains forces that drive the location and mix of airport-centric developments around the Cape Town and OR Tambo airports. The study found that transport-oriented firms (such as couriers and freight carriers) formed anchors around airfreight services of the airport.

Case Study Implications

The case study presents a broad practical issue of implementing infrastructure-led development policies, focusing on air transport and logistics to support economic growth, with challenges for planning. The theoretical problem relates to the broader debates on the relationship between transportation and development and how the emerging role of air transportation relates in the process of spatial change in contemporary cities and draws on notions of 'production of space', where social space is argued as a social product (Lefebvre, 1991).

The growth in freight and flow of goods and the related land use to support logistics have placed demands on the current distribution and production systems globally, prompting a policy and planning response (Hesse, 2008). The key issue is that logistics activity is not without planning and sustainability challenges, which is compounded when economic, social and environmental interests engage in struggles over public interest objectives. However, aspects of logistics and especially the movement of goods, is not necessarily completely open for public engagement, despite public impact and policy imperatives for engagement (Hesse, 2008). Parastatals, government and local interests have differential access to influence over investment and operational issues. Within the broader logistics phenomena, the case of the Dube TradePort, provides an opportunity to explore the planning and policy implications emanating from reflective practice. Forester (2013) in his work on critical pragmatism and building on ideas from Donald Schön (1983) on the *Reflective Practitioner* argues that '*reflective practice*' provides planning with analytical tools to construct alternatives from conflict (Forester, 2013).

Governments worldwide are investing significant resources in logistics in order to engage in the global freight transportation network (Rivera et al., 2014). South Africa is no different in this regard. Logistics are both a factor in the competitiveness of the economy as well as an output that reflects the performance of the economy (Ittman 2010:1). In South Africa, the annual reports on the relationships between transportation infrastructure and logistics are reported in the Annual State of Logistics surveys. The Annual State of Logistics Surveys between 2004 and 2014 provides quantitative reports by the Council for Scientific and Industrial Research (CSIR) on the movement of goods and freight in South Africa. In a most recent survey, the logistics costs as a percentage of Gross Domestic Product (GDP) have for the period 2011-2013 remained stable at 12.5% and are estimated to have been R423 billion in 2013 (Council for Scientific and Industrial Research, 2013). South Africa is ranked as 34 of 160 countries according to the Logistics Performance Index (LPI) for South Africa, and this is compared with 23rd out of 155 countries two years prior (Council for Scientific and Industrial Research, 2013). Transport costs forms the largest component of logistic costs in South Africa, where in '*2012 transport costs accounted for 61.2% of logistics costs, in 2013*

this percentage is estimated at 61.6%. In 2003, the global average for transport costs' contribution to total logistics costs was 39%6 (Council for Scientific and Industrial Research, 2013). The Annual State of Logistics Surveys between 2004 and 2012 are relatively silent on the role of airports in logistics performance. However, the 10th Annual State of Logistics Survey recognised airports as logistics enablers. It was reported that approximately 400 tons of cargo annually are transported by air and 80% in the belly of international passenger flights (Council for Scientific and Industrial Research, 2013). This research aims to draw attention to the issue airports and logistics by critically reflecting on the role of airports in logistics.

South Africa is strongly committed to infrastructure-led development and this is reflected in the National Development Plan (2012) plan to eradicate poverty and reduce inequality in South Africa by 2030 (National Development Commission, 2012). Part of the strategy targets the expenditure of 10% of Gross Domestic Product (GDP) on public infrastructure investment. The income to support expenditure on transport, energy and water infrastructure will be financed through tariffs, public-private partnerships, taxes and loans and focused (National Development Commission, 2012). The focus on public infrastructure investment to support efficient movement of goods suggests a reduction in the cost of trade and this in turn impacts on economic efficiencies and growth and, ultimately, poverty alleviation. Furthermore, the National Infrastructure Plan (2012) identifies a number of Strategic Integrated Projects (SIP), largely socio-economic infrastructure investments to support freight growth (Presidential Infrastructure Coordinating Commission, 2012) and this includes the Durban-Free State-Gauteng logistics and industrial corridor SIP 2, which intends to strengthen the logistics and transport corridor between South Africa's main industrial hubs and to improve access to Durban's export and import facilities (Presidential Infrastructure Coordinating Commission, 2012).



Figure 1: Location of Dube TradePort containing the relocated King Shaka International Airport.

The Dube TradePort site, incorporating King Shaka International Airport and Dube Cargo Terminal, and surrounded by development zones, operates as an air logistics platform, and is currently being planned and developed as the largest infrastructural project in the Province of KwaZulu-Natal (Dube TradePort, 2015). Furthermore the Dube Trade Port development is planned and purpose built to move freight efficiently as part of the strategic infrastructure required to support the Provincial Growth and Development Strategy (Provincial Planning Commission, 2013). However, despite South African policy and expenditure support for the efficient movement of goods, the optimal integration between the airport, within the Dube TradePort site, with other modes of transport (roads, rail, and ports) is unclear (Provincial Planning Commission, 2013).

The Dube TradePort site is located some 30km north of the port city of Durban, in KwaZulu-Natal, on South Africa's eastern seaboard. The initial 2 940 hectare development, although

recently expanded to include new land holdings, contains King Shaka International Airport and Dube Cargo Terminal. The site is also 45 minutes north of Africa's busiest cargo port, Durban Harbour, and 90 minutes south of the Richards Bay Harbour. On the cargo side of the business, the Cargo Terminal is supported by Dube TradeZone 1 and 2 on the site, as a serviced industrial land for the development of *'warehousing, logistics and distribution, manufacturing, assembling, air-related cargo distribution, high-tech aerospace services, pharmaceuticals, electronic manufacturing, automotive industries, clothing, textiles, and cold storage'* (Dube TradePort, 2016a). The cargo terminal is also supported by Dube Airoad, a road based logistics fleet, intended to move time sensitive goods between the terminal and other centres.

More recently in 2016, Dube TradePort has been proclaimed as the only Special Economic Zone (SEZ) in the province (Dube TradePort, 2016b). While the take-up under the SEZ provides incentives from the South African Revenue Services, development in the zone is not exempt from labour, environmental and related legislation. The location of the SEZ at the airport, supported by significant infrastructure, incentives and government support, specifically targets the sectors of *'aerospace and aviation-linked manufacturing and related services; agriculture and agro-processing, including horticulture, aquaculture, and floriculture; electronics manufacturing and assembly; medical and pharmaceutical production and distribution; and clothing and textiles'* (Dube TradePort, 2016b).

Preliminary Findings

Some of the preliminary findings from the case study interviews, documents review, land use analysis are outlined below:

1. Dube TradePort, including the Cargo Terminal Facility and TradeZone onsite industrial estate, was designed and purpose built as a multimodal facility to support the efficient and value added services and manufacturing related to the cargo. However, the first phase of development at the airport (2010-2015), despite significant growth in air cargo, faces challenges in terms of multimodal integration.
2. The nature of integration with the Port of Durban is not a direct or linear relationship. Relatively low volumes of goods currently move between the port and airport and only in the case of the cruise line industry, is there a direct connection. The issue of integration is rather about developing industrial and manufacturing opportunities in close proximity to the airport that to provide flexibility and choice for distributing goods on either road, rail, sea or by air.
3. Interviews on the prospects of Dube TradePort developing into a full multimodal logistics platform suggest the importance of a rail connection, with a secure land connection between the rail and the cargo terminal multimodal logistics platform. The motivation relates to industrial requirements for security and reliability between places of manufacture and distribution. While these capital intensive investments have not been committed, there is progress in terms of acquiring land and undertaking planning for the rail integration between adjacent off-site properties with a multimodal siding and the on-site tradezone.
4. In terms of land use integration between the airport and logistics (including distribution, manufacturing and consumption) the expected shift to the airport has not occurred. While additionally the airport specifically targets freight forwarders and logistics in the Dube TradeHouse (GT Services, Hazpak Trainaid, Kuehne & Nagel, Bidvest Panalpina Logistics, SA Red Cross Air Mercy Service (AMS), Menzies Aviation / Air Menzies, Interloc Freight Services, Air Chefs, Turners Shipping, GT Logistics, SDV South Africa, Rohlig-Grindrod Consolidation and Wholesale Cargo East Coast, Ocean View Marine Services (TradePort, 2014), the bulk of logistics are still road and port centred. This suggests further investigations are required to fully appreciate why sub-optimal modal splits persist and how city logistics and long haul distributions relate.
5. Integration on the site between the Cargo Terminal and TradeZone 1 is designed into the

development. However, although TradeZone 1 site is fully developed, the direct links between the firms and air cargo operations are tenuous. The second phase development may overcome some of these integration challenges through proposed screening criteria. The relative influence of the SEZ in attracting new development on Dube TradePort site and specifically the integration with cargo terminal is still underway.

This research project is in the early phases of investigation to establish the role of airports in the distribution of goods and how airports integrate with places of production and consumption related to the movement of goods. It is concluded that while strong integration was designed into the development of the airport region as a multimodal logistics platform, the current trajectory is suboptimal. The study provides for a level of generalization for airport regions within the context of a case study.

References

- BANISTER, D. 1995. *Transport and urban development*, London, E & FN Spon.
- BOLOUKIAN, R. & SIEGMANN, J. 2016. Urban Logistics; a Key for the Airport-Centric Development – A Review on Development Approaches and the Role of Urban Logistics in Comprehensive Airport-Centric Planning. *Transportation Research Procedia*, 12, 800-811.
- BRUECKNER, J. K. 2003. Airline traffic and urban economic development. *Urban Studies*, 40, 1455-1469.
- BUTTON, K. & TAYLOR, S. 2000. International air transportation and economic development. *Journal of Air Transport Management*, 6, 209-222.
- CASTELLS, M. 1996. *The Rise of the Network Society*, Oxford, Blackwell Publishers.
- CHARLES, M. B., BARNES, P., RYAN, N. & CLAYTON, J. 2007. Airport futures: Towards a critique of the aerotropolis model. *Futures*, 39, 1009-1028.
- COE, N. M., HESS, M., YEUNG, H. W.-C., DICKEN, P. & HENDERSON, J. 2004. Globalizing regional development: a global production networks perspective. *Transactions of the Institute of British Geographers*, 29, 468-484.
- CONVENTZ, S. & THIERSTEIN, A. 2015. *Airports, cities and regions*, London, Routledge, Taylor & Francis Group.
- COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH 2013. 10th Annual State of Logistics Survey for South Africa 2013: Bold Steps Forward. Pretoria, South Africa.: CSIR.
- CUI, J., DODSON, J. & HALL, P. V. 2015. Planning for Urban Freight Transport: An Overview. *Transport Reviews*, 1-16.
- DICKEN, P. 1998. *Global shift: transforming the world economy*, London, Paul Chapman.
- DOCHERTY, I. 2004. Transport and regional economic competitiveness in the global economy. *Journal of Transport Geography*, 12, 341.
- DUBE TRADEPORT. 2015. *Dube Tradeport - Home* [Online]. Available: <http://www.dubetradeport.co.za/Pages/Default> [Accessed 15 July 2015].
- DUBE TRADEPORT. 2016a. *Dube TradeHouse | Developments | Dube TradeZone | Dube TradePort* [Online]. Available: <http://tradezone.dubetradeport.co.za/Pages/Developments/Dube-TradeHouse> [Accessed 18 June 2016].
- DUBE TRADEPORT. 2016b. *Dube TradePort SEZ | Dube TradePort* [Online]. Available: [http://www.dubetradeport.co.za/Pages/SEZ-and-Aerotropolis/Special Economic Zone](http://www.dubetradeport.co.za/Pages/SEZ-and-Aerotropolis/Special_Economic_Zone) [Accessed 18 June 2016].
- FORESTER, J. 2013. On the theory and practice of critical pragmatism: Deliberative practice and creative negotiations. *Planning Theory*, 12, 5-22.
- FREESTONE, R. & BAKER, D. 2011. Spatial planning models of airport-driven urban development. *Journal of Planning Literature*, 0885412211401341.
- FUJITA, M., KRUGMAN, P. R. & VENABLES, A. 2001. *The spatial economy: cities, regions, and international trade*, MIT Press.
- GREEN, R. K. 2007. Airports and economic development. *Real Estate Economics*, 35, 91-112.
- HALL, P. V. & JACOBS, W. 2010. Shifting Proximities: The Maritime Ports Sector in an Era of Global Supply Chains. *Regional Studies*, 44, 1103-1115.
- HERBERT, D. T. & THOMAS, C. J. 1997. *Cities in space: city as place*, London, David Fulton.
- HESSE, M. 2008. Logistics and Freight Distribution from a Policy and Planning Perspective. *City as a Terminal: The Urban Context of Logistics and Freight Transport.*: Ashgate Publishers (Ltd).
- HESSE, M. 2013. Cities and flows: re-asserting a relationship as fundamental as it is delicate. *Journal of Transport Geography*, 29, 33-42.

- HESSE, M. & RODRIGUE, J.-P. 2004. The transport geography of logistics and freight distribution. *Journal of Transport Geography*, 12, 171-184.
- HOYLE, B. S. & KNOWLES, R. D. 1998. *Modern transport geography*, Chichester, Wiley.
- KASARDA, J. D. & GREEN, J. D. 2005. Air cargo as an economic development engine: A note on opportunities and constraints. *Journal of Air Transport Management*, 11, 459-462.
- KASARDA, J. D. & LINDSAY, G. 2012. *Aerotropolis: the way we'll live next*, London, Penguin.
- KIVITS, R., CHARLES, M. B. & RYAN, N. 2010. A post-carbon aviation future: Airports and the transition to a cleaner aviation sector. *Futures*, 42, 199-211.
- KNOWLES, R. D., SHAW, J. & DOCHERTY, I. 2008. *Transport geographies: mobilities, flows and spaces*, Massachusetts, Blackwell.
- KRUGMAN, P. 1991. *Geography and Trade*, Massachusetts, MIT Press.
- KRUGMAN, P. 1998. What's new about the new economic geography? *Oxford review of economic policy*, 14, 7-17.
- LEFEBVRE, H. 1991. The production of space. Donald Nicholson-Smith, trans. *Massachusetts: Blackwell Publishing*.
- MOKHELE, M. 2016. *Spatial economic attributes of airport-centric developments in Cape Town and Johannesburg*. degree of Doctor of Philosophy, Stellenbosch University.
- NATIONAL DEVELOPMENT COMMISSION 2012. National Development Plan 2030: Our Future-makes it work. Executive Summary. In: NATIONAL DEVELOPMENT COMMISSION (ed.). Republic of South Africa, The Presidency,.
- O'CONNOR, K. 2010. Global city regions and the location of logistics activity. *Journal of Transport Geography*, 18, 354-362.
- O'CONNOR, K. 2010. Global city regions and the location of logistics activity. *Journal of Transport Geography*, 18, 354-362.
- PECK, J. A. & YEUNG, H. W. 2003. *Remaking the Global Economy : Economic-Geographical Perspectives*. London: Sage.
- PORTER, M. E. 1998. The Cluster Theory. *Harvard Business Review*.
- PRESIDENTIAL INFRASTRUCTURE COORDINATING COMMISSION, S. A. 2012. A Summary of National Infrastructure Development Plan. In: PRESIDENTIAL INFRASTRUCTURE COORDINATING COMMISSION (ed.).
- PROVINCIAL PLANNING COMMISSION 2013. KwaZulu-Natal Provincial Growth and Development Plan 2011-2030. In: THE OFFICE OF THE PREMIER, P. O. K.-N. (ed.) *2030 Provincial Growth and Development Plan - Building a better future together*. KwaZulu-Natal.
- REPUBLIC OF SOUTH AFRICA 2013. Spatial Planning and Land Use Management Act No 16 of 2013. In: THE PRESIDENCY (ed.). Pretoria: Government Gazette.
- RIVERA, L., SHEFFI, Y. & WELSCH, R. 2014. Logistics agglomeration in the US. *Transportation Research Part A: Policy and Practice*, 59, 222-238.
- ROBBINS, G. 2014. The Dube TradePort-King Shaka International Airport mega-project: Exploring impacts in the context of multi-scalar governance processes. *Habitat International*.
- RODRIGUE, J.-P., COMTOIS, C. & SLACK, B. 2013. *The Geography of Transport Systems*, GB, Routledge Ltd.
- SCHAAFSMA, M. A., J. AND GULLER, M. 2010. *Airport and City. Airport Corridors: drivers of economic development.*, Schipol, Netherlands, Schipol Real Estate.
- TODES, A. 2014. New African Suburbanisation? Exploring the Growth of the Northern Corridor of eThekweni/KwaDukuza. *African Studies*, 73, 245-270.
- TRADEPORT, D. 2014. *Freight Forwarders & Airlines | Dube Cargo Terminal | Dube TradePort* [Online]. Available: <http://cargoterminal.dubetradeport.co.za/Pages/Freight-Forwarders-and-Airlines> [Accessed 12 September 2014].
- WANDELDT, S. & SUN, X. 2015. Evolution of the international air transportation country network from 2002 to 2013. *Transportation Research Part E: Logistics and Transportation Review*, 82, 55-78.

Digitisation and Participation

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Abstract

The Dutch government is preparing an unprecedented and comprehensive reform of all legislation concerning the physical environment, resulting in a new Environment and Planning Act. Its implementation is supported by a new digital system, containing massive amounts of data but not designed to enhance the involvement of communities in the planning process. This could be done by intensifying the application of 3D city modelling, augmented reality, virtual reality and the use of social media.

Two of the major challenges of the Environment and Planning Act are to increase the involvement of citizens in local planning practice, also known as participatory or collaborative planning (Fagence, 1977), and to stimulate private planning initiatives. So far, the results of interactive decision-making processes in the Netherlands have not been very promising (Boonstra and Boelens, 2011). An important precondition for such *planning empowerment* is not just the availability of sufficient and validated data, but also the way in which information derived from those data is visually presented. To involve more, and especially younger people in planning policy and initiatives, we need to make more and smarter use of modern 3D visualisation techniques and social media. This paper first addresses the characteristics of the new Environment and Planning Act, the features of the new digital system and how it supports professionals in the planning process. Then it will elaborate methods of 3D visualisation and social media strategies that could support non-professionals engaging in the planning process, wrapping up with some remarks concerning further research and experiments in our Saxion LivingLab.

1. Environment and Planning Act

1.1 A comprehensive legislative operation

In the 1960s and 1970s, the Netherlands, in an effort to improve the quality of the physical environment, rapidly introduced a system of sectoral laws. More or less independent legislation was established on spatial planning, construction works, water, air, noise, soil and other environmental compartments, with each of these laws having its own set of standards. Initially, the procedures to request administrative permissions were arranged by law, too, but in the 1990s and in 2010, a harmonisation was introduced in stages (Environmental Permitting (General Provisions) Act). This procedural harmonisation, however, is far from complete. According to the government, the current legislation no longer ties in properly with the current and future developments.¹ The timely involvement of stakeholders in the decision-making process on projects, for instance, is not adequately ensured and the accumulation of legislation makes the current system far from transparent for citizens. Naturally, it is important that legislation provides certainty, but it may also stifle planning initiatives by citizens and entrepreneurs. Calculation models and scientific evidence are often applied too rigidly. The (digital) provision of information also differs between the various laws. This discourages participation in the planning process.

The Environment and Planning Act has been announced by the Dutch press as the largest legislation operation since World War II. The new system is based on a shift in the paradigm:

from 'No, unless' to 'Yes, provided that' in response to planning initiatives that will improve the physical environment as a whole. This creates room for development.

In time, it will replace some 26 sectoral laws. An estimated 50,000 analogue zoning ordinances will be turned into approximately 400 digital environment plans. The Environment and Planning Act has already passed both Houses of Parliament and will be implemented as from January 2019. The Environment and Planning Act has yet to be elaborated in technical regulations. At the same time, all corresponding planning data and IT systems will be integrated and modernised. In fact, the entire planning process will be digitised over a period of 4 – 8 years. The Environment and Planning Act's methodology follows the directives of the European Union (EU), in which a central policy cycle is aimed at the active realisation of specific targets for the physical environment, according to the government. This requires clear framework conditions in which citizens, businesses and the government can develop activities. The Environment and Planning Act offers a unified system of instruments to ensure those activities keep on the right track.

Important objectives of the Environment and Planning Act are:

- to offer scope to consider planning initiatives from society
- to stimulate and safeguard participation in the planning process.

1.2 *Changing society*

Society is changing: increased individualisation, greater access to information and, in particular, the emergence of social media. Citizens are increasingly less likely to be represented in fixed groups, but form varying networks to deal with a single theme. Partly as a result of the democratisation of knowledge, the authority of social institutions – including the government – can no longer be taken for granted. Society's needs are changing as well: work is less restricted to a particular area, mobility is on the increase, knowledge and points of view are rapidly shared, but the depth of the shared information is decreasing.

The current environmental legislation does not correspond sufficiently to the developments in society. Municipalities, for instance, feel that the current research obligations and legal precedents force them to make detailed zoning plans, while society demands fast and flexible government action. Large projects may currently take dozens of permits.

The current legislation arranges citizens' participation and involvement in projects in a different way, and considers active involvement, preferably at an early stage, most desirable, in particular in case of complex projects. The Environment and Planning Act obliges the government to take the interests of all involved parties into account in its decision-making process. Additionally, the government is accountable for its actions. The Minister may impose rules on early involvement and stated the following during the discussion in Parliament: "Administrative bodies will have to justify the input yielded by the early involvement and the manner it was weighted in its substantiation of the draft decision, which will allow interested parties to examine what was done with their contribution."ⁱⁱⁱ

2. **Environment and Planning Act: The digital system**

2.1 *The digital system to support the Environment and Planning Act*

The communication between public authorities and citizens is increasingly digitised. During the next few years, this trend is set to continue in environmental law and in planning practice, and links up with the further digitisation of society.ⁱⁱⁱ

Digitisation of the Environment and Planning Act focuses on both the provision of information (the availability of the right information at the right time) and the procedural support. To ensure

an effective improvement of the digital information provision, a transparent system is required that is clear in terms of its methodology, language, control and data management. The digital system is not an isolated set of rules, but part of the existing e-government services, the generic data infrastructure, the internal government processes and the legal system.

The preliminary design of the digital system comprises of (1) a single portal connected to user applications that offer standardised information required by citizens, businesses and authorities for applications for building permits and notifications, (2) a central information infrastructure, to which clear agreements and digital standards apply and (3) information institutions linked to the information infrastructure that offer practical standardised information from various policy fields (such as planning, building & construction, water, soil, air, noise, etc.) required by the promoters and authorities.

The digital system is not one large ICT system, but a coherent set of agreements and ICT facilities, recordings, data collections and sources. This system ensures that the promoters, interested parties and authorities may consult the information they need for the Environment and Planning Act's processes. Furthermore, all information must be easily accessible for everyone, which is not the case right now. Data sets are created from varying motives and interests, which is why data on the physical environment is not always sufficiently available, usable or durable to be used right now.

The role that citizens and entrepreneurs increasingly ask and assume is of great importance. They want to be informed about and involved in the planning process via co-creation, or even be in the driver's seat. They could even perform their own measurements of noise levels or air quality, or develop technology (open data, 3D, etc.).

The Environment and Planning Act can only work properly if information, data, rules and decisions are digitised, made public and can be displayed easily. The quality, reliability and findability of information should be secured and should be easily understood by everyone. Among other things, such openness and transparency ensure that both public authorities and citizens have access to the same information.

2.2 *Design principles*

Digitisation will only succeed if the skills and expectations of citizens and entrepreneurs are included explicitly and continuously. This means that the digital system must not be set up from the perspective of a (steering) authority, but from the perspective of the user.

Equivalent and simple information. The availability of information is a basic requirement, but still by far not enough for a 'level playing field' for citizens and authorities. The information will have to be disclosed in such a way that even a non-skilled user will be able to be an equal discussion partner. And that is only possible when data are aggregated to information in line with the world as perceived by citizens. Visualisation in 3D makes information easier to understand for non-professionals. Maximum simplicity and transparency are, therefore, important conditions for the digital system as an instrument to support participation, but are not yet established.

There is a great diversity of parties who develop plans, both public and private. In order to do justice to this diversity and to make the interest of the user of the information paramount, it is necessary to differentiate in information supply. Each actor in the planning process has other questions and needs. A civilian participating in the planning process relies for his information needs on the government and on professional promoters. At the same time, the government and the professional players do not always have the funding, time and interest to make the information available to the civilian in a comprehensible form. Ultimately, the digital system to

support the Environment and Planning Act aims for citizens to receive individualised information, tailored to their personal situation and needs.

2.3 Increased focus on the needs of society

Integrated part of the digital system will be the development of service formulae that describe what the service to the initiator of spatial plans will be like (VIVO, 2016). The service formulae also offer the government some guidance. By means of 'customer travel', the formulae will be tested in practice. Developing the service formulae in practice offers an insight into what this requires the municipalities to do in terms of customer processes, channels, work processes, information supply, human resources, financing and staff.

Between now and 2024, the service formulae will be developed and implemented within the municipalities. Starting point is that the service formulae are developed and tested in close cooperation with citizens and entrepreneurs. In that, the Netherlands is one of the frontrunners in Europe. In my view, still too little attention is paid to citizens that want to participate in the planning process. As far as I am concerned, informative and interactive 3D applications should be central in service formulae for participation processes.

3. 3D applications in the planning process

3.1 Introduction

How can we involve the local community in a planning process that requires massive amounts of complex data? Nowadays general public still has practically no 3D visualization tools to aid in visual understanding. Kunmar et al. (2016) considers this problem as the major cause factor for the non-involvement and negligible influence of the general public in policy making. We must realise that society has become more set on the visual recording and processing of information. The value of 3D stands or falls with the development of applications from a user perspective.

In practice, it is clear that from a user perspective, 3D is preferable to 2D. Many people use 3D technology each day. 3D movies have been around for years now, 3D printing techniques are also developing rapidly. However, mobile applications, smart phones and tablets in particular show the fastest development with the most users. Virtual reality (VR) and augmented reality (AR) are developing at lightning speed, also because the capacity and speed of smart phones and tablets become ever greater. Samsung, for instance, includes a VR headset with its latest smart phone model, which can be placed in a headset. The quality of the image still leaves to be desired, but that is merely a matter of time.^{iv}

3.2 2D to 3D environment plans

According to Stoter (2015) 3D environmental plans are the future. Instead of a 2D map and extensive descriptions, municipalities should make a 3D model, visualizing all the relevant information for a particular area. That would not only be buildings and objects in the public area, but environmental aspects with a spatial dimension, such as air quality, noise, external security, soil quality and mobility as well. Changes in time can be visualised better in 3D than in 2D. However, according to her, 3D won't really take off until the market picks up on it by developing new applications. Many 3D geodata sets have been developed via market initiatives, such as the Esri^v 3D content initiative, with open 3D viewing services for a number of Dutch cities (Stoter, 2015).

Environment plans in 3D mainly have four user groups:

1. The government itself, for the benefit of its public tasks;
2. Promoters intent on realizing a (building) design;
3. Citizens who wish to be involved in the proposed spatial developments;
4. Entrepreneurs who use the data in commercial applications.

The dataset used in The Netherlands to build the environment plan is the previously mentioned Basic Registration Large-scale Topography (BGT). The BGT records detailed spatial information and provides input for spatial models. Of the currently available basic recordings, only the IMBRO model for the subsoil offers 3D information. In principle, the BGT could easily be expanded to offer 3D models if elevation data would be available via a national public facility, but that isn't the case yet. Some municipalities already use elevation data in models. Those models, however, have primarily been developed for the first mentioned target group, the government itself, rather than for participation by society.

Standardisation of the models is necessary for all user groups. That is why national agreements on the supply of data or data sets are needed. After all, an environmental plan is a legal document of which the content should be validated. This also means that the data must be well-protected, but at the same time be sufficiently open to stimulate market initiatives leading to innovations in 3D applications. The more open data are available, the more interesting it becomes for entrepreneurs to develop new, innovative, 3D visualizations.

3.3 3D city modelling

"Local governments and cities around the globe are rapidly incorporating advanced 3D tools and technologies into their planning, design, construction and operations. 3D GIS and 3D CAD technologies connected to local government databases and businesses are weaving a common thread throughout communities. Improved mapping, collaboration, 3D building designs and visualised opportunities for better education and understanding all flow from these new technological assets".^{vi} Reality or wishful thinking?

The first 3D city models were developed as early as in the late 1990s. Around that time, the first steps were made to develop Google Earth. This application is now used by many individuals as well as urban planners. In 2015, the ISPRS International Journal published a comprehensive State of the Art review of 3D city model applications. In this study, the authors demonstrated that 3D city models were used in at least 29 cases as a part of more than 100 applications. According to the authors, the comprehensive inventory could "be useful for scientists as well as stakeholders in the geospatial industry, such as companies and national mapping agencies, as it may serve as a reference document to better position their operations, design product portfolios, and understand the market" (Biljecki and Stoter et al. 2015, p. 2842). Geodata developments are moving fast as well. In the Netherlands, 3D is now supported in the optional part of IMGeo, the Basic Registration Large-scale Topography (BGT)'s information model. Around the globe, we see 3D city models being developed (Jackson & Simpson, 2012). The X3D Blacksburg Collaborative (Virginia Tech), for example, is developing a city model of the Town of Blacksburg and its surroundings.^{vii} The City of Adelaide, Australia, has created a 3D city model as a key tool to assist in planning for the City's future^{viii}. The City of Austin, Texas also uses 3D models for urban planning, to improve research and decision-making by urban planners.^{ix} And a last example: the city model for Pretoria's Tshwane district. Various design teams created a collaborative 'master plan' that everyone could work from.^x

Who are or what is the driving force behind the rapidly expanding 3D city modeling? In the private sector, these are the major firms of architects and planners, who are modelling in 3D

for public consultations in their urban projects. The most important corporation for 3D city modelling is Esri, which has a strangle on government planning departments with its ArcGIS suite of tools, now being updated through their recent purchases of Google Earth Enterprise and ETH-Z's procedural modelling software 'CityEngine'.^{xi} Top university centres on 3D modelling and 3D visualisation include MIT (SENSEable Cities Lab in Boston and Singapore), ETH-Zurich's Future City Lab in Zurich and Singapore, CASA at University College London and the Institute for Advanced Architecture Catalonia in Barcelona, but many other scientific institutes around the world experiment with 3D city modelling (Jackson & Simpson, 2012). The examples of current initiatives in 3D city planning, public as well as private, show that 3D city models can perform several functions at the same time. From a public perspective, it is a tool for professional city planners and a means to develop tourism by informing visitors about places and buildings. From a private perspective, city models combined with other sources of (big)data, can be used for commercial (development) purposes. From a scientific perspective, city models are a useful database for research. From the perspective of participation in the planning process 3D City Models could be modified for Virtual Reality (VR) en Augmented Reality (AR) applications.

3.4 VR and AR

From the perspective of enhancing a Smart Society, the potential of 3D visualization techniques for interactive public participation is most interesting. A Smart Society can be seen as "one that successfully harnesses the potential of digital technology and connected devices and the use of digital networks to improve people's lives" (Levy & Wong, 2014). By experimenting with augmented reality (AR) and virtual reality (VR) we can gather valuable information about the way people experience new developments and changing environments in their own neighbourhood and city.

Virtual reality is the term used to describe a three-dimensional, computer-generated environment that can be explored and interacted with by a person. That person becomes part of this virtual world, or is immersed in this environment and whilst there, is able to manipulate objects or perform a series of actions.^{xii} VR has already been used in a wide number of fields.^{xiii} With the introduction of the Oculus Rift^{xiv}, the Samsung Gear VR.^{xv} and the HoloLens by Microsoft^{xvi}, VR technology is becoming affordable for the main public.

Upcoming are new applications like Web-based Virtual Reality Geographical Information Systems (WebVRGIS). An experiment with WebVRGIS in Shenzhen, China however showed that the quality of the VR modeling on city scale depends highly on the available volume of data (Varna et al. 2016). Another promising development are Peer-to-Peer (P2P) network engines for geographic VR data and GIS analysis which combines VR, 3D GIS and P2P network (Zhihan et al., 2013). The P2P network makes a mapping of the users in real and virtual space and it could support VRGIS functions and serve as a web engine for 3D globe and digital city. But like with WebVRGIS the processing of massive amounts of (big)data and making it available in a web-application for mobile devices is really challenging (Li, et al., 2015). Simulation technology like the CityEngine, the OpenSimulator and CafuEngine are rapidly developing VR tools for use in 3D urban planning^{xvii}. Zhang and Moore (2014) made a comparative study of a three-dimensional VR model against 3D models built with ArcGIS and BricsCAD tools. The results from the comparison with GIS and CAD were significant positive as to ease-of-use and faster task completion in an urban planning context.

AR What is augmented reality (AR)? "AR supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world" (Azuma, 2001,

p. 34). The public is getting accustomed to using virtual reality apps. A few years ago, we witnessed the introduction of Google Glass and earlier this year, Nintendo launched the popular AR game Pokémon Go. The potential of AR for Planning Practice is hard to overestimate. In the Netherlands, 4 out of 5 people have a smart phone, and 65% a tablet.^{xviii} Clearly, the hardware is no impediment to the large-scale application of AR in planning practice. What we need is access to data and parties interested in the development of apps. tools expand the toolkit of the urban professional responsible for participation and that can be applies in almost every phase of a planning process (Reinwald, 2014). Olsson (2012, p. 739) who compared the effect of AR on a mobile system with paper visualizations of the plans concluded that AR was highly useful to visualize building plans in a 'holistic and intuitive way from the first-person point of view thus having a clear additional value over the traditional printout-based visualizations'. The results of case studies points in the same direction (for example Garnero, 2013 and Wanarat&Nuanwan, 2013). In architecture, AR and VR applications are developing rapidly.^{xix} What promotes this development is the availability of data sets in CAD and Construction Information Management systems (*Bouw Informatie Management, BIM*). This offers prospects for AR and VR application at site level as well, as the Netherlands shows a strong increase in the number of data sets shared by municipalities and provinces on data platform.^{xx} Cooperating with other organisations such as knowledge institutions creates more new initiatives. The introduction of the Dutch Environment and Planning Act is expected to boost this development in the Netherlands even more. The major challenge will be to stimulate the development of AR and VR applications that use existing and new data platforms (like the digital system being developed in The Netherlands). AR and VR enable us also to get community input around subjective aspects of the urban environment (Sabri et al., 2016). Society could thus have a significant influence on the planning process. 3D city models using AR and VR techniques are therefore important incentives for social innovation in the physical environment.



Photo 1: Virtual Newcastle Gateshead (source: Northumbria University)

4. Social media and public participation

How can planning professionals use social media to stimulate the sharing of ideas, opinions and information, thus enhancing the involvement of society in the planning process?

4.1 *Interaction between planning professionals and society*

Planning professionals should invite and enable community members and other interested actors to communicate about plans and their effects. There are several strategies to design public participation in the planning process effectively. Based on a review of more than 250 articles and books, Bryson c.s. (2013) answered the question of how to design public participation. He provided us with a dozen guidelines, most of which also apply to online participation.

According to Bryson c.s., it will first of all be necessary to establish that a public participation process is needed, and that it is based on a clear understanding of the challenge or problem (a part of the specific context) for which public participation is a desirable part of the response. The community members may have different views on the problem or challenge, and they determine the legitimacy of the process. The same applies to the management of expectations. Can the participants ask questions about the plan or project, are they supposed to give their opinion, or are they expected to co-create or even co-decide? In the latter case, an appropriate set of rules and a structure are needed to guide operational decision-making. Who gets to be involved in decision-making and how? According to the guidelines, it is necessary to manage power dynamics to provide opportunities for meaningful participation.

Secondly, the purposes and desired outcomes of the participation process have to be clarified and if necessary, regularly re-designed. In an online participation process, the community re-design is more an ongoing and co-creative process than a regularly performed activity by the professional.

Thirdly, every participation process, whether off- or online, must be monitored and evaluated. The outcome of evaluations must be shared with the participants. It should also be perfectly clear how the outcome of the process will be used. Because planning is a cyclic process, participation never stops. Whereas the 'traditional' participation process stops after the initial planning phase, the online participation process continues, but with a changing community. In most major infrastructure projects in The Netherlands social media like Facebook and Twitter are an integrated part of the communication strategy. The absence of research publications makes it impossible to evaluate the effectiveness of the use of social media in the planning process.

4.2 *Interaction within a community*

Interaction within a community will increasingly take place through social media. For example, there are over 4,500 WhatsApp groups for neighbourhood watches in the Netherlands and Belgium.^{xxi} In his dissertation on social media use, Robin Effing concludes that the perceived value of social media for non-profit communities depends on having a social media strategy (Effing, 2014). This is not a strategy composed by a professional outside the community, but by the community itself. That is the most distinctive difference from the participation process as described in paragraph 5.1. As in the case of the neighbourhood WhatsApp groups, it is important for communities to develop an integrated approach to their social media strategy. According to Effing (2014, p. 137) "a strategy will exploit the potential benefits and provide the

community with the advantages of social media, such as reaching potential new members, and on the other hand, it regulates the downsides of use, such as reducing the impact of social media attacks on the community. In addition to having an integrated approach, it is important to understand that there is no one-size-fits-all strategy, but that the strategy depends to a large extent on the chosen social media channels, the specific nature and goals of the community, and its environment". He mentions seven key elements of the social media strategy within a community and most of them also apply to a planning process.

First of all the use of social media should have a pre-defined goal to be effective and also a target audience that can be reached through social media channels, and what behaviour is to be expected from this population. Secondly there has to be some kind of organisation and resources within the community, to make and carry out an activity plan to guarantee the continuity of the interaction as much as possible and also to monitor the communication on social media channels to prevent bullying, harassment and gossip as well as to prevent conversations to escalate and cause severe reputational damage.

Communities that have set up a social media channel to mobilize citizens against government plans can be very successful. See for example the occupation of Taksim Square and Gezi Park in Istanbul, Turkey in 2013^{xvii}.

5. Further Research

Research on visualization tools to support planning practice is carried out from perspectives like geographic information science, computer graphics, 3D city modelling, interaction design and urban planning. Based on an analysis of 114 articles, published in 2004-2014, Billger et al. (2016) conclude that studies of implemented tools in real planning processes are still rare. Lovett et al. also stress the need for systematic evaluation of applications for 3D visualization techniques (Lovett, 2015). According to Brown and Kyttä (2014) there is need for more empirical research to increase participation rates by using GIS (PPGIS). But an important precondition for that kind of research is the availability of web-based PPGIS tools (Butt and Li, 2012). Another way to experiment with 3D visualization tools is through serious gaming (Poplin, 2012).

Both empirical research and serious gaming are part of our research programme at Saxion UAS. One of our main topics is participation. With the support of the Dutch Ministry of Infrastructure and Environment we established a LivingLab to carry out research projects that support the implementation of the Environment and Planning Act and the digital system. At the moment some 10 municipalities, a province, 2 watercontrolboards and 2 civil organisations participate in experiments with the new legislation. One of the municipalities is currently working on a 3D environmental plan which will be subject to participation later this year. With groups of students we will conduct experiments with digital vs analogue participation. The purpose of these experiments is to better understand the citizens' information needs, to determine the possibilities that 3D technology offers and evaluate the effectiveness of the various forms of participation. On that basis, we aim to develop new 3D applications in multidisciplinary teams, to be used in the planning process. We also intend to research the development and application of social media strategies in the context of the Environment and Planning Act.

Although the development and management of city big data, using virtual reality technology is an inspiring and promising approach, we can identify some serious challenges. First of all we must learn more about user preferences, especially regarding VR and AR, if we want to involve more citizens in the planning process. That's what we are working on now in our LivingLab.

Another challenge is to deal with the increased amount of (big)data and the quality of that data: in other words: "data we have, information we need". Thirdly we must critically evaluate the use of social media by society itself. The instrument itself can be very useful in a participation process, but when initiated by professionals usually fails.

6. Conclusion

We can conclude that, due to their multiple purpose use and business opportunities, 3D city modelling, VR and AR applications are innovative and promising tools for public participation in the planning process and rapidly growing commercial market. It is also a fascinating field of applied research. It is important that governments and businesses adopt policies that support 3D digital technologies such as AR and VR, in particular when applied in planning and decision-making processes in which interactive public participation is desirable or required. The development of digital systems that support the new Dutch Environment and Planning Act in the Netherlands offers us a unique opportunity to make a great leap forward in 3D applications, not just for planning professionals but in particular to stimulate an innovative urban planning practice that involves interactive digital public participation.

References

- Azuma, Ronald et al.. (2001), "Recent Advances in Augmented Reality", IEEE Computer Graphics and Applications, Vol. 18, No. 6, pp. 34-47.
- Biljecki, Filip and Stoter, Jantien et al. (2015) "Application of 3D City Models: State of the Art Review", ISPRS International Journal of Geo-Information, Vol. 4, 2842-2889.
- Billger, Monica, Liane Thuvander, and Beata Stahre Wästberg (2016), "In search of visualization challenges: The development and implementation of visualization tools for supporting dialogue in urban planning processes." Environment and Planning B: Planning and Design). Published online: 0265813516657341
- Boonstra, B. en Boelens, L. (2011), "Self-organization in urban development: towards a new perspective on spatial planning". Urban Research & Practice. 4 (2) pp. 99-122.
- Brown, Greg, and Marketta Kytta (2014), "Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research." Applied Geography 46, pp. 122-136.
- Bryson, John (2013) "Designing Public Participation Processes", Public Administration Review, Vol. 73, Issue 1, 23-34 (February)
- Butt, Muhammad A., and Songnian Li (2012), "Developing a web-based, collaborative PPGIS prototype to support public participation." Applied Geomatics 4.3, pp. 197-215.
- Effing, Robin (2014), The Social Media Participation Framework (diss.), Enschede, The Netherlands: Saxion and Twente Universities

- Fagence, Michael (1977), *Citizen Participation in Planning*, Pergamon Press: Oxford, p.2.
- Garnero, Gabriele, et al. (2013), "VGI, augmented reality and smart web application: projects of development in the territory of the Sardinia region." *International Conference on Computational Science and Its Applications*. Springer Berlin Heidelberg.
- Jackson, Davinia & Simpson, Richard (2012), *D_City*, Newton, Australia (e-book:epub)
- Kumar, A. Arun, et al. (2016), "Perspective from the field: Innovative Geographic Visualization for Improved Understanding and Effective Public Participation in Environmental Policy Making and Implementation." *Environmental Practice* 18.02, pp. 129-131.
- Lovett, Andrew, et al. (2015), "Using 3D visualization methods in landscape planning: An evaluation of options and practical issues." *Landscape and Urban Planning* 142, pp. 85-94.
- Levy, Charles & Wong, David (2014), *Towards a smart society*, Lancaster: Lancaster University
- Li, Xiaoming et al. "Xearth (2015), A 3D GIS platform for managing massive city information." 2015 IEEE International Conference on Computational Intelligence and Virtual Environments for Measurement Systems and Applications (CIVEMSA). IEEE.
- Lv, Zhihan, Shafiq Ur Réhman, and Ge Chen (2013), "Webvrgis: A P2P network engine for VR data and GIS analysis." *International Conference on Neural Information Processing*. Springer Berlin Heidelberg.
- Olsson, T., et al. (2012), "User evaluation of mobile augmented reality in architectural planning." *eWork and eBusiness in Architecture, Engineering and Construction*, pp. 733-740.
- Poplin, Alenka (2012), "Playful public participation in urban planning: A case study for online serious games." *Computers, Environment and Urban Systems* 36.3, pp. 195-206.
- Reinwald, Florian, et al. (2014), "Augmented Reality at the Service of Participatory Urban Planning and Community Informatics—a case study from Vienna." *The Journal of Community Informatics* 10.3.
- Sabri, Soheil, et al. (2016), "Leveraging VGI Integrated with 3D Spatial Technology to Support Urban Intensification in Melbourne, Australia." *Urban Planning* 1.2, pp. 32-48.
- Varna, D. S., et al. (2016), "City Bigdata 3D Visualization and Analysis Based on Webvrgis Platform." *International Journal Of Scientific Research And Education* 4.04.
- VNG (2016), *Verkenning informatievoorziening Omgevingswet*, Den Haag: Vereniging Nederlandse Gemeenten (Organization of Dutch Municipalities)

Wanarat, Konisranukul, and Tuaycharoen Nuanwan (2013), "Using 3D visualisation to improve public participation in sustainable planning process: Experiences through the creation of Koh Mudsum plan, Thailand." *Procedia-Social and Behavioral Sciences* 91, pp. 679-690.

Zhang, Sisi, and Antoni B. Moore (2014), "The Usability of Online Geographic Virtual Reality for Urban Planning." *Innovations in 3D Geo-Information Sciences*. Springer International Publishing. pp. 225-242.

End notes

- i TK 2013-2014, MvT 33 962 Nr. 3 (<https://zoek.officielebekendmakingen.nl/kst-33962-3.html>)
- ii Nadere memorie van antwoord, 16 February 2016 (https://www.eerstekamer.nl/wetsvoorstel/33962_omgevingswet)
- iii Vision letter e-government 2017 (<https://www.rijksoverheid.nl/documenten/kamerstukken/2013/05/23/visiebrief-digitale-overheid-2017>)
- iv <http://www.tested.com/tech/556752-testing-samsung-gear-vr-consumer-release/>
- v <http://www.esri.com/products/arcgis-capabilities/3d-gis>
- vi <https://www.3dvisworld.com/features/feature-articles/6133-new-approaches-for-3d-city-design-and-urban-planning.html>
- vii <http://www.web3d.org/sites/default/files/presentations/Next%20Generation%20Spatial%20Data%20Infrastructures/Next-Generation-Spatial-Data-Infrastructures.pdf>
- viii <http://www.adelaidecitycouncil.com/planning-development/city-planning/3d-city-model/>
- ix <https://www.3dvisworld.com/features/feature-articles/10564-using-interactive-3d-models-for-urban-planning.html>
- x http://www.arup.com/3d_city_modeling
- xi <http://www.esri.com/software/cityengine>
- xii <http://www.vrs.org.uk/virtual-reality/what-is-virtual-reality.html>
- xiii <http://www.vrs.org.uk/virtual-reality-applications/>
- xiv <https://www3.oculus.com/en-us/rift/>
- xv <http://www.samsung.com/nl/consumer/mobile-phone/wearable/galaxy-gear/SM-R322NZWAPHN>
- xvi <https://www.microsoft.com/microsoft-hololens/en-us>
- xvii <https://www.eurosis.org/cms/?q=node/1769>
- xviii <http://www.marketingfacts.nl/berichten/het-mobiel-gebruik-in-nederland-de-cijfers>

- xix http://www.architectmagazine.com/technology/products/three-augmented-and-virtual-reality-apps-for-design-and-construction_o
- xx <https://www.dataplatform.nl/nieuws/600-gemeentelijke-datasets-op-dataplatform>
- xxi <http://wabp.nl/>
- xxii <http://www.dinamopress.it/news/taksim-square-and-gezi-park-occupation-practicing-commons>

How Smart are we about Smart Cities: Exploring opportunities for Empowering Alternatives

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Abstract

The resurgence of interest in smart cities recently is captured in the many images promoting technology-mediated, connected cities devoid of contextual significance. An odd feature of these representations is 'spacelessness'... Digital renditions of glass-clad skyscrapers and superhighways appear to float in an abstract realm that is assumed to be malleable enough to adapt to any environment. These photo-shopped images are reminiscent of the technological determinism present in early (Information and Communication Technology) ICT debates with regards to city planning, where the tyrannies of space were assumed to be rendered insignificant through access to the cyber realm. This hypothesis has been disproven many times as the spatial manifestations of the digital divide are uncovered and renewed inequalities are manifested in the knowledge economy.

This chapter explores manifestations of the smart city at a local scale and argues that engagements with space, directly or indirectly, are integral to how technology is appropriated by those acting from the margins and is therefore of meaning to planners working in the global South. Three dimensions of this relationship are explored through reference to a number of examples. The first refers to grassroots efforts to render the margins more visible through online mapping and geo-referenced data capture. The second dimension then explores how this information can empower and enable local communities to engage powerful stakeholders, with the third exploring the extent to which this makes input into spatial governance. In the same way that a 'killer app(lication)' represents the core value of a technology, this chapter concludes on ways through which an engagement with the spaces of the 'real' smart city can serve as a means to unlock and enable livelihoods and thereby enable more inclusive planning processes.

1. Introduction

In 2002 the City of Cape Town, in South Africa, undertook a Digital Divide Assessment entitled 'Taking Stock and Looking Ahead'. The survey elicited responses from 2000 members of civil society, business, academic institutions and government agencies. The aim was to understand qualitative and quantitative constraints to technology access. It had four main objectives: gauge access to ICT, assess the needs of Cape Town's people and organisations for future ICT services, identify opportunities to improve access and identify constraints (Bridges.org 2002). Interviews in the early 2000s with staff from the City of Cape Town and bridges.org confirmed that the study was to feed into the smart city strategy, released in 2001,

aimed at achieving broader developmental goals (Wright 2003). Smart cities were seen to be essential to achieving the socio-economic objectives outlined in the city's strategic plan. Similar research that I had done elsewhere (Odendaal, 2006; 2010; 2011), confirmed faith in the developmental capacities of ICT. In fact many smart city strategies, in the early 2000s, were closely aligned with strategic planning processes in the North and South (Odendaal, 2003; Aurigi, 2005).

More than ten years later, the City of Cape Town, together with the Swedish Consul in Cape Town, hosted a Smart City Summit in 2012. The opening address by the Swedish ambassador emphasized the function of technology as an enabler of transparency and fighter of corruption. The emphasis was on city governance and climate change, featured boldly as part of a normative agenda that would need to be addressed through improved ICT-enabled city administration. The two initiatives share the same terminology, differ in overt objectives yet the technological determinism that sees technology as an unlocking and emancipatory mechanism for development remains.

More recently, the romance of 'high-tech' and the visual discourse of high-rise skyscrapers hyper-connected into a seemingly space-less global economy dominate much of the marketing language that promotes the more recent iteration of the smart city idea. It is a slippery concept open to abuse and varied translations (Hollands 2008). There is surprisingly little theoretical work on the notion of smart, with even less on cities of the global South (see Luque-Ayala and Marvin 2015). The purpose of this chapter is to explore what the notion of 'smart' means for city planning in the global South. I commence this by reviewing debates on the relationship between smart cities, global South urbanity and planning.

My theoretical position is one that rejects the objectification of technology as an outside force that, by itself, liberates or constrains. The city is taken as representing the outcome of continuous socio-technical processes that manifest spatially as the relationships between the material (technology, infrastructure, natural systems) and human agency (social action, planning...) evolve. This represents a 'dance' between technological innovation and appropriation through social action and livelihood imperatives within the highly unequal urban spaces of the global South. I argue here and elsewhere (Odendaal, 2011), that this is an opportunity for planning to be relevant and effective. It requires a renewed understanding of the relationship between technology and space however. I explore three dimensions of this relationship here, using examples from African cities to illustrate: the first refers to grassroots efforts to render the margins more visible through online mapping and geo-referenced data capture. The second dimension then explores how this information can empower and enable local communities to engage powerful stakeholders, with the third exploring the extent to which this makes input into spatial governance. I conclude the chapter on implications for planning and future research.

2. ICT, Cities and Planning in the global South

There are three dimensions to the debates on the relationship between ICT and planning in the global South, that assist in gaining insight into how technology can enhance spatial planning. Since the beginnings of the development industry, technology has played an important role in discourses surrounding modernization and progress. This has impacted on funding programmes and assumptions underpinning policies and thus, is an important element to consider. The relationship between technology and space is an uneasy one where early debates on ICTs have largely assumed the end of spatial divides and tyrannies. By extension it has often been assumed that this enhances and in some ways provides opportunities for innovation in spatial planning. My position however, is that the relationship between technology and space is more intricate than that and requires a relational lens to uncover opportunities for spatial planning. The second part of this review therefore considers this relationship in more detail, while the third part focuses more specifically on smart cities.

Technology and Development

The spatial imagination that accompanies technological export is associated with the assumption that technologies are likely to spread everywhere with the same impact, regardless of context, argued Thrift very early on (1996). Since the mid-1990s different dimensions of this assumption have manifested in different forms. One of the features of technology adoption is how 'older' forms of communication, such as analog radio, coexist with digital forms in ways that best represent local conditions. Mytton (2000: 2) estimates that the million radio sets in Africa in the mid 20th Century increased to approximately 100 million by 2000. Community and amateur stations (with access to inexpensive short – to medium term bandwidths) broadened listenership while also allowing for growth in specific sectors such as university campuses and churches. Radio is a highly superior mass medium, given the lower cost of production and transmission (Paterson 1998). In Cape Town, South Africa, it continues to play an important role in soliciting opinion on public issues (Bosch, 2011). New media is beginning to be recognized as a tool for social organization and sharing in Uganda, (Javuru, 2013), but radio remains a core part of political mobilization (Mwesige, 2009). Technological innovation and appropriation are not linear processes but closely tied to livelihoods and lifestyles (Odendaal, 2011).

From a governance perspective, faith in the transformative power of technology has endured. Within the urban context, e-governance promotes digital connectivity as a democracy enabler and is in keeping with more recent efforts to enable greater decentralisation of government. New communication technologies facilitate the non-hierarchical, flatter organisational structures of market-led, decentralised development...in keeping with the trajectories of the World Bank and other development agencies (Schech 2002). ICT developmental efforts are informed by such overt ideological determinants. Neo-liberal expectations of technological diffusion influence access and policy implementation: "...the social and economic model inscribed into the technology which often implicitly sets the rules of the game

which affect both the online and the offline world” (Kleine 2009: 181).

In development discourses, the Information and Communication Technology for Development (ICT4D) paradigm has systematically explored the relationship between governance (and by extension planning), social action and social development. The premise is that ICT enables information transfer and communication critical to economic production and distribution. A more critical examination of the ICT4D idea reveals its modernisation roots: the notion that technology enables a progression away from more traditional forms of communication and media, progressing towards more sophisticated and complex structures. The linear path assumed for development, the global agenda driven from the North and the hegemonic image of the Western developmental model as the most desirable, typify the modernisation paradigm (Schech 2002). It also speaks to a temporal linearity that is deeped inevitable, where developing countries cannot afford to be ‘left behind’ (Graham, 2008). ICT4D is informed by the ideological and policy objectives of development agencies and governments. There is a more recent tacit recognition of the need for a more contextually appropriate approach. Moving from a supply-driven model to more demand-centered approaches, frames the poor as potential innovators and producers, not just passive consumers (Heeks, 2008).

Anti-developmentalists warn against the tendency to impose ICT projects without consideration of context and local cultures (Graham, 2008). Northern digital content is dominant online and on social media (Obijiofor 2008). ICT is considered an export of Western culture (Schech 2002) representative of Western knowledge and capitalism (Escobar 1995). Much like radio was used by the Portuguese to capture the minds of Mozambicans (Schech cites Power, 2000 in this regard), the Internet distributes a particular brand of knowledge mediated by language preference and content. The reverse holds however. Frelimo invaded the offices of Mozambican radio stations in 1975 to broadcast indigenous history and culture. In the same way, the Internet has been appropriated for advocacy of local issues to a global audience. This represents a new power dynamic where, in the hands of subaltern groups, technology can “foster new practices of being, knowing and doing” (Schech 2002: 21).

The Arab Spring illustrates the performative dimensions of ICT. In Egypt and Tunisia, social media played an important role in influencing key debates *before* both uprisings, and assisted in spreading democratic messages beyond the countries’ borders, during and after demonstrations (Howard *et al*, 2011). ICT was part of broader heterogeneous networks that included television, radio and built upon existing social and kinship capital (Allagui & Kuebler, 2011). The power of the media no longer vests in the state alone, enabling distributed voices and visual content that potentially challenge official discourses. These multi-layered, technology-mediated exchanges are subject to context, differentiated access and existing social networks.

Global unevenness with regards to bandwidth access and hardware costs remains however. Some argue that the geographic distribution of high technology across the globe in terms of high technology exports, computer power, and Internet hosts follows the hierarchical pattern of the core-periphery system explored by dependency theorists (Guellen and Suarez 2005). Information technology leads to new forms of

dependency argues Everett (in Guellen and Suarez 2005). ICT can entrench internal core-periphery relationships, following and perpetuating other indicators of inequality (Wahl in Kleine 2009). Increases in social divides can be perpetuated by unequal access to ICT. Within a community those with greater resources (money, education, and training) are more likely to use and access technology (Donner 2007). The developmental potential of ICT is frustrated by the mundane: physical and socio-economic barriers such as lack of training, literacy, hardware access and infrastructural limitations (Odendaal, 2010). Prioritisation of resources, time scarcity and literacy are all factors that impact on the divide between those that are digitally enabled and those on the wrong side of the ICT revolution.

Factors that influence the digital divide include language, poverty indicators and perceptions of technology (Keniston and Kumar, 2004). Demographic and socio-economic factors influence the choice and use of ICTs as well as how they are used in conjunction with other resources (Crang & Graham, 2007; Selwyn and Facer 2007). Availability of technology does not guarantee use. Several African studies quoted in Obijiofor (2008) show a predominance of Internet use for e-mail while web surfing remains low. Social attitudes to computers are associated with social hierarchy and status. These perceptions are closely tied to other socio-economic indicators such as education, income and age (Crang & Graham, 2007).

Technology and Space

ICT does not necessarily overcome spatial inequalities; the opposite is in fact true. Drawing on Graham and Marvin's 'Splintering Urbanism' thesis (2001), Servon argues that: "IT is deeply rooted in geography" (p. 226). Despite the ability of ICT to transcend space, it remains a core factor in considering digital access. In South Africa, the distribution of cell phones and landline telephony as well as online access in social facilities such as libraries and schools reflect Apartheid geographies, and subsequent post-Apartheid investment patterns (Odendaal, 2011). Spatial constraints do not simply disappear with broadened technology access but co-exist with cyber-space in a hybrid form (Graham, 2008) that is more relational than Cartesian (Odendaal, 2014).

Spatial inefficiency coexists with the creation of new technology-mediated spaces. The location of Internet cafés and mobile phones in Africa reflects access differentiation, and also the creation of new places for social and economic relations (Obijiofor 2008). Where individual contact is constrained by income and bandwidth, public and private Internet cafés become important access points. Tele-centres are in many cases the result of private entrepreneurial activity in urban centres that offer connectivity and a suite of services that include photocopying, faxing as well as computer and Internet access. In some cases they provide telephony (that relies on cellular technology) and have compensated for low land line availability, providing services for small businesses in many cases (Falch 2004). A study of 32 Internet cafes in inner-city Johannesburg, South Africa, found that these facilities are used for gathering information on study and job opportunities and compiling CVs, but also as a tool for organizing social events and staying in touch with friends and family. The study reports a high rate of returning customers and almost half of respondents accessed the Internet on behalf of others. (Hobbs & Bristow, 2007)

Appropriation of technology can be highly personal and creative. Social acquaintance with technology is ongoing and imbued with values and norms. We still need to understand how different technologies take on different social meanings in particular cultural contexts, argues Thrift (1996). The choice of the cell phone as an extension of personal style is a contemporary example. Amongst the youth of marginalised communities in Cape Town, for example, it is a personalized and symbolic connection to the world; a means of reinforcing identity through technology appropriation while remaining connected to selected global cultural icons (Hammett, 2009). Work on mobile phones shows appropriation is linked to social networks, cultural beliefs and socio-economic contexts. New spatial modalities of ICT use in developing countries mitigate cost restrictions: container telecentres and informal phone shops on side walks ('umbrella ladies') are examples (Donner 2007). The ways through which innovations are mediated by culture and social norms is illustrated by the notion of 'beeping' (making missed calls) as documented in Donner's ongoing work on mobile phone use in developing countries (2005; 2008). Not only are missed calls intentional, they represent an implicit communication code. They are indicative of particular social network arrangements. Beeping "joins a repertoire of voiceless conversations, text messages, image-exchanging, emailing, and even purely visual 'display' " (Donner 2008: 17).

Ubiquitous computing means the fixtures and utilities of contemporary life are, "...augmented with computational capacities..." (Dourish and Bell 2007: 414). The boundaries between private and public have become less certain. As technologies become increasingly mobile and pervasive, opportunities for surveillance increase. As we purchase goods at supermarkets (using credit cards), stop at traffic intersections (through traffic web cams), acquire books and music online and enter buildings (through electronic entry points) we leave 'bits' of ourselves; "These technologies allow spaces to both remember and anticipate our lives" (Crag and Graham 2007: 789).

This has implications for the experience of space and movement between places. Ambient computing anticipates a spatial dimension where the 'cyber' and 'real' co-produce an experiential dimension typified by seamless flows of information and interaction. A hybrid space is possible at the interface between infrastructure and human experience (Dourish and Bell 2007). Whilst traditional networked infrastructures are tangible and fixed, ubiquitous computing is pervasive, mobile and increasingly footloose due to wireless capacity.

Planning the Smart City

The contextual embedding of technology is a socio-technical process of appropriation tied to livelihoods and qualities of place. It results in diverse spatial configurations, very different from the mainstream representation of 'smart cities'. In India, the Modi regime defines them as "cities that leverage data gathered from smart sensors through a smart grid to create a city that is livable, workable and sustainable" (Business Standard: 2014). Multinational technology companies are touted to invest in smart grid infrastructure while the government of Singapore is claimed to be

interested in supporting the construction of 10 smart cities on the Delhi-Mumbai industrial corridor (Seth, 2014). Marketing images project a "... fuzzy, New Millenium fantasy" (*Ibid.*), a decontextualised spacelessness.

The link to social development is a tenuous one and reminiscent of the determinist language of the past. The IBM's Smarter Cities programme makes three connections that apply to the context of the global South; a celebration of how the last 20 years technology has enabled improved quality of life, an emphasis on climate change and the fact that vulnerability to floods and storms in over half of developing world is a reality, and the need for improved governance. Technology is the answer (www.ibm.com). The central operations center in Rio de Janeiro, Brazil is one of the most visible examples of IBM/municipal collaboration. Following a flash flood in 2007 that took the city by surprise, the company, together with CISCO and the local authority developed a integrated disaster response and monitoring system that integrates 32 agencies and services and relies on 400 active cameras in the city for continuous surveillance. As in most socio-economically divided cities, the concern is that only well-off neighbourhoods benefit and that it is an interim measure that detracts from real infrastructural problems. A concern with privacy and surveillance has also been expressed. (Singer, 2012.)

Three trends in contemporary discussions on smart cities in the media and literature are discernable. The first is a broadening that seeks a stronger engagement with the social and cultural coordinates of urbanity. In many cases this is marketing language used to augment corporate agendas, a visual language that emphasizes global connection. Whether digital technologies enable inclusion and empowerment would be important questions in this regard.

The second is an engagement with natural sustainability and specifically climate change, reinforcing the relationship between livelihoods, disaster management and digital monitoring. Threats to livelihoods have in many cases necessitated social mobilization, often using communication technologies.

The third shift is an explicit acknowledgement of other infrastructure services. The relationship between ICT and other utilities has always been implicit. Municipal utility billing systems rely heavily on centralized information capture and processing for example. Explicit reference to technology enabled management of services and digital innovations such as smart grids focus on the interrelationship between utility parts.

The fourth, and most pertinent to thinking about spatial planning and ICT, is an eerie decontextualisation that leads to a spaceless representation. There is a worrying tendency towards formulation of an ideal smart city (glass tower and superhighways are part of the visual language) that seemingly applies everywhere. The depiction of 21st century Utopias is not new in planning, but the stark contrasts between the physical qualities of cities in the global South and this visual language is staggering.

So if this is indicative of a new form of urbanism, one that is data-driven and essentially accessible to a broad populace, it begs the question how, in the urban

areas of the global South, can this translate into transformative practice that is cognizant of local place? The following section explores this question with some tentative answer supported by examples.

3. Technology, Space and Planning in Cities of the global South

Cities in the global South clearly vary in size and character but do share a number of characteristics: increasing informalisation that is indicative of the failure of the formal economy to provide livelihoods, spatial inequalities as the fallacy of trickle-down economics is displayed in fragmented urban forms, and income disparities. I explore three dimensions here in relation to the relationship between ICT and planning that speak to the global South urban experience. The first is an engagement with informality; the second engages with the notion of collaborative governance as a function that could potentially be supported through technology; and the third explores technology-enabled production of space.

Rendering the 'invisible' visible

At the World Urban Forum in 2014, in Medellín, Shack/Slum Dwellers International (SDI) convened a session entitled 'Smart Cities from the bottom up'. Together with the Sante Fé Institute, the organisation is working on uncovering the 'science of slums' (Brelsford & Bettercourt, 2015), systematically mapping the spatial logics that underpin informal neighborhoods. The project is technically interesting and will no doubt make an important contribution to insights that can assist in appropriate planning intervention. The Institute uses GIS and other technical tools to analyse the logics of grassroots spatial practices, and how various spatial interventions can assist in improved access. This is part of the smart story; using technology to analyse and test various intervention scenarios, and can no doubt, add enormous value to planning processes. The second part of this initiative relates to what it uncovers, which is of interest to understanding smart practices at a grassroots level. Re-blocking practices (where slum dwellers reorganize their own settlements spatially to enable utility provision) and self-enumeration enables control and generation of spatial and other data by slum dwellers themselves, empowering them with the information necessary to engage the state and other service providers.

The acts of documentation and systematic mapping are processes of making the invisible (slums are seldom mapped on typical topo-cadastral maps and are generally seen as 'temporary' by authorities) visible. This is the strapline used by the Map Kibera Trust in describing their work in this famous Kenyan settlement. In addition to the invisibility of slums on conventional maps and in planning documents, mapping is often outdated as land uses, for example, change on an ongoing basis and circulation routes adjust to suit local conditions. Technically it therefore makes sense to enable local residents to map and update local conditions, but the actual process of mapping is an act of power – claiming information through technical means builds capacity and intellectual property.

The MapKibera project, led by Erika Hagen and Mikel Maron, initially trained carefully selected and representative residents in using a range of technologies, to map and collect stories about local places in Kibera, resulting in dense maps capturing points of interest, categorized and selected by participants (Hagen, 2010). Java editing software was used to map and share this data through OpenStreetMap, a community driven 'wikipedia of maps' that captures local knowledge about places (OpenStreetMap, 2015). The project has evolved into three spinoffs that illustrate the generative potential of such work. With support from funding partners more detailed mapping on prioritized thematic areas has been done, and includes ongoing media development using 'Ushashidi' (an East African non-profit company that develops open source software) tools that enables mapping through use of mobile phones, online video news reporting and SMS monitoring of local issues (Hagen, 2010). This learning is now used in two other slums in Nairobi and the web site has evolved into a training platform where information and techniques are shared (MapKibera, 2015).

Technology-mediated Governance

The term 'governance' is often used in relation to smart city discourse, with the promotion of transparency and more integrated decision making seen as important outcomes. The reciprocal relationship between content provided and consumer; ongoing interactive exchange is mentioned but it is worth considering whether this can be truly empowering in relations between the state and communities. The predominance of social media signifies a shift to a more decentralized form of e-governance where citizens could contribute content. But it also reveals a new form of oppositional politics as illustrated by a contemporary case in Cape Town.

The Social Justice Coalition Cape Town (SJC-CT) is a civil society organisation based in Khayalitcha, engaged in monitoring communal sanitation in the area. The lack of sufficient maintenance, the limited numbers of facilities and high number of attacks on women at night in communal sanitation areas, together with the fact that many of the toilets provided do not have doors, have caused great and justified embarrassment to the city administration. SJC uses digital tools to monitor and report on such issues. It does this through its onsite presence in Khayalicha and other locations, but also through social media.

The organisation's web site includes online petitions, responses to public press releases and links to news articles. One of the drop down menus on the site is entitled 'Imali Yethu' a Xhosa phrase for 'our money'. The menu contains pages with places where service delivery contracts are in place for sanitation, refuse removal and policing in Khayalitha. The detail of each contract is displayed, with the expected frequency and scope of maintenance tasks, the contact person and detail of the company contracted and time frames. The aim is to empower communities with the necessary facts to monitor and share information on service delivery. The overall aim is to increase monitoring of public spending and accountability. Each page contains the usual Twitter, Facebook and other social media sharing facilities.

The online dissemination of surveys and reports, as well as links to media from

activist organisations, as a counter to municipal evaluations, has proven to be one of the central tasks of the organisation. Using this information to motivate for more rigorous upkeep of communal toilets has resulted in revising service level agreements between the City of Cape Town and contractors. (Mitchell 2014) The fact that these audits on sanitation services are updated monthly is important for ongoing operations.

Essentially, SJC's social media and online campaigns do represent a 'smart city from the bottom-up', but mainly as a challenge to city discourses and more importantly, as a monitoring strategy. These are important functions that have practical impacts, but with limited mobilization effects due to seemingly mundane but important constraints that speak to larger digital divide issues. As part of the organisation's 'quiet activism' (Robins 2014) it is part of broader governance that may lack the drama of the 'poo protests' but nevertheless represents an alternative to the corporate smart city discourse.

Negotiating 'new' and 'old' spaces

ICT functions as an economic tool that can enhance livelihoods, and can do so in many documented ways from formal ecommerce processes to the less formal transactions by those engaged in the informal economy for example. More pertinent to planning in the global South are the spatial dimensions that emerge from the interface between technology and marginal livelihoods.

New spatial configurations have emerged from the interface between ICT and the informal economy and provide some interesting opportunities for augmented urban design. Field work I did in Durban over the last decade show interstices on the streets where umbrellas and trolleys combine in physical space to provide telephony to the passer-by co-exist with containers situated on open spaces often providing community focal points. Telephony extends the repertoire of goods for sale by hawkers as they diversify and agglomerate. Boundaries between the public and private became blurred as a pedestrian takes a moment to have a telephone conversation in a public space. The informal-formal enterprise spectrum incorporates a number of entry points for the telephony trader: from second-hand mobile sales to sidewalk phone booths and sponsored container shops. (See Odendaal, 2014)

The flexibility of mobile telephony enables technology appropriation that translates into embodied 'spatialities' where the line between the corporeal and public is blurred; a private conversation links the individual to another space while he sits on a small stool in the middle of a physical place designated in front of a shopping center. Observations shows how it extends to community - albeit transient community - as pedestrians go about their business, stopping to make a phone call at a table with an umbrella located on a paved space and then extending the chat to an interchange with the vendor and fellow callers (Odendaal, 2014). The space can become private again as booths in shops allow for separation from the bustle of city life. In informal spaces, the smart city is never far away physically, or from our consciousness.

4. Conclusion

This chapter departs from determinist notions of smart cities that favor as infrastructure-led approach to the complexities of cities in the global South. Using examples from the African context I explored three dimensions of a more nuanced reading of ICT-enabled planning. Community mapping in informal spaces in Kibera and Cape Town, is valuable in terms of process and outcomes. In addition to the capacity building dimension of enabling local communities to produce their own spatial data depositories, the actual act of 'making the invisible visible' is important. It avails opportunities for true collaboration on an equal footing between planner and participant. Making that information available, and augmenting it with place-based stories through digital means, enhances the experiential qualities of spaces.

The use of social media and the Internet to challenge or engage with local government in Cape Town, revealing a governance dimension that creates opportunities for feedback – a data-driven urbanism that does not only vest in the hands of experts. The SJC example shows how the smart city from the bottom up can act as an important governance input in ensuring that local government delivers on its mandate. It may be limited in scope in terms of broader mobilization and process (at this stage) but like technology, such situations can change.

The augmentation of space through sale of technology and telephony has added some dimensions to repertoire of informal trade. It also enables embodied spatialities (some Dourish here) that avails opportunities for ongoing information exchange. Urban space is saturated with reminders of the digital age and has in recent years been the manifestation of digital mobilisation around social justice. How then do we turn such ubiquity into urban opportunity? I argue that digital space needs to be part of a continuum of urban space that stretches from the physical to the virtual. Maintaining the dichotomy of real and virtual spaces is not helpful. This has design implications. Newly defined land uses and uses of open space require urban design that is mindful of expanded livelihoods, that accommodates flexibility and acknowledges the fleetingness of exchange. Public space is required to be multifunctional, connected and augmented, enabling co-presence through use of smart phones. Understanding the spatial manifestations of marginal livelihoods is important. They provide us with clues on the entry points for technology appropriation in urban space.

Long before the notion of the smart city became fashionable, in the 1970s, Lewis Mumford (1973) explored the notion of 'expression through the machine'; the development of new aesthetics, language, feeling and quality of materials that evolve from the interchange between engineer and machine. In many ways the relationship between social agency and technology represents an ongoing dance between technical innovation and individual appropriation. Urbanity is a continuous process of emergence, and the smart dimensions of that reveal important prospects for planning. Quite when technology evolves from being a connector to being an essential part of the social infrastructure people employ to access the city depends on how well it fits in with the day-to-day strategies of the marginalized.

Bibliography

Allagui, I., & Kuebler, J. (2011). The Arab Spring and the Role of ICTs: Editorial Introduction, in International Journal of Communication 5 (2011), Feature 1435–1442. American University of Sharjah, 5, 1435–1442.

Aurigi, A. (2005). Competing Urban Visions and the Shaping of the Digital City, in Knowledge, Technology and Society. Vol. 18(1): 12-26.

Bosch, T. (2011). Talk radio, democracy and citizenship in (South) Africa. In Popular Media, Democracy and Development in Africa. London: Routledge, 73-87.

Brelsford, C. and Bettercourt, L. (2015) Optimal Re-blocking as a Practical Tool for Neighborhood Development (Online). Sante Fe Institute. Available from: <http://www.santafe.edu/media/workingpapers/15-10-037.pdf> (Accessed 3 November 2015)

Bridges.org (2002). Spanning The Digital Divide. Understanding And Tackling The Issues (online). Washington, DC. Available from: http://www.bridges.org/files/active/1/spanning_the_digital_divide. (Accessed 14 April 2006).

Business Standard (2014). What on earth is a 'smart city'? (online). Sunil Seth. New Delhi, July 18. Available from: http://www.business-standard.com/article/opinion/sunil-sethi-what-on-earth-is-a-smart-city-114071801449_1.html (Accessed 26 Mary 2015).

Cape Times (2014). Data-driven activism empowering (online). Steve Robins. Cape Town, December 15. Available from: <http://www.iol.co.za/capetimes/data-driven-activism-empowering-1.1795657#.VWSB0FIViko>. (Accessed 24 January 2015).

Crang, M. C., T & Graham, S. (2006). Variable Geographies of Connection: Urban Digital Divides and the Uses of Information Technology. Urban Studies 43(13): 2551-2570.

Donner, J. (2005). User-led Innovations in Mobile Use in Sub-Saharan Africa. Receiver, Vodafone.

Donner, J. (2007). Research Approaches to Mobile Use in the Developing World: A Review of the Literature. The Information Society 24(3).

Donner, J. (2008). The Rules of Beeping: Exchanging Messages via Intentional 'Missed Calls' on Mobile Phones. Journal of Computer-Mediated Communication 13: 1-14.

Nancy Odendaal: How smart are we about smart cities?
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Dourish, P. and G. Bell (2007). The Infrastructure of Experience and the Experience of Infrastructure: Meaning and Structure. Environment and Planning B: Planning and Design. 34(3): 414-430.

Falch, M. (2004) Tele-centres in Ghana. Telematics and Informatics. Vol. 21 (2004) 103–114

Graham, M. (2008). Warped Geographies of Development : The Internet and Theories of Economic Development, in Geography Compass 2/3 (2008): 771–789.

Guellen, M. F. and S. L. Suarez (2005). Explaining the Global Digital Divide: Economic, Political and Sociological Drivers of Cross-National Use. Social Forces 84(2).

Hagen, N. (2010). Putting Nairobi Slums on the Map. Development Outreach (World Bank Institute), July 2010: 41 – 43.

Heeks, R. (2008). ICT4D 2.0: The Next Phase of Applying ICT for International Development. In, Computer: Journal of the IEEE Computer Society, June 2008.

Hobbs, J. and T. Bristow (2007) Communal computing and shared spaces of usage: a study of Internet cafes in developing contexts, ASIS&T IA Summit, Las Vegas, March, pp. 22–26, 2007.

Hollands, R.G. Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? In City, Vol 12, No 3, Dec 2008.

Howard, P. N., Duffy, A., Freelon, D., Hussain, M., and W. Mari (2011). What Was the Role of Social Media During the Arab Spring? Report to the Project on Information Technology and Political Islam. www.pitpi.org. Accessed February 2015.

Howard, P. N., & Hussain, M. M. (2011). The Upheavals in Egypt and Tunisia: the role of digital media, in Journal of Democracy, Volume 22, Number 3: 35 – 48.

Javuru, K. (2013). New Media and the Changing Public Sphere in Uganda: Towards Deliberative Democracy?. New Media Influence on Social and Political Change in Africa, 357.

Karlsen, S. Smart Cities – Swedish solutions to Cape Town’s challenges? On www.futurecapetown.com. Accessed October 2012.

Keniston, K., and Kumar, D. (eds) (2004). IT experience in India. Delhi, India: Sage Publishers.

Kleine, D. (2009). “The Ideology behind Technology - Chilean Microentrepreneurs and Public ICT Policies.” Geoforum 40: 171-183.

Nancy Odendaal: How smart are we about smart cities?
'52nd ISOCARP Congress 2016

Ladner, D. (2011) "Inspiring change for a sustainable Cape Town". Blog;
www.discover Siemens Africa.com. Accessed April 2013.

Luque-Ayala, A. and Marvin, S. (2015) Developing a critical understanding of Smart Urbanism? Urban Studies 52 (12): 2105 – 2116.

MapKibera - <http://mapkibera.org/about/> (Accessed 3 November 2015).

Mitchell, H. (2014) Information and Communication Technologies and Urban Transformation in South African township communities. Unpublished M. Phil Thesis. University of Cape Town.

Mumford, L. (1973). Interpretations and Forecasts: 1922 - 1972
Studies in Literature, History, Biography, Technics, and Contemporary Society. New York, Harcourt Brace Jovanovich.

Mwesige, P. G. (2004). "Cyber Elites: a Survey of Internet Cafe users in Uganda." Telematics and Informatics 21: 83 - 101.

Mwesige, P. G. (2009). The democratic functions and dysfunctions of political talk radio: the case of Uganda. Journal of African media studies, 1(2), 221-245.

Mytton, G. (2000). From Saucepan to Dish: Radio and TV in Africa. In African Broadcast Cultures: Radio in Transition. R. Fardon and G. Furniss. Oxford, James Currey Publishers.

Obijiofor, L. (2008). "Mapping Theoretical and Practical Issues in the Relationship between ICTs and Africa's Socioeconomic Development." Telematics and Informatics

Odendaal, N. (2003). Information and Communication Technology and Local Governance: understanding the difference between cities in developed and emerging economies. Computers, Environment and Urban Systems 27: 585-607.

Odendaal, N. (2006). Towards the Digital City in South Africa: Issues and Constraints. Journal of Urban Technology 13(3): 29-48.

Odendaal, N. (2011) Splintering Urbanism or Split Agendas? Examining the Spatial Distribution of Technology Access in Relation to ICT Policy in Durban, South Africa, in Urban Studies Vol 48, No 11.

Odendaal, N. (2014) 'Space matters: the relational power of mobile technologies / O espaço importa: poder relacional das tecnologias móveis'. In URBE: Brazilian Journal of Urban Management, Vol. 6, No 1, pp. 33-45. January 2014.

OpenStreetMap <https://www.openstreetmap.org/about>).

Nancy Odendaal: How smart are we about smart cities?
'52nd ISOCARP Congress 2016

Paterson, C. A. (1998). "Reform or Re-colonisation? The Overhaul of African Television." Review of African Political Economy(78): 571 - 583.

Robins, S. (2014) Data Driven Activism Empowering, in The Cape Times, 15 December 2014.

Santinha, G & De Castro, E.A. (2010) Creating More Intelligent Cities: The Role of ICT in Promoting Territorial Governance, in Journal of Urban Technology Vol 17, No 2.

Schech, S. (2002). "Wired for Change: the Links between ICTs and Development Discourses." Journal of International Development 14: 13 - 23.

Selwyn, N. and K. Facer (2007) Beyond the Digital Divide: rethinking digital inclusion for the 21st century. Bristol, Futurelab.

Servon, L. (2002). "Four Myths about the Digital Divide." Planning Theory and Practice 3(2).

Singer, N. (2012) Mission Control, Built for Cities: I.B.M. Takes 'Smarter Cities' Concept to Rio de Janeiro, in The New York Times. 3 March 2012. Accessed at www.nytimes.com July 2014.

Social Justice Coalition web site: www.sjc.org.za. (Accessed December 2014).

Social Justice Coalition (2014) Our Toilets are Dirty. Report of the social audit into the Janitorial Service for communal flush toilets in Khayelitsha, Cape Town: 14th–19th July 2014. www.sjc.org.za. Accessed December 2014.

Thrift, N. (1996) "New Urban Areas and Old Technological Fears: Reconfiguring the goodwill of electronic things." Urban Studies 33(8): 1463 – 1493.

Wright, C. City of Cape Town. (2003) Interview

Inspire and be inspired: an innovative, crowdsourced design of the Spatial Structural Vision 2030 'Room for Ghent' (Belgium)

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hent looks forward to an ambitious and innovative future

Ghent is a city of approximately 320.000 inhabitants (approximately 250.000 inhabitants and daily over 70.000 college and university students), situated in the center of Flanders Region (Belgium). The city boasts a strong tradition in strategic urban planning. Monitoring and analysis have shown that the spatial vision from the current Spatial Structure Plan Ghent (conducted between 1999 and 2003), is actually still accurate. Nevertheless some aspects require further explanation or renewed insights. Some emphases and priorities need to be revised. The result will be a renewed plan: the Spatial Structural Vision 2030, 'Room for Ghent'. We are pursuing an emphasis shift on several subjects:

- a thorough update to formulate a coherent and forward looking answer on the new challenges as regards liveability, a climate proof and a child-friendly city;
- a more strategic policy document that is less detailed and stern, but – within well-defined limits – can in a more flexible way weigh and use the potential that may occur at any time as regards the development of the city;
- not only focused on a systematical use of the space (in which the use of the space is policy driven), but also on the living environment of the inhabitants as well as everyday use of space;
- develop a planning policy in which citizens are getting a more active role (co-creation)

Spatial capacity and spatial quality are key concepts.

Social and spatial challenges for the future

Which new challenges are to be expected?

The liveability challenge is quite broad and comprises strongly divergent aspects (social, cultural, economic and ecological) that often interfere with the other challenges: a livable city is simultaneously an accessible city, with a balanced and affordable housing market as well as sufficient (differentiated) job opportunities. Climate change and increasing car traffic puts urban livability under pressure. A livable city is also a child-friendly city. This requires an integrated approach: all children need education, should be able to move safely, to play and to play sports ... Spatial planning plays a crucial role in this regard.

The depletion of fossil fuels and climate change are global issues which also require answers on a local scale. Spatial measures are playing a vital role. For instance by organizing the space in such a way that the transfer pattern of people is changing, or by means of sustainable house renovation, we are able to reduce the need for energy - and thus CO₂ emissions (mitigation). Greenery areas and water, certainly in Ghent, are generating cooling in an urban environment; a more open urban structure decreases the urban heat island effect

(currently already 3 to 8 ° C hotter than outside the city). Open spaces are also necessary to capture water in case of heavy rainfall and to retain water in periods of drought (adaptation).

The population keeps on expanding. 20.000 extra citizens are expected by 2030. Moreover, family and social structures are changing. There are more small households, young families are fleeing the city ... All these demographic trends are creating new social and spatial challenges.

On the one hand, these questions require a policy which focuses on a differentiated, suitable, affordable and high-grade living (10.000 suitable dwellings are needed) and care offer tailored on the family composition, age and / or physical disabilities, boasting sufficient (supporting) facilities: education, greenery, recreation, (child friendly) public areas,

On the other hand, we need to pursue a policy in which we use the scarce available space and land in a well-considered way. We are looking for smart methods of densification. New high-grade housing typologies, densification of the 20th century districts, ... The challenge of the future is to provide compact and high-grade housing with ample room. The dualism of society also plays a role in the city dynamics; we therefore include the spatial consequences of social segregation and will investigate how we will be able to mitigate the effects from a spatial viewpoint.

As regards mobility, we can observe two tendencies in Ghent.

On the one hand, Ghent is subject to an increasing force of attraction, ensuing in a demographic growth, an increase in the number of students and commuters, a higher activity level, ... On the other hand, Ghent is playing a pioneering role in the past decades as regards sustainable urban mobility. We are reaping the first fruits of these developments.

The immediate pressure from the metropolitan region remains the key mobility challenge: in absolute numbers, the car traffic from the neighbouring suburbs is still increasing, owing to growing housing and other activities. Public transport supply and safe and direct bicycle links are often lacking, thus raising the car dependency and the traffic on the main roads towards the city. Moreover, the current transport model, including trams and buses, is historically strongly radially oriented towards the city centre. Because many (large-scale) functions are situated outside the historic centre, Ghent gradually evolved towards a polycentric municipal structure. There is a larger spatial and mobility interaction between various urban growth centres, even more enhanced by the often mono-functional developments and therefore distribution of activities (housing, working, shopping, education). These developments are partly breaking up the historic radial movement pattern, with a huge impact on the mobility. In order to maintain persistent current mobility trends, we will have to expand smart growth strategies for the urban districts and suburbs as to safeguard and warrant a manageable and sustainable mobility. Next to car traffic, we will have to develop bicycle traffic and public transport as fully-fledged mobility systems, tailored to the Ghent region. This challenge requires a quantum leap in mobility and spatial policy. The current transport systems are insufficiently adapted to the spatial organization, and vice versa. Next to promoting and accommodating bicycle use, we will also need to focus on managing the streams and the grafting of spatial developments on the mobility system. As regards public transport, we will increasingly anticipate on the potential of engrafting spatial developments on interchanges and public transport axes. The individual motorized traffic needs to be disconnected from the individual vehicle ownership; car sharing systems are gradually outgrowing the niche level. The perceptible revolution in the freight and distribution systems must receive spatial support.

In order to meet the predetermined objectives as regards employment and diminishing unemployment, we need additional, differentiated and suitable job opportunities in Ghent. Expected is that 30.000 new jobs will be needed by 2030. To raise – or even to maintain – job opportunities, a future-oriented employment development will be required. We have to take into account new economic trends and tendencies. High-grade room for economy is one of the essential conditions to create jobs.

The challenge consists of well-thought economic growth by a further diversification of the economy, creating sufficient room for companies in growth sectors such as energy and environmental technology as well as creative economy.

Through monitoring and target-oriented research, we can react more swiftly and make a correct assessment of the new economic trends. Thus, we will be providing an appropriate high-grade offer.

Opting for a crowd-sourced design of the spatial planning

We opt explicitly to design the Structural Vision 2030 "Room for Gent" as a spatial but also a crowd-sourced plan. This human-centered approach means that we:

1. pursue the ambition to pay more attention than before to the everyday spatial planning on behalf of the citizens (planning based on their living environment);
2. not only involve experts, sector organizations and decision makers, but also give citizens an active role in the spatial policy (co-creation).

These two aspects of crowd-sourced planning are closely related by investigating which social and spatial knowledge and competences are mobilized in the spatial policy. On the one hand, we need to count on active participation of citizens in co-creating the space, so as to mobilize their local knowledge of the area and its use.

On the other hand, it means that preparing spatial project definitions and the analysis phase of spatial policy plans also involve other than physical-spatial expertise. This should avoid that the task is prematurely narrowed down to physical-spatial tasks (e.g. densification).

Furthermore, we will identify which other actors need to be involved during spatial interventions. In other words, there is a need for input from expert knowledge on social trends and (its impact of) the use of space by social scientists and professionals (social planners, social workers, participation professionals) in spatial policy processes.

Whoever approaches the space from the perspective of the users and allows them to play a more active role in spatial policy, will inevitably be confronted to social stratification of society. Citizens differ in their social-economic position (class), level of education, gender, ethnic-cultural background, sex, age, lifestyle, etc. These differences are burdened with power relations, which express themselves in an unequal capacity to adjust the use and design of space to their proper interests, needs and aspirations. From the 117.665 families in Ghent 30% has foreign roots. The population density is 1.622 inhabitants/km².

Spatial policy cannot fail to assume a position. Based on its democratic mission spatial policy makers will have to make sure that all social groups are treated more or less equally. This means that planning policy is also an instrument of community, including providing space for various human activities, the attunement of spatial planning and certain types of land use, the choice of locations for service provision and economic activities, the role of citizens in spatial policy making, the flexibility of spatial rules, the access to the use of spatial and other instruments, etc.

Regional policymakers are entering into negotiations with various space users. On the one hand, they see to it, according to their democratic mandate, that all social groups are equally addressed. On the other hand, based on their status and mandate as a spatial experts, they are reconciling the demand of citizens as regards the use of space with the capacity of

spatial systems. Until now, their mission statement is all too often included in the instrument of judicial rules, thus ensuing in a deficient anticipation of social trends, changes in land use and the desire of citizens to jointly determine the space. Crowd-sourced planning will get a new meaning: where planners previously facilitated determined (desired) socio-environmental practices, they now develop target-oriented instruments and flexible budgets as to effectively be able to proceed to achievements.

The pilot projects that are elaborated parallel to the intrinsic process of the Structural Vision 2030 'Room for Gent' represent an ideal test case in view of the transition towards a crowd-sourced planning (see Inbox).

road societal debate

Various actors are fulfilling a role during the layout of the Structural Vision 2030 'Room for Ghent'. It is essential that everyone knows their job and can provide input. That is why consultation and feedback run like a thread throughout the process. A good consultation structure and direction, a social debate, active communication and a thorough data monitoring are crucial during the entire process, from the elaboration of the vision up to and including its actual achievement.

To keep this in mind, a thorough internal process structure is necessary.

A project team represents the various municipal services involved. At regular intervals, they are providing vital input, based on their expertise (greenery areas, mobility, housing, etc.). From the early beginning, the City of Ghent was keeping a finger on the pulse by means of the think tank. This is a diverse group of approximately thirty broad-minded Ghent citizens who experience the entire structure planning process. The group includes people who are feeling involved in the future of Ghent, can debate with an open mind, respect other views and have sufficient motivation to participate during the entire process. During the think tank meetings, brainstorming sessions are held on a rather abstract and conceptual level about the spatial future of the city of Ghent. The results from these discussions provide input to the project team so as to achieve an innovating, future-oriented and sustainable spatial vision of Ghent.

Creating involvement

The preparation of such a structure plan is impossible without the involvement of the broader audience. From the beginning we opted for an active public debate. Eventually, we are dealing with an abstract message that does not keep many people busy. 2030 will indeed not quite occur in the immediate future. A structural vision is not immediately translated on the terrain, old viewpoints do not change overnight. Moreover, it is certainly not a ready-made bite, but a vision in the making. The audience is required to show not only involvement, but also an active participation. The target groups include a very wide range of ages, professional categories and social profiles. The challenge is to keep it interesting, both for the specialized spatial planner as well as the student, young family, the elderly couple, the tourist, the entrepreneur, the employee in the social economy and so on.

Creating urgency was taking the first hurdle. How could we bring to the attention that 'Room for Ghent' is imminent, should be achieved, and will have consequences for all Ghent citizens? At the end of January 2015, a broader communication trajectory and a social debate was initiated, including a press conference and a 'stunt'. At the 'Gravensteen' (Castle of the Counts), Ghent's most important historical monument, a giant banner announced that the castle would accommodate luxury flats. Needless to say that press attention and 'buzz' were assured.

With the cooperation of a communications agency, the campaign was supported in social media. The proper media channels of the City of Ghent were also fully deployed.

www.ruimtevoor.gent

To reach the broadest possible diverse audience, the communication occurs via various channels, both online and offline. The online communication takes the lion's share, and constitutes the basis of the debate.

A tailor-made interactive website was created, next to the existing municipal website. In Spring 2015 everyone could post their proper ideas about the future of Ghent. People could also share and like ideas of others. To make this comprehensible, every month a different theme was highlighted: working and learning, housing, leisure and meeting, nature and environment, care, transportation. Via social media a question was 'pitched' each week, boasting the necessary challenge to lure people towards the website and post their proper idea. Every month, a 'room maker of the month' was speaking a film, giving inspiration about the monthly theme.

The launch of two playful promotional films with renowned Ghent citizens generated quite some interest from regional and national press.

Besides a gathering place for inspiring ideas, the online platform also provides a calendar mentioning the activities as regards the city of the future, a news forum with reports, background information on 'Room for Ghent' and a newsletter.

Links to existing initiatives

The offline communication is just as important. Not everyone has access to the internet or is actively using social media channels. Billboards in the Ghent cityscape were supporting the campaign.

Furthermore, trajectory intakes were held from the very beginning, including a wide spectrum of organizations, research institutions and associations to jointly examine when and how their specific target audience can participate in the debate. Their participation is therefore tailored to the specific target group and their input is gradually incorporated in the intrinsic process. Whenever possible and relevant, the City of Ghent links to current (policy) trajectories and meetings, such as 'District of the Month', highlighting a specific urban district. Internal communication, within the city administration, occurs with intranet messages, so-called 'lunch meetings' and articles in the staff magazine.

Switch between macro and micro levels

One of the key challenges in the public debate is translating the abstract message to the various target groups, while ensuring that the input of these groups transcends the local level, as to include them in the intrinsic process. However, the real story of the citizen is the starting point to achieve a broader vision.

Hence, every target group is encouraged and inspired on a micro level that is proper to their situation. Every single thing that could inspire people to tell how important live, work and life in the city is for them and which are their expectations. The Ghent citizens are indeed the experts with respect to life in the city. The actual activity is followed by an in-depth moment during which the stories are raised to a higher level. Discussions in different groups, moderated by a representative of the municipality or municipal staff member. Experience has learned that such an approach allows a constant switch between the micro and macro level and yields a quite satisfactory input.

The weblink www.ruimtevoor.gent is using this method. The 'question of the week' or the 'space maker of the month' formulate a concrete discussion item, often providing broader answers. For example when someone in a film is telling about how he shares his garden with the neighbours, a discussion is started about more meeting places in districts or the demand for more district parks.

Introduce landmarks

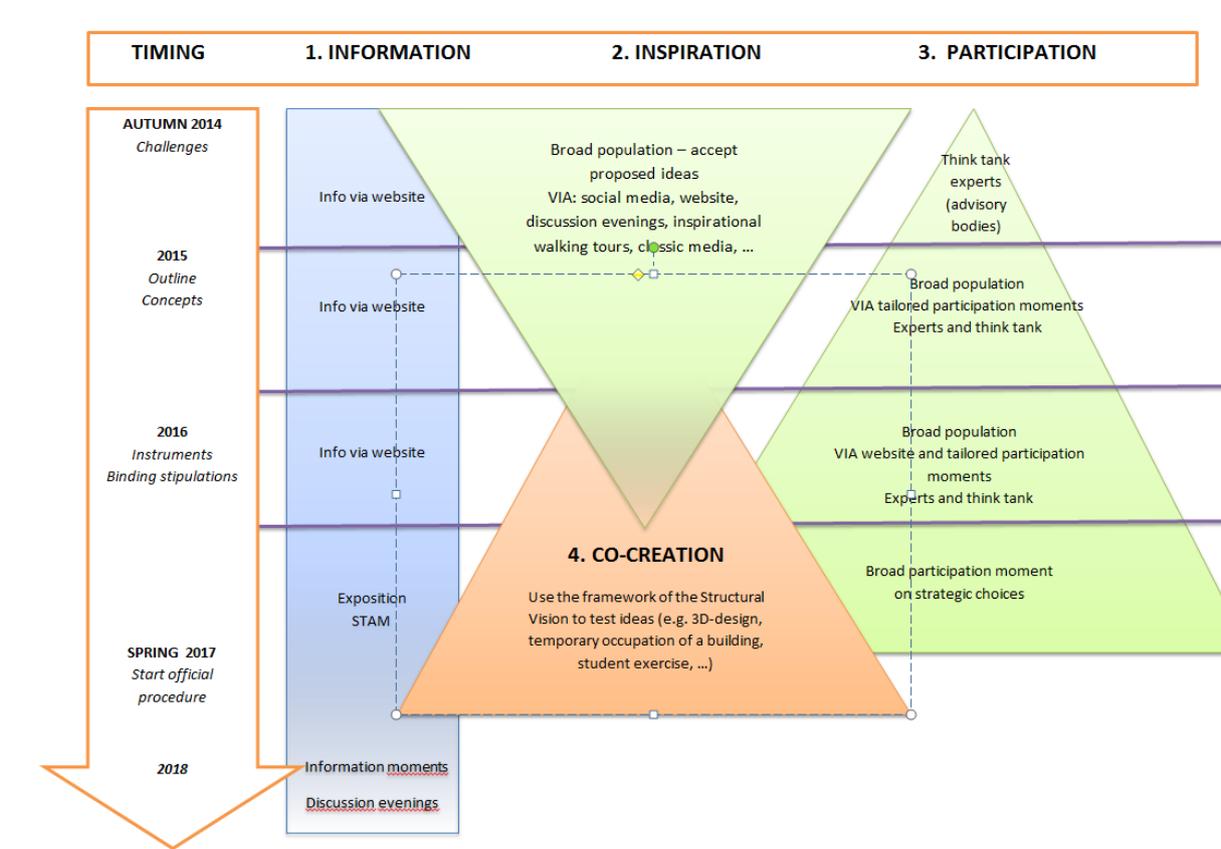
Since the campaign is stretched out over such a long period of time, it is necessary to keep the attention alive. Depending on the phases of the intrinsic process, the campaign is

subdivided into several smaller campaigns, each with their proper focus and landmarks. These landmarks are important since they provide a feedback moment. The turning point was an inspiration day on behalf of a broad audience, including walking tours on several themes. Some ideas, assembled via the website and activities, are elaborated with an expert and public jury.

Pilot projects

Experts from the think tank, together with the City, selected some ideas suggested by Ghent citizens. In consultation with the authors of these proposals, a process of co-creation was initiated. Their ideas represent a possible future for Ghent. They incite to reflect on actual solutions and show what is feasible. Thus a study and an animation will show the potential when we remove a piece of the motorway from a residential district (E17 in Gentbrugge). Another pilot project will illustrate how unoccupied churches can be deployed in a different manner. A group that submitted an idea to pay more attention to short-chain agriculture started working on a vacant lot. An entire district gets a proper master plan and is examining how to improve the occupancy rate of unused inner areas. In turn, these bottom-up ideas offer inspiration for the Structural Vision 2030 and are revealing something about the spatial lines of force in the future.

By the end of 2016 the Structural Vision 2030 will be incorporated in the official procedure. Citizens will be informed about the contents of the structural vision during an information meeting and will be able to formulate their objections and remarks comments during the public inquiry. A publication and several short films will clarify the taken choices. The structural vision will also be illustrated during an exhibition at the STAM City Museum.



Scheme of participation and communication process. ©Stad Gent

Vision and spatial concepts for spatial development: 'Room for hent'

The Structural Vision 2030 includes the global targets and ambitions of the City of Ghent as regards spatial development. Based on this mission statement and the urge for a crowd

sourced design, 'Room for Gent' can be interpreted as 'Room for all Ghent Citizens'. The spatial development is intended to give all Ghent citizens (Ghent residents and Ghent users) the necessary livable space for their development. The two parts of the title of this Structural Vision 2030 are each covering their share of its contents. 'Ghent' stands for everything that the municipality and the Ghent citizens (want to) count for:

- Ghent as an obstinate and family friendly, coherent city boasting a mosaic of places with a proper identity
- Ghent as an authentic city
- Ghent as a high quality, viable and intertwined living and working city
- Ghent as an innovative city
- Ghent as a versatile city of knowledge and culture
- Ghent as a multi-layered, sustainable and climate proof city, which intends to remain livable for future generations of Ghent citizens
- Ghent as a self-confident, pioneering, seducing and ruling cooperating city.

'Room for' illustrates the way in which we intend to achieve this in respect of the spatial aspect.

The vision elements can indicate how to offer a spatial response to the challenges we will be facing, in the (medium) long term, thus to offer guarantees for a future proof city.

1. We are building a livable city

Each spatial project is founded on the basic assumption that they need to contribute to an increased quality of life. When a project can no longer warrant the viability of an area and its surroundings, the spatial capacity of that area is exceeded. Elements of capacity are protection, comfort, experience and focus on children and youngsters.

2. We are taking the physical system as the basis of spatial development

Throughout history Ghent developed itself on the physical system of the confluent river valleys of Scheldt and Lys. This physical system is also the basis for the further spatial development of the city. Certainly the water structure and the water system are determining spatial bearers. Many other patterns are adapting themselves to the physical system and, in particular, to the water. The substratum is often literally unreclaimed area; it does not only impose preconditions during developments, but also provides a lot of (spatial) opportunities that we want to highlight. The subsoil codetermines the structure of the overhead spatial development.

3. We are opting for a cautious urban development

The spatial uniqueness, functionality and quality of the Ghent area (landscapes, urban structures, open and public spaces and buildings) are three criteria that occur at each spatial development. How it works (functionality) and what it looks like (image) are equivalent and have a strong mutual dialectics. We are taking into account the present characteristics, the significance and history and the possible future of a spot as well as the relation to its environment (genius loci): cautious urban development respects the stratification of an area. We continue to build on the existing city and reckoning the existing spatial and social fabric (improvement without displacement). Cautious urban development supports the social dimension of living and working of the Ghent residents in the city. Spatial interventions are adding value, on a social, functional, scenic, economic and ecological level (in any case more value than that which could have been lost).

4. We are making the city climate-proof by means of water and greenery

Greenery areas and water, varying from the large greenery poles at the edge of the city, over the green(blue) axes and the district parks, and also including street trees, façade greenery and greenery rooftops are making the city attractive, livable and climate proof. Greenery

areas, certainly combined with water, are cooling the city in summer and are mitigating the urban heat-island effect. Greenery also provides shade to cool down on hot days. The smallest greenery spots, including even a solitary tree, are also playing a crucial role. Greenery structures are not only significant in residential areas or within busy public areas, a fully-fledged greenery structure in economic clusters also constitutes an essential link for the management of urban temperature, the water system and the air quality in the urban conglomerate. Greenery plays an essential role in retaining, infiltrating and buffering of rainwater and thus helps to prevent flooding. Reducing the hardening degree is important to allow a maximum water infiltration into the soil. On urban level, greenery certainly has a positive impact on air quality. The direct effect (by absorption) of vegetation on the noise is rather limited. However, the indirect effects are often more significant: we experience noise as less annoying in an attractive green environment.

5. We are striving for a sustainable use of space by innovating instead of merely expanding
When the city is expanding, this must be done in a sustainable way. Sensible growth is the key word. This can mainly be achieved by renewing the urban tissue and coping with the urban expansion within the existing infrastructure. We are opting for innovative solutions in which the available space and the existing heritage are used in an (more) efficient manner, while simultaneously reckoning with the spatial capacity and spatial quality. An efficient use of the available space is also a prerequisite if Ghent wants to be a viable, child-friendly, climate neutral and climate proof city.

6. We are strongly focusing on public space
Optimal residential quality of public space is essential. We are designing a space in which everyone can stay and move independently, and is arranged in a child friendly way. Next to cohesion, design criteria also include the (traffic) safety, scale, quality, readability and comfort and usability.

7. We are pursuing interweaving and diversity and are opting for proximity
One of the key assets of Ghent is the unique intertwinement. In the future we intend to highlight this vibrant mix of functions, atmospheres, architectural styles and cultures. The proximity and accessibility – a result of the city's scale – generate opportunities. The spatial options need to enable and strengthen this intertwinement. In this regard, not only inhabitants, but also other users (students, tourists, commuters, employees, ...) should each get their proper spot(s) in the city without jeopardizing the balance within and the viability of these spots.

Within his neighbourhood (within walking or cycling distance) every Ghent citizen should have access to (local) basic services such as local food, exercise and play, greenery, employment, education and health care. By introducing new amenities and services and by opening and creating fordable accesses of large, multifunctional complexes of enterprises and facilities (hospitals, schools, sports halls ...) we will create micro-centrality. Thus we are reducing the number of car trips of a family. We will also enhance social cohesion, anticipate to demographic growth and the demand for facilities as well as create room for economic development. By focusing on densification and proximity new densification opportunities will arise.

8. We are opting for a selective, but high-grade accessibility
Intertwinement, diversity and proximity require selective accessibility. More people means more transfers. The city needs to be accessible to everyone, but not at the expense of the living quality in and around the city. We are striving towards an accessible and livable city, in short, a high-quality contemporary urban mobility. Diversity should once again be the keyword, deploying diverse modes to transport goods and passengers, to effectively achieve the symbiosis between accessibility and livability. Cycling and walking are the basis.

9. We are stimulating dynamical and change-oriented constructions

By taking into account the future modification and usage opportunities in the design and realization, it is possible to prolong the useful life expectancy of buildings and building elements. Thus, we anticipate on changing needs and reduce the environmental impact of constructions.

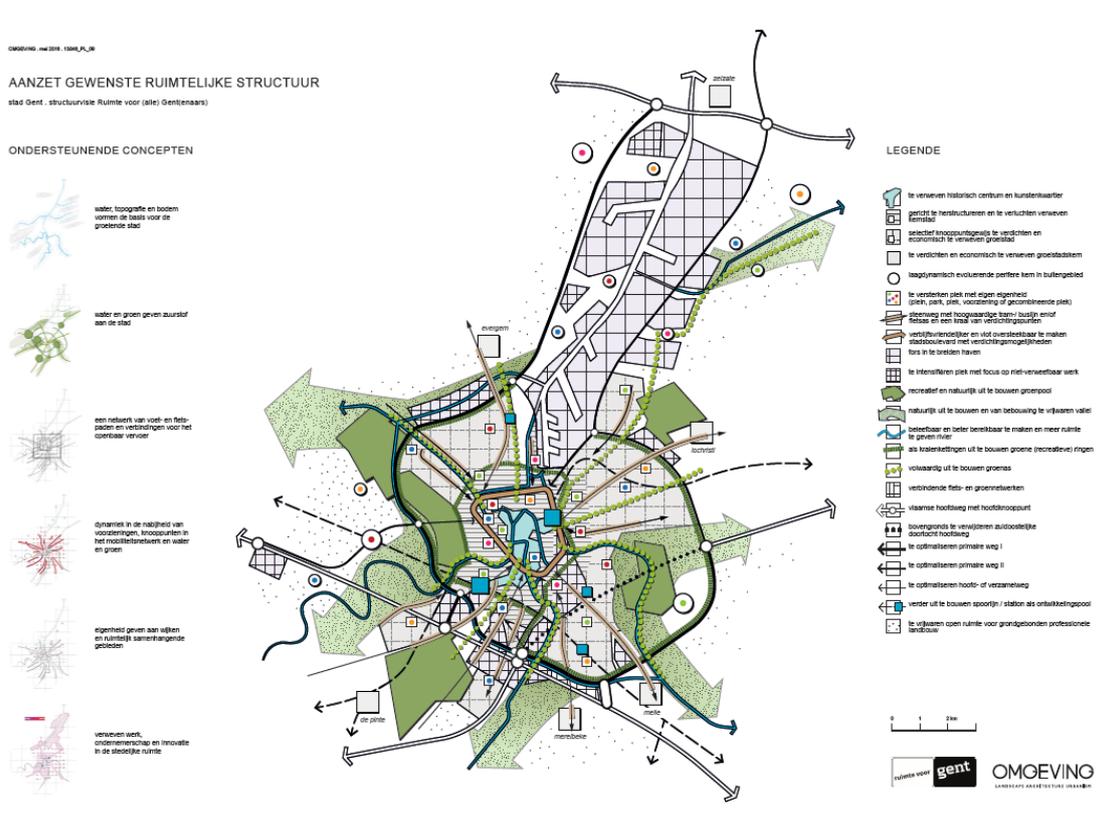
10. We are looking for spatial synergies in the metropolitan area

Spatial structures and developments do not stop at the city boundaries. Spatial developments such as housing, employment, mobility, security, the use of infrastructure and facilities, nature and greenery (poles) or food supply are discussed on the level of the urban region. Thus we adapt the (spatial) policy to the existing interweaving between Ghent and its neighbouring municipalities, we ensure that synergies occur and we also develop the urban region in a balanced, sustainable manner.

The **spatial concepts** indicate in short the mean features of the way in which we are dealing with space in and around Ghent, and especially with the structuring subdivisions, and how they need to be developed to achieve the spatial vision. They are the basis for the further development of the Structural Vision 2030 in later projects, plans and instruments. They are stable and are looking (at least) until 2030, and whenever possible even until 2050. The following five spatial concepts are involved:

1. the water, topography and soil are the basis of the expanding city
2. the water and greenery areas are giving oxygen to the city
3. the network of pedestrian paths and cycle tracks and connections to public transport are warranting a selective accessibility
4. the densification occurs in a smart way in the immediate vicinity of infrastructures, at junctions in the mobility network and in the urban green-blue areas
5. employment, entrepreneurship and innovation are interwoven in the urban space.

The **desired spatial structure** combines five (equivalent) spatial concepts with spatial networks and emphasizes its internal cohesion.



Looking for implementation

The City of Ghent, the provincial and regional authorities, the private initiators and Ghent citizens are assuming different roles in the spatial development.

The local authority plays a significant initiating and active role in achieving the robust structure of the spatial networks. This is certainly the case for the realization of new (greenery) public space, raising the residential quality of existing public space and strengthening of the bicycle network. The local authority is the key partner of other authorities in the development of the public transport network, the protection and safeguarding of open space.

The local authority has a pioneering and directing role in fulfilling themes such as interweaving, densification, quality and uniqueness. For a number of goals, it remains the leading party: the realization of social infrastructure is a prime responsibility of the authority. By planning these provisions at the appropriate spot in the urban tissue, we can strengthen and support the network structure. Yet, in the future, these kind of achievements will evolve towards a cooperation and shared responsibility with residents and users.

The majority of spatial realizations are private initiatives. The local government is assuming a directing role to ensure that these private initiatives do contribute to an enhanced quality of a place, a district and the city as a whole.

To implement the ideas and options from the Structural Vision 2030 we count on the following aspects.

1. The significance of design, designing research and quality monitoring

Good design is often the result of designing research. High-quality design and designing research is stimulated in various ways as methodology:

- by accompanying private parties and inciting them to design contests
- by organizing proper design contests
- by conducting designing research (research of building blocks).

A 'city architect' cooperates with a Quality Chamber for spatial and architectural quality.

2. Stimulating behaviour modification and consciousness as regards spatial quality

There is a need for an evolving mentality as regards property. The basis of our property model dates from Napoleonic times, ensuing in the individual and collective capacity development. In Ghent 50% of the residents live in a home they own. All sustainability insights, however, indicate that an evolution from property to use as the basis for a sustainable society, is the next logical step. We are also stimulating the increasing consciousness with respect to the quality of proximity, greenery and water.

3. Implementing spatial strategic projects

We distinguish strategic spots of which the transformation is essential in implementing spatial ambitions. On the one hand, it involves some large-scale spaces within the built tissue in which room will become available in the coming decades that can be developed or transformed. On the other hand, in the rural areas we have spots for which we will make sharp strategic policy choices. The structure planning process includes the reflection and design exercises that have portrayed the potential as well as the surplus value of these strategic locations.

4. Deploying (innovative) instruments

We will elaborate instruments for the gradual implementation of the spatial options: incentive instruments (e.g. example books and subsidies), co-productive instruments (e.g. setting up and supporting bottom-up experiments), directing instruments (including regulatory and policy guiding frameworks, acquisition) and internally directive instruments (e.g. organizing workshops, efficient project structures).

5. Monitoring and assessing the spatial development

Because of the process-oriented character of the structure planning, a systematic monitoring and assessment is systematically anchored in the implementation. By determining the correct (feasible) indicators, we will monitor the impact of spatial

choices in a transparent way. The spatial strategic projects are continuously assessed and checked to the spatial policy choices.

6. Cooperation with other authorities

Achieving the options of the Structural Vision is a combined action between diverse actors, in which other authorities are playing a significant role. For those aspects which explicitly belong to the competence of other authorities, we as local authority are submitting suggestions and incite cooperation.

Conclusion

The Structural Vision Ghent 2030 is innovative in a Flemish and an international context, both intrinsically and with respect to the process.

1. The Structural Vision 2030 'Room for Gent' is the first local spatial structure plan in Flanders region that completely fits in the current strategic and financial long-range plan of the city and positions itself as a coordinating spatial vision document next to (predetermined and supported) sectorial policy documents, of which they are the spatial framework.
2. It is the first local spatial structure plan in Flanders region boasting the ambition and instruments with a 100% space efficiency within the current destinations, meaning on balance not including new hard developments.
3. It does not mention detailed and localized statements, but contains a set of assessment frameworks and procedures and a practiced organization structure, in order to make spatially and socially responsible choices and use the available opportunities throughout all themes.
4. It opts for a radical interweaving of functions and an economical use of space and it translates this into appropriate assessment frameworks and instruments.
5. It is the first crowd sourced local spatial structure plan in Flanders region; vision and content are elaborated by means of broad co-creation and include a thoughtful component of co-creation and behaviour management in view of its implementation.
6. It is the first local spatial structure plan that looks beyond 2030 to 2050, as regards the consequent building on the physical system, future-oriented infrastructure and climate resilience (including effective spaces for water and growth of greenery areas on all scale levels). The structural vision does not only provide a framework for necessary short-term achievements, but simultaneously links them to – equally indispensable - long-term goals and strategic projects
7. It is the first local spatial structure plan that deploys the bicycle as a basis of urban development, more than public transport, and considerably more than the car.



Children at work in one of the "Room for Ghent"-workshops. ©Stad Gent

Participatory Planning in the Age of Smart Cities in India

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This paper reviews India's new urban agenda to develop 100 Smart Cities from the angle of participatory planning - to understand whether this new urban agenda would promote more inclusionary form of development through dissemination of information or further perpetuate social polarisation through technocratic planning.

1. Introduction

Political rhetoric in postcolonial India prioritised 'rural' over the 'urban' for several decades. However, economic as well as demographic changes since the 1990s has brought the cities at the centre stage of the national developmental debate. On the one hand, gradual opening-up of the Indian economy from closed door public sector dominated developmental state to more market oriented ways through greater integration with the outside world, has substantially increased the importance of the cities as engines of economic growth. On the other hand, as a country with a large youth population, focus on cities is essential to create employment opportunities.

The contribution of urban centres to India's GDP had been rising steadily since beginning of the economic reforms in the early-1990s and is projected to reach 70 percent by 2030 (Mckinsey Global Institute 2010). Recognising the importance of the urban sector in propelling economic momentum, India's national government has launched an ambitious Smart Cities programme, which has propelled the urban sector to the centre-stage of the countries developmental debate and raised expectations of large section of India's burgeoning new middle class. The basic premise of the Smart Cities programme hinges on widespread application Information Technology tools to improve the quality of data infrastructure, services delivery and citizen interface. At operational level the programme envisages the municipal governments to play key role and also encourages intensive involvement of the corporate sector and international agencies – including select foreign governments. At spatial scale, the programme ranges from development of new greenfield townships; to focused redevelopment of inner city areas; to improving the quality of specific service by revamping at least one pan-city infrastructure sector in each of the selected cities.

This paper seeks to analyse the challenges on the way of implementing the Smart Cities agenda – especially in terms of inclusivity and sustainability. While the post-liberalisation decades had seen emergence of newer economic opportunities in India's main urban centres, they had also witnessed widening of social polarisation and worsening of environmental quality. Could the Smart Cities programme address plug these deficiencies or further exacerbate them? Moreover, years of neglect had made the urban local bodies weak and suffer human resource capacity deficit in the areas of planning and governance. Are they in a position to manage newer demands which are bound to emerge out of the Smart Cities programme and enhanced citizen expectations – or we are going to see gradual outsourcing of municipal governance? Finally, this paper will outline the contours of an alternative paradigm of urban rejuvenation in India based on good practices characterised by inclusiveness and sustainability.

2. India's Urbanisation Trends

With 377 million people living in cities, India has the second largest urban population in the world. There are 53 cities with million plus populations (Census 2011). But on the other side, with nearly 70 percent of the people still living in the villages, India is the world's largest rural nation. With urban population increasing by 91.0 million against 90.4 million in the rural areas during the Census decade of 2001-11 for the first time, first time in India, the urban areas recorded higher population growth in absolute terms. Overall level of urbanisation in India increased from 27.7% in 2001 to 31.1% in 2011 – an increase of 3.3 percentage points during 2001-2011 compared to 2.1 percentage points during 1991-2001 (Census 2011). This spurt in urbanisation could be to a good extent attributed to the age profile of the population. Over 35 percent of the Indian population is below 15 years of age, while the 65-plus category comprises less than 5 percent (Census 2011).

Big cities and mega-urban agglomerations had traditionally dominated India's urbanisation process and gradual adaptations of market-driven economic policies have skewed the scenario. The number of million-plus cities increased from 35 to 53 between 2001 and 2011. These 53 cities account for 13 percent of the population and produce about a third of the country's economic output. At the top of this pyramid, the ten largest cities of India, with 8 percent of the population contribute 15 percent of the GDP (IIHS 2012). It is important to note that a significant proportion of the tertiary economic activities (especially in the segments like retail, construction, real estate, tourism and transportation) and industrial manufacturing – which underpin the urban economic boom – are happening through unorganised sector – outside the ambit of the regulatory planning mechanism (Ghani, Goswami & Kerr 2012). While authentic data are hard to come by, it is estimated that almost 70 per cent of the jobs in the cities are being generated through the unorganised or informal sector (IIHS 2012).

The formal and informal economies have started to manifest in clear spatial terms and a new twin-track economic geography have started taking shape in urban India (Chatterji 2014). Fringe areas of the big cities have emerged as the preferred production and consumption spaces of the new globalised Indian economy. A new form of enclave urbanism is coming up engulfing the peri-urban villages, represented by high security IT Business Parks, shopping malls, star hotels and gated residential townships – promoted by private developers (and often funded by FDI). On the other hand, the core areas of the cities has got dominated by the informal bazaar economy – with petty trading and small scale retail sector emerging as its most dominant face.

The emerging scenario of India's urban shift is thus, riddled with complex paradoxes. Pursuance of market-led growth agenda for over two decades has turned the big cities of India, drivers of the country's economic momentum, where the rural youth migrate in search of new career options. At the same time, the cities themselves are getting internally polarised, where the employment opportunities for bulk of the masses are primarily in the form of petty jobs in the unorganised sector; while the mindscape of the policy elites are clouded by the suburban gated enclaves which accommodate the globalised higher-end services.

3. Urban Policy background

Although the Nehruvian Indian state adopted centralised economic planning through Five Year Plans, as *the* vital instrument of nation building almost immediately after independence, spatial planning continued to be neglected. Issues pertaining to the urban sector were considered to be 'state' subject and were relegated to the background for several decades by the policy elites at the national scale. The situation started to change since the Eighth Plan Period (1992-97) coinciding with the policies of gradual economic liberalisation (Shivaramakrishnan 2013). Over the next three decades the national government had taken three major policy initiatives: the 74th Constitution Amendment Act (74CAA) of 1992;

launching of the JNNURM (Jawaharlal Nehru Mission for Urban Renewal Mission) in 2005; and lastly the Smart Cities Mission and AMRUT in 2015.

The 74CAA was a path breaking legislation, which sought to deepen democratic participation through decentralisation and devolution. It explicitly recognised Urban Local Bodies (ULB) as the third tier in the federal governance framework; demarcated their administrative and financial powers vis-a-vis the state governments; and put in place a mechanism for regular elections to the ULBs (Shivaramakrishnan 2013). However, the reluctance of the state governments to devolve power had come in the way of strengthening the ULBs to the extent envisaged by the 74CAA.

The JNNURM launched a decade after combines the features of programme as well as a policy instrument. On the programme front, JNNURM provided direct financial support for physical infrastructure development in 65 cities across the country, with the state governments acting as guarantors (Shivaramakrishnan 2013). Reflective of the changing role of the state from provider to facilitator in the neoliberal era, the programme encouraged Public Private-Partnership in infrastructure building and services delivery; and stressed on the need of the ULBs generating their own resource through taxation, user charges and other market oriented economic reforms. On the policy front JNNURM sought to entice the state governments to accelerate empowerment of the ULBs in accordance with the 74CAA.

City Development Plans (CDP) prepared under the aegis of JNNURM (by private consultants) came to be criticised for favouring mega-infrastructure projects (and generating big construction opportunities) as panacea for the urban problems and demonstrating undue haste in plan preparation without providing adequate scope for public consultation (Banerjee-Guha 2010). Some of these projects necessitated relocation of squatters and homeless. Nevertheless, it cannot be denied that injection of funds under JNNURM helped augment physical infrastructure in many cities. But the policy objectives especially related to urban reforms remained largely unmet.

4. Smart Cities Mission

The Smart Cities mission was launched in June 2015, as the JNNURM came to an end after running for 10 years. It has a budgetary provision of Rs. 48,000 crore, including Rs 100 crore for each of the 100 Smart Cities. According to the draft concept note, the primary aim of the smart city initiative is to increase competitiveness of the Indian cities to attract investment and operational efficiency in service delivery through the pillars of institutional, physical, social and economic infrastructure, mediated through real time data monitoring and application of digital technologies. 'Smart' solutions will be applied to a broad range of civic services, such as: video surveillance for traffic management; water quality monitoring and leakage identification; smart electricity metering and electric load distribution; and delivery of telemedicine.

Institutional infrastructure seeks to address the fragmented nature of service delivery across multiple jurisdictions, provide e-governance facilities and enhance scope for citizen participation through social media and other intelligent communication tools. Physical infrastructure thrusts on achieving transit oriented development pattern, high level of urban mobility, smart parking management and 24x7 availability of basic civic services including digital network connectivity.

Social infrastructure encompasses quality education, healthcare and entertainment facilities to attract entrepreneurs and professionals. Economic infrastructure will comprise of industrial parks, export processing zones, IT/BT parks, trade centres and financial and logistic hubs.

The Smart Cities initiative has adopted an area based development approach with the objective of providing: mixed use development in a planned manner, housing (especially housing for the poor), walkable localities, provision of adequate open spaces and public transportation with last mile connectivity.” The three models of area based development approach spanning multiple spatial scales are:

- **Retrofitting** - Development of an existing built area greater than 500 acres so as to achieve the objective of smart cities mission to make it more efficient and liveable e.g. Local Area Development of Ahmadabad)
- **Redevelopment** - Replace existing built environment in an area of more than 50 acres and enable co-creation of a new layout, especially enhanced infrastructure, mixed land use and increased density e.g. Bhendi Bazar, Mumbai
- **reenfield** - Develop a previously vacant area of more than 250 acres using innovative planning, plan financing and plan implementation tools with provision for affordable housing, especially for the poor e.g. New Town, Kolkota. In the greenfield developments it envisages “80 percent buildings to be of energy efficient green buildings” and “15 percent buildings will be in the affordable housing category”.

Private sector is expected to play a big role in the implementation process of the Smart Cities. For ‘smart and efficient implementation of the Smart Cities Mission’ and ‘focussed single point responsibility’ the scheme envisages setting up of professionally managed Special Purpose Vehicles (SPV) for each city. Each SPV shall be constituted as a public limited company, with the concerned ULB and the State Government holding equal stake. While the State Government and the ULB together will jointly hold the majority stake and control the SPV, private companies and financial institutions are expected to hold about 40 percent stake. The Smart Cities Mission has also institutionalised a hitherto unprecedented regime of intra-state and inter-state competition between the cities. In Stage-I cities will compete with each other within the state against a predetermined set of criteria – including their previous track record in completing projects funded under JNNURM and existing e-governance infrastructure. One hundred shortlisted potential cities will then compete at the national level in Stage-II. Each of these cities will be given a grant of Rs 2crore to prepare their detailed Smart City proposal through external consultants or foreign governments (USA, France, Japan and Singapore) which had agreed to support the process. Based on their proposals, nationwide 20 cities will be selected in first round to set up their SPV and start implementing their individual Smart Cities agenda. Other cities will go-back to the next round to improve their proposal.

5. Challenges and Conerns

It is apparent that the Smart Cities mission launched in 2015, carries forward much of the neoliberal policies of the JNNURM. But in terms of economics of scale, ambition, political rhetoric it is many times over the predecessor programme – and consequently received extensive media coverage. Needless to say, that the mission would face enormous challenges in mobilising financial, institutional and human resources and consensus of primary stakeholders including citizens of diverse socio-economic strata in delivering its stated objectives. But the bigger question lies in understanding whether the mission would be able to plug the widening urban divide in India or further polarise it.

First, the selection criteria in the Smart Cities Mission do not take into account vast unevenness in terms of urban management capacity across the country and its implications in term of urban geography(Roy 2015). True to the market driven ideology, the scheme emphasizes on past performance standards in terms project execution, cost recovery and revenue earning. JNNURM experience shows that better managed cities located in the

industrialized states in southern and western parts of the country and a few big cities other regions are better able to satisfy such stringent criteria, as against the smaller cities located in the Northeast and other hilly regions. Thus, the existing pattern of regional imbalance in urban geography could further widen.

Second, there are distinct possibilities of that the Smart Cities scheme fuelled by speculative FDI inflows could further increase the process of commoditization of land and consequent land conflicts. The last two decades had seen flaring up of rural discontents against state-led acquisition of agricultural land to meet urban and industrial needs. Although the Smart Cities mission has provisions for inner-city redevelopment, it is doubtful, how far the 'revenue' and 'efficiency' seeking SPVs entrusted to drive the Smart Cities agenda will take such routes, which would require negotiating time consuming legal processes.

Third, the SPV route of project execution further undermines the position of the elected ULBs. The SPVs are to be chaired by the bureaucrats appointed by the State Governments, while plans will be prepared by the external consultants – further pushing away scope for participatory planning and the progressive intents behind the 74CAA.

Fourth, the Smart Cities Mission further perpetuates technocratic approach towards city building – ignoring socio-political and cultural factors. The presumptions that all urban problems could be measured and monitored in real time and ripe for technical solutions ignoring deeply embedded challenges manifested in unequal access to opportunities linked to skewed power relations - are flawed and fails to capture the heterogeneity of culture, politics, policy and physical landscape shaping Indian cities.

6. Towards an Alternative Paradigm

It has become a crucial challenge for the urban planning and governance process of India to bridge the fragmented and divided city to achieve sustainable outcome. Planning in India had historically followed a blue-print or master planning oriented approach, in which, normative practices are sought to be imposed through statutory means. This thought process was underpinned by the thesis, that planning is a rational activity, whose goals and objectives could be guided in a centralised manner, by an elite panel of technocrats and bureaucrats. The planning documents presuppose an ideal end state, at the end of the planning horizon, if all its proposals and normative ideals are implemented.

The Smart City mission's obsession with technocratic and one size fits all approach that cities could be shaped in identical mould ignoring the diversity of physical landscape, culture, history and politics seems to further perpetuate such top-down mode of urban development. As noted earlier, informal sector constitute the bulk of the services and shelter provisions in Indian cities. The leap frog approach to development ignoring such socio-political realities, by relying on principles of unattainable service level benchmarking for existing cities and large scale acquisition of agricultural land for new urban enclaves are neither inclusive, nor sustainable.

To be inclusive, it is necessary to adopt a more people-centric approach to city building. This is not to deny the importance of information technology in urban development. To make cities smart in the Indian context it is necessary to explore how the potentials of the IT sector could be harnessed to benefit the marginalized sections of the society - to enhance their access to employment, market, education, health and building their resilience against natural disasters. For example: Community Telecentre in Africa which provides job opportunities for women and open source software for disaster response developed by the Random Hacks of Kindness which were used effectively in Haiti earthquake in 2010. Map Kibera project used participatory GPS to empower communities of Kenya's largest slum to monitor and record their experiences on state initiatives. In Kosovo Science for Change Project people measure

air quality, temperature, humidity, noise levels in their communities with the help of Arduino based smart citizen sensors and share the data through internet.

Similar examples could be found in India as well. Bangaluru based Babajob, a digital social network provides information about jobs to millions working in informal sector. About a decade ago, a collaboration of NGOs and networks of women prepared the slum atlas of Pune by mapping them in GIS platform to bring slum communities into the ambit of planning so that they could have a fair share of resources.

The growing evidences suggest the possibilities of grass-root action and vision of local governments across the globe for an inclusive future to create just and humane cities based on community empowerment and participatory principles of development. The notion of prosperity and competitiveness in cities should look beyond the confines of economic growth and strive for equitable distribution of benefits and opportunities securing economic wellbeing, social cohesion and environmental sustainability. Unfortunately, the Smart Cities mission has failed to bring out such an urban agenda which address the needs of India's growing urban population in terms of sustainability and inclusivity.

References

- Banerjee-Guha, S 2010, 'Introduction: Transformative Cities in the New Global Order', in S Banerjee-Guha (ed.), *Accumulation by Dispossession*, Sage, New Delhi.
- Census 2011, *Population Census 2001- 11*, Registrar General and Census Commissioner, Govt. of India, Delhi.
- Chatterji, T 2014, *Local Mediation of Global Forces in Transformation of the Urban Fringe – The Story of India's Regional IT Clusters*, Lambert Academic Publishing, Saarbrücken, Germany,.
- Ghani, E, Goswami, AG & Kerr, WR 2012, *Is India s manufacturing sector moving away from cities* , National Bureau of Economic Research.
- IIHS 2012, *Urban India 2011: Evidence*, Indian Institute of Human Settlements,, Bangalore,.
- Mckinsey Global Institute 2010, *India s urban awakening: Building inclusive cities, sustaining economic growth*, Mckinsey Global Institute,, Delhi.
- Roy, S 2015, 'Smart City Utopia and Indian Urban Reality', *The Statesman*, March 7.
- Shivaramakrishnan, KC 2013, 'Revisiting the 74th Constitutional Amendment for Better Metropolitan Governance', *Economic and Political Weekly*, vol. 48, no. 13, pp. 86-94.

Digital Slums. Understanding the importance of the digital connectivity to transform African slums: the case of Cape Town.

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Summary

61,7% of urbanites in Africa are slum dwellers, and as the urban population of the continent increases at unprecedented rates, this percentage may increase if robust and innovative measures are not taken by local authorities. The Digital Slums project is a research initiative to better comprehend the transcendence and possibilities of the digital technologies for the urban poorest. If handled appropriately, these new technologies may be one of the keys to face and solve the huge challenges African cities will face in the upcoming years.

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Bibliography

1. Context

It is well known that since the year 2007, more than half of the global population lives in cities. While some regions have been highly urbanized throughout the 20th century, such as Western Europe or North America, countries like China, India or the ones in Latin America have notably contributed to this increase. The urbanization rates these developing countries have faced are considerably higher than the ones European countries handled in the Industrial Revolution, but they are still considerably inferior to the ones Africa will face in the coming years.

With a 36% of urban population, sub-Saharan Africa is currently one of the least urbanized regions in the world, however, this will quickly change for the year 2050, where 54% of the population is expected to be urban. While this number may not seem surprising, it is necessary to note that this will be the fastest process of urbanization the world will have ever dealt with. To put it in to context, the rate to which London's urban population grew between 1800 and 1910 was about 2%, while the one that Asia will have faced between 1950 and 2050 is 3,7%. Africa will face a 5,2% between the years 2000 to 2100, and some cities inside it, like Kigali in Ruanda, are currently handling a 7% increase, meaning their population is doubling every 10 years.

While around 33% of the world urban population lives in slums, precisely in sub-Saharan Africa, the number rises to a shocking 61,7%. Taking into account 800 million more urbanites will be added to the region in approximately 30 years, slum dwellers will undoubtedly increase if robust and innovative measures are not implemented by city councils. Vanessa Watson from University of Cape Town and Babatunde Agbola from University of Ibadan (*Who will plan African cities?*) are certainly right when they indicate that without appropriate planning, African cities will become increasingly chaotic, inefficient and unsustainable.

Integrating these slums in the urban grids, by giving them water, electricity, housing, education or jobs is probably the biggest challenge that African cities will face, and one of the most crucial ones that the world will have to deal with because of its transcendence. As the global urban population increases, eradicating poverty and the socio-economic inclusion of slums have now become the same problem to solve.

As specified in the Brenthurst Foundation paper *Poles of prosperity or slums of despair?*, cities are indeed double-edge swords, where if properly planned, they can be engines of national growth, fast-tracking development by serving as incubators of economic activity, but if not, they can become a toxic blend of poverty, unemployment, disease and insecurity. Cities amplify what they produce, be it good, or bad.

Just like cities, technology can be a double-edge sword too. In the same way a knife may be used to kill a person, or to share a peace of meat between a family, digital technologies may be the reason why the African urbanization is occurring at such a fast pace. Rural inhabitants are now able to contact their urban families or friends with their cellphones or even the e-mail, making the process of rural to urban migration easier to handle with. In the other hand, digital technologies have still been underused in order to tackle the huge problems cities are facing. Understanding their full potential for the urban poorest is essential to promote the socio-economic inclusion of slums, and this is why tackling the urban issues of the 21st century requires techniques of the 21st century.

2. Traditional Success Stories

African cities are not the only ones that have faced enormous challenges, many before them have seen how abrupt immigration has generated overcrowded slums, shortage of basic needs and serious economic difficulties. Solving these issues is not simple, but there have been some examples throughout the second half of the 20th century that show dealing with slums and obtaining a positive outcome is possible.

Bus Rapid Transit (BRT) systems have become increasingly popular in many developing cities, especially in Latin America. Their origin is precisely in the Brazilian city of Curitiba, which not so long ago was facing a strong communication deficit, housing shortages, and overcrowding. Through this transportation system (a cheap alternative to the metro that proved to be very effective) and other public initiatives such as the food-for-trash program, social housing or the ambitious park system, the city has managed to be one of the leading metropolitan areas of Latin America. It currently attracts investment from all over the world, being considered as one of the 5 best cities to invest in Latin America and the notable presence of international companies has made it one of the richest in the continent.

Medellin, in Colombia, faced similar issues back in the 1980-90s. The population had tripled in 20 years, habitants could not afford a house, and crime rates had skyrocketed to 6,349 killings in 1991 (18 per day). The solution came from a series of mayors and the public enterprise Empresas Públicas de Medellín, which invested in education and culture in the center of the city. The MetroCable was built right afterwards, a cheap public transportation system made up of cable cars that connected this area with the slums in the slopes. Medellin is currently one of the safest cities of Latin America; it was named the “most innovative city in the world” in the year 2013 by The Wall Street Journal and Citigroup, and has a very high human development index of 0,864. The municipality is currently taking the culture and education inside the slums, investing in modern infrastructures like the Biblioteca España, connected to the city center through the MetroCable.

Singapore is a modern wonder that has possibly experienced the most notable urban transformation. When it achieved independence from Malaysia, the small island of 580 km², with a population of 1.6 million in the year 1965, had tremendous unemployment rates, and 2/3 of the population were living in slums. Through the strong leadership of its Prime Minister Lee Kuan Yew, the city started the Housing Development Board, which was able to supply housing to 83% of the population. The city understood that promoting the economic development was the key that would make them progress. Making use of their port and cheap labor, Singapore started to become what it is today: a global hub where 121 foreign banks and 7.000 multinational companies have their headquarters, a Human Development Index of 0.912, and a GDP per capita of \$82,712.

The transformation of these 3 cities is just a glimpse of the capabilities cities have to transform the lives of the ones that inhabit in them. 100 years ago, London and New York had exactly the same overcrowding and diseases that Singapore faced not so long ago, and both Atlantic cities are currently the most influential in the world. It is the job of local authorities and urban planners to guide these transformations, and it is their job to use all the tools available at the time to face the growing challenges that metropolitan regions across Africa will face.

3. The Power of Technology

The previous examples show the crucial role infrastructures play in cities. Without the appropriate water or electricity networks, transportation systems or buildings, cities would not be able to function. They are, after all, the biggest physical creation of humans, and as such,

play a pivoting role in the global economy.

However, one tool that Jaime Lerner, the mayors of Medellin or Lee Kuan Yew did not possess when they started solving urban issues was digital technologies. Although most of them started to be developed in the 80s and 90s, the 21st century has seen a tremendous increase in the use of cellphones, computers or the Internet, in particular, within the poorest population.

Technology is a concept usually related to developed and rich cities, used, in the context of smart cities, to improve bus schedule information, healthcare systems or CO2 emission information. These utilities are tremendously important, but in many developing cities, such as in Africa, there is no public bus transportation systems, no efficient healthcare and no factories capable of emitting greenhouse gases, but what many of them do possess are cellphones, access to computers, or internet.

This is a tremendous potential to improve the lives of people. After all, the rate of urbanization in Africa is expected to be so high because of access to these new technologies. However, they need to also be used to deal with the huge problems cities of the region will face in order to improve the socio-economic inclusion of slum dwellers. There is some strong evidence that digital technologies have helped people overcome the inexistent traditional infrastructure systems, such as the use of mobile phones for money transfers in Kenya with M-PESA, or initiatives such as Digital Jobs Africa by the Rockefeller Foundation, jobs that can be done anywhere with a computer and access to internet.

What is interesting about both examples is the combination between the physical and digital connectivity: both systems are based on the use of digital technologies in order to create a banking system or a job market, however, they rely on the physical connectivity in order to do so. In the case of M-PESA, the cellphones need to be charged with money in places such as supermarkets, and there need to be physical antennas that give them signal. With Digital Jobs Africa, people need to have access to a computer with Internet in order to be able to work, and that means having the physical network necessary for it, from personal devices to small public centers with computers.

The interesting part about cities is that they usually do have the minimum infrastructures that are required to improve the lives of its inhabitants, but they are not properly used because of the huge infrastructure deficit that exists as a hole. For instance, in Johannesburg, many slum dwellers need to spend about 50% percent of their monthly salary commuting to work, going to their education centers or going to a library. This makes improving the economic status or educational level of many poor urbanites a very difficult task, since they have no money to spend on the transportation system that will take them to work or to university.

However, there is hope for cities. The difference between a town and a city in the case of many African countries is that in the first one, the job opportunities are very scarce, and the educational centers, if they exist, are very limited. However, cities do have generally more job opportunities and many of them have universities and specialized schools that give its students specific skills for future jobs. The problem is that a huge part of the African urban population does not make use of these facilities, physically excluded by the streets they live in and by the money they earn.

New technologies can be used to overcome the physical difficulties of many slums, improving their relationship with the rest of the city. Digital connectivity alone is very powerful, but sometimes insufficient in order to solve issues such as access to education, awareness of job opportunities or security. However, if these are combined with local existing initiatives or infrastructures, the power of new technologies may be the key to make cities much more inclusive, promoting the socio-economic integration of slum dwellers.

4. Digital Slums: a project to understand the digital slum society

The digital technologies and the virtual networks it generates have started an unprecedented social phenomenon, generating a strong impact in the social and economic variables that define the activity of a city. Computers, cellphones and smartphones are now an essential part of a great portion of the urban population, increasing the possibilities of being connected to the immediate surroundings and to the rest of the world.

Understanding the importance of these virtual structures and the impact they may have in the process of urbanization may be a turning point for the strategies of traditional urban policies. Usually based in the construction of physical infrastructure, the ways in which socio-economic inclusion has been tackled in many cities around the world seems to be unable to cope with the tremendously high rates of urbanization that the African continent will face.

For this purpose, we, an interdisciplinary team of researchers from the Navarra Center for International Development and the School of Architecture from the University of Navarra, have started a research project called Digital Slums, with the purpose of understanding the extent and capabilities of the digital slum society. In order to identify its true potential, it is necessary to comprehend the way slum dwellers use digital devices, and to what extent they have access to them, answering questions such as:

- How many of them have cellphones, computers, Internet or smartphones?
- What are the main activities they use these technologies for?
- What is the difference between the slums that do have access to them and the ones who do not?
- What are some examples of efficient technological initiatives that have helped developing countries and what has been their impact on the population?
- What is the relationship between the way a slum is physically connected to the rest of the city and the way its population is digitally connected?
- How have digital technologies affected the process of urbanization?

Answering these questions in an efficient way requires focus and in-depth analysis, and for this purpose, we have decided to focus our research on the city of Cape Town in South Africa.

5. Case Study: Cape Town

Many experts agree on the fact that studying South Africa today is studying Africa 20 years from now, given the interesting combination of factors that make the country a big scale social laboratory.

In the same way, some South African cities may represent the way in which other African cities will develop. The following reasons have made us choose the city of Cape Town as our case study for the topic to be researched:

1. Combination of very interesting factors:
 - Top-level civil society, universities and governance. Big amount of good quality data available about slums and the city.
 - Notable presence of mobile devices with digital connectivity capabilities – smartphones, cellphones, tablets – with a ratio similar to developed nations (118 cellphones / 100 habitants). Very different ratios depending on the areas of the

- city.
- Pressing issues in a similar way to the rest of the continent: socio-economic inclusion, health diseases, security or access to basic needs.
2. Appropriate size for research: 4 millions in its metropolitan area:
 - Small enough to analyze it in an urban scale with the necessary detail.
 - Big enough for the results to be applied to other African cities.
 3. Strong presence of national and international organizations working in the field of slums:
 - Shack / Slum Dwellers International
 - University of Cape Town – African Center for Cities
 - Future Cape Town
 - Afrographique
 - Digital Jobs Africa.
 4. Existence of slums like Khayelitza, planned during the apartheid, currently overwhelmed by informal settlements and uncontrolled population growth:
 - Population of about 500,000 people.
 - Young population: around 40% of its residents are under 18 years of age.
 - Combination of planned and unplanned physical urban structures.

Although Cape Town is usually perceived as a beautiful touristic destination with top design cafes and luxurious coastal mansions, the truth is the city is a melting pot of contrasts. Crossing to the other side of Table Mountain is enough to witness the Cape Flats and the misery under which most of its population is living on. Being a city of so notable disparities is what makes this case study so interesting.

6. Research Done in the Field

The study of socio-economic phenomena related to the South African urbanization is a topic of increasing interest in contemporary research. Proof of that is the recent inclusion of this scope (papers about urbanization, economics and sociology of slums) in the *Developing Countries Programme*, a joint venture between the University of Oxford and the London School of Economics, extensively financed by the World Bank.

Along with that, the immense demographic potential of the African continent and of its urban population is an issue of rising awareness in the private and public organizations. Some reports, like the *2015 MasterCard African Cities Growth Index* and *Poles of prosperity or slums of despair?* by the Brenthurst Foundation, expand on the current knowledge regarding demographics and economics related to cities of the region, while the ones elaborated by UN-Habitat or the Socioeconomic Data and Application Center (SEDAC), put the focus on the human geographic aspect of this phenomenon. Interactive maps, such as the ones developed by the Center for Advanced Spatial Analysis (CASA) of the Bartlett School of Architecture demonstrate that integrating the slum population of cities is one of the upcoming crucial economic matters of global transcendence.

From the point of view of the urban and regional planning community, the research done by the University of Cape Town's African Center for Cities is one of the most relevant in the field, specially by his director Edgar Pieterse (also a South African Research Chair in Urban Policy) and by Vanesa Watson (co-chair of the Association of African Planning Schools, AAPS) along many others. Their thorough and interdisciplinary focus shows the reality of South African cities, and of Cape Town in particular, identifying the dynamics of the fast-

paced – and often unsustainable – process of urbanization.

Regarding informal urban settlements in Africa, it is mandatory to mention the continuously cited report written precisely by Vanessa Watson and Babatunde Agbola (University of Cape Town, University of Ibadan) *Who will plan Africa's cities?*. Along with the Africa Research Institute's work in the sections Cities and Economics & Finance, Edgar Pieterse's *Africa's Urban Revolution* report shows state of the art information about the issue. The international organization Shack/Slum Dwellers International, with its headquarters precisely in Cape Town, has risen awareness of the real concerns about these communities, promoting bottom/up planning processes and joint ventures with international organizations such as UN-Habitat or the Bill & Melinda Gates Foundation in order to improve the living conditions of slum dwellers.

The importance of new technologies as a way to improve the living conditions of the world's poorest is a rising concern for many companies and research organizations. A report from the Brookings Institution (*Advancing Technological Diffusion in Developing Countries*) has demonstrated that access to technology in these deprived areas is transforming the traditional path to development. Cheap and useful technologies are helping communities finance themselves in a much more efficient way, organizing themselves in ways that promote local development. In the other hand, bringing Internet to everyone in the world is a concern for companies like internet.org by Facebook, and its research shows that this type of digital connectivity is a key to promote the socio-economical development of a huge part of the global deprived population.

The Space Syntax methodology (a modern Geographical Information System enriched with computer software like Python) helps to demonstrate the relationship between socio-economic variables and physical ones in urban environments, one of the keys for this research project. While generally both kinds of data have been managed separately, this system helps understand the relationship between aspects like the physical design of a city and the effect of it in the lives of the urbanites that inhabit it. Along with spatial economic techniques, like the ones developed by Berger et al in Cote de Ivore, by Klonner and Nolen in South African rural markets or by Harari and La Ferrera, these methods may be the strategies to understand how these new digital technologies are affecting the lives of slum dwellers and how they might be most efficiently used to improve their socio-economic status.

Concerning the relationship between economics and urban planning, professor and architect Ricky Burdett from LSE Cities has expanded the knowledge about cities thanks to the Urban Age Project, developed along Deyan Sudic and an interdisciplinary team. Their publications, especially *The endless city* or *Living in the endless city* show a general analysis of social, spatial and economical factors of a series of metropolitan regions, helping to understand the existing relationship between diverse disciplines inside a city.

7. Research Methodology

In order to carry out the project, a research methodology of 4 parts has been established to analyze the diverse factors. These are:

1. Physical: growth of Cape Town and current state of transportation and other physical networks.
 - a. Pre-Apartheid
 - i. Drawing and analysis of plans throughout the history of Cape Town, to understand the way the city has evolved physically.
 - b. Apartheid
 - i. Analysis of the physical structures of planned townships for spatial

- segregation, street and house design, location etc.
 - ii. Descriptive analysis of the infrastructure networks that were built during this period to transport township dwellers from work places to their homes.
 - c. Post-Apartheid
 - i. Make use of NASA pictures through the Worldview platform in order to map how slums have grown in the city.
 - ii. Compare the spatial layout of planned slums (apartheid townships) and unplanned slums (informal settlements) in the city
 - iii. Analysis of the current infrastructure networks, including water, electricity, transportation, Internet and telecommunication antennas.
- 2. Economical: Demographic and economic variables that help explain the formation of slums and their microeconomic activity
 - a. Pre-Apartheid
 - i. Descriptive analysis of the diverse productive economic models throughout the history of the city.
 - b. Apartheid
 - i. Descriptive analysis of the economic function of the planned shack/slum dwellers, their working conditions, economic status, access to education etc
 - ii. Analysis of the rural and forced immigration that the city faced.
 - c. Post-Apartheid
 - i. Analysis of the diverse economic factors that make rural inhabitants migrate to Cape Town
 - ii. Identification of different economic statuses inside the city, for diverse slums, and the evolution they have faced in the last 20 years.
- 3. Digital: Gathering of evidence concerning how can the development of a digital society in slums be effective for their socio-economic inclusion of their population. Mapping and analyzing the access to Internet, cellphones and computers in slums.
 - a. Descriptive
 - i. Mapping of population access to cellphones, smartphones, computers and Internet in different slums.
 - ii. Mapping of specific public infrastructures that facilitate the access of the population to new technologies.
 - b. Analytical
 - i. Study how mobile phone network expansion itself affects the growth and patterns of slums.
 - ii. Analyze patterns of economic activity related to access to cellphones to see future development of certain slums.
 - iii. The effect of new technologies on the immigration patterns of rural habitants and their configuration in physical slums regarding ethnic or other origins.
 - iv. Analyze the current use of digital technologies in the slums of Cape Town to obtain education, jobs, security etc.
- 4. Relations + Proposals: Virtualization of the obtained data in a digital physical system in order to better comprehend the relationship between the physical structure of the city and the transcendence of the digital society that lives in it. Proposals for urban planners and city councils to identify the most efficient ways in which digital technologies may be used, alone or combined with other initiatives to improve the lives of slum dwellers.

The Digital Slums project, therefore, plans to bring an innovative focus to the traditional

urban analysis by using interdisciplinary research strategies that will help us better understand and relate variables from different disciplines. This way, we hope to comprehend in a more profound way the new strategies that urban planners and policy makers may use to face the coming challenges of the African urbanization.

8. Conclusions

The expansion of African cities will be the last large-scale urbanization process the world will face, and it will also be the fastest and largest in terms of population. Although the challenges will be tremendous, and many of them are still unknown, the urban planners, city councils and even national governments need to be ready to tackle the current and upcoming issues in agile and durable manners. Slums will be the indicators of successful assimilation rates of African cities, and if handled appropriately, the African urbanization may be a once in a lifetime opportunity to dramatically decrease global and African poverty rates.

This project aims to bring more awareness and comprehension about the rising digital society throughout Africa. New technologies have proved capable of improving our lives in ways no one thought it was possible. The developed world is a solid proof of that, and it is time the developing world and Africa in particular start being a proof of that too.

Bibliography

2015 MasterCard African Cities Growth Index: Crosscurrents of Growth. ACGI.

<<http://newsroom.mastercard.com/mea/documents/2015-mastercard-african-cities-growth-index-crosscurrents-of-growth/>>

Africapolis, Urbanization Trends 1950–2020: A Geo-statistical Approach. West Africa, Fact Sheets By Country (AFD-SEDET, 2008).

ALMÁS, I.; ARMAND, A.; ATTANASIO, O. & CARNEIRO, P. *Measuring and Changing Control: Women's Empowerment and Targeted Transfers.* National Bureau of Economic Research Working Paper. 2015.

BAKKER, J.D.; PARSONS, C. & RACUH, F. "Urbanisation in Post-Apartheid South Africa". [Paper] *Urbanisation in Developing Countries Programme of Research.* University of Oxford and London School of Economics, 2016.

<<http://urbanisation.econ.ox.ac.uk/materials/papers/52/southafrica.pdf>>

BERGER, D.; KALYANARAMAN, S. & LINARDI, S. "Violence and cell phone communications patterns: Evidence from Cote d'Ivoire". [Paper] 2014.

BURDETT, Ricky & SUDJIC, Deyan. (eds.). *The endless city.* Phaidon Press, 2007.

BURDETT, Ricky & SUDJIC, Deyan. (eds.). *Living in the endless city.* Phaidon Press, 2011.

CHUNG, C. J.; KOOLHAS, R et al. *Project on the city.* Taschen, 2001.

LSE Cities Report 2012-14. London, 2014 p. 49.

<<https://lsecities.net/publications/reports/annual-reports/lse-cities-report-2012-14-2/>>

FRANKLIN, S. "Enabled to Work: The Impact of Government Housing on Slum Dwellers in South Africa". [Paper] *Urbanisation in Developing Countries Programme of Research.* University of Oxford and London School of Economics, 2016.

<<http://urbanisation.econ.ox.ac.uk/materials/papers/49/franklinhousing.pdf>>

HARARI, M. "Cities in Bad Shape: Urban Geometry in India". [Job Market Paper] Massachusetts Institute of Technology, 2015.

- HARARI, M. & LA FERRARA, E. "Conflict, Climate and Cells: A Disaggregated Analysis". [Paper] 2014.
- KILCULLEN, D.; MILLS, G.; TROTT, W. "Poles of Prosperity or Slums of Despair? The Future of African Cities". [Discussion Paper 5/2015] The Brenthurst Foundation, 2015.
- KLONNER, S. & NOLEN, P.J. "Cell Phones and Rural Labor Markets: Evidence from South Africa". [Conference Paper] *Proceedings of the German Development Economics Conference*, no. 56. Hannover, 2010.
- KOOLHAS, R. *Lagos: How It Works*. Lars Muller Publishers, 2007.
- MANYICA, J.; LUND, S.; BUGHIN, J. et al. *Digital globalization: The new era of global flows*. [Report] MacKinsey Global Institute, 2016.
<<http://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/digital-globalization-the-new-era-of-global-flows>>
- PARNELL, S. & PIETERSE, E. "Translational global praxis –rethinking methods and modes of African urban research". *International Journal of Urban and Regional Research*, 2015.
<DOI: 10.1111/1468-2427.12278>
- PIETERSE, E. *City Futures: Confronting the Crisis of Urban Development*. Zed Books, 2008.
- PIETERSE, E. *Rogue Urbanism: Emergent African Cities*. Jacana Media, 2012.
- PIETERSE, E. (ed.). *Counter-currents: Experiments in Sustainability in the Cape Town Region*. Jacana Media, 2010.
- PIETERSE, E. & PARNELL, S. *Africa's Urban Revolution*. Zed Books, 2014.
<<http://www.zedbooks.co.uk/hardback/africas-urban-revolution>>
- POTTS, D. *Whatever happened to Africa's rapid urbanisation?* [Report] Africa Research Institute - Counterpoints, 2012.
<<http://www.africaresearchinstitute.org/publications/whatever-happened-to-africas-rapid-urbanisation-new/>>
- POTTS, D., *Challenging the Myths of Urban Dynamics in Sub-Saharan Africa: The Evidence from Nigeria*, World Development, 2012.
- ROBACK, J. "Wages, Rents and the Quality of Life", *Journal of Political Economy*, 90 (6), 1257-1278, 1982.
- ROSEN, S. "Wage-Based Indexes of Urban Quality of Life", in Mieszkowski, P. and M. Straszheim (Eds.), *Current Issues in Urban Economics*, Baltimore, Johns Hopkins University Press, 1979.
- SASSEN, S. *Urbanising technology*. [Article] LSE Cities. Consulta: 17/04/16.
<<https://lsecities.net/media/objects/articles/urbanising-technology/en-gb/>>
- SPACE SYNTAX. *Slum and informal settlements: An evidence-based approach to sustainable upgrading and development*. [Report] Space Syntax, 2010.
<<http://www.spacesyntax.com/media/books-brochures/>>
- TODES, A. "Regional Planning and sustainability: Limits and potentials of South Africa's integrated development plans". In *Dialogues in Urban & Regional Planning*. Edited by Bruce Stiftel, Vanessa Watson and Henri Acselrad. Taylor and Francis, 2007.
- WATSON, V. & AGBOLA, B. *Who will plan Africa's cities?* [Report] Africa Research Institute - Counterpoints, 2013.
<<http://www.africaresearchinstitute.org/publications/who-will-plan-africas-cities/>>

GREEN ENERGY FOR AFRICAN CITIES- THE CHANGING LANDSCAPE OF OUR CITIES

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Abstract

Green energy mandate for urban development in African cities is becoming the changing landscape of our cities. The rise of energy supply in response to the demand of electricity has become one of the corner stone in tackling urbanization and rural migration within the urban development paradigm.

In most African cities, energy demand is likely to be supplied by energy from fossil fuels, oil and coal; which has negatively affected the economy through rising oil prices. The need to complement current supply with additional electricity could present an opportunity for cities to turn towards a green energy agenda in order to secure the needed levels of energy. Renewable energies have thus far not penetrated far into African Cities (South Africa not being the exception). Whilst most engineering news and research are now turning the tides towards the new planning paradigm shift; the focus of renewable energy cannot be taken lightly as this marks the new framework for the cities that we desire. Where energy demand grows fast in emerging market cities, alternative energy technologies are by definition of a more decentralized nature and these developments still have an experimental character and can be prohibitively costly.

Cities can no longer look at environmental issues separate from energy crisis. All African cities mandate, need to recognize the link that exists in finding urban development problems relating to energy supply. Green energy supply as an emerging urban development trend cannot be a separate issue funded by the remains of budgets spent on other projects. African cities mandate is to recognize that the natural environment has become of great importance in finding short and long term sustainable energy supply. Market conditions for renewable energy generation can be optimized by reducing the barriers to the increased production of electricity from other sources through the development and implementation of an appropriate financial and legislative framework that enables competitive economic conditions.

1. Aim and Objective of this paper

- To describe the present status and forecast the potentialities of renewable energy in South Africa (SA) and Africa;
- To define an analytical framework for the understanding of the renewable energy Sector in SA and other developing African countries;
- To suggest priorities and specific fields of research on renewable energy and energy efficiency;

- To assess the strength and weakness of renewable energy and energy efficiency in SA;
- To identify existing international funding agencies for potential partnerships and finance sharing for the establishing of a regional fund to support the development of renewable energy projects.

2. Introduction

“The present worldwide trend towards environmentally sustainable energy utilization is a response to global climate change. The African Continent is endowed with an abundance of renewable energy resources”- White Paper SA (2003:1) on Renewable Energy. In South Africa, the recognition of this trend has well been received by Government authorities, as new policy indicating the shift in energy supply has been mandated to look into this matter with great help. South African government has committed itself through the White Paper policy document on Renewable Energy, to give much needed thrust to renewable energy; a policy legislation that envisages a range of measures to bring about integration of renewable energies into the mainstream energy economy. However, as this policy document stands and has been produced since 2003; in 2016, there are few energy projects in South Africa that speaks to this intended shift in the energy sector and this calls for great concern.

2.1 Transformation through Green Energy

According to the World Bank Group Infrastructure Strategy Update (2015), opportunities for green infrastructure exist in Africa's vast unexploited renewable energy resources. This is true and for every development that takes shape on the ground, one cannot sideline the spatial implications of any development that ought to happen.

The global energy demand is growing in such a pace that, by 2050, around 80% more energy will be consumed as compared to 2010, scaling up from a 45-50% higher demand by 2030 (Inter- American Development Bank, 2011).

In South African planning context, cities are responsible and accountable for their resource usage, this includes the energy supply distribution. This implies that City managers need to have data about their resource stock and flows. “South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources; in particular, South Africa has developed an efficient, large-scale, coal-based power generation system that provides low-cost electricity, through a grid system that is being extended to rural areas, to millions of residential, commercial and institutional consumers” White Paper SA (2003:8) on Renewable Energy. Eskom (Electricity Supply Commission of South Africa), as an institutional role player in the supplying energy, currently dominates electricity generation and transmission in South Africa.

Electricity stock and flow is one of the concern that helps them understand the annual energy usage, which has not been without its challenges as data is not always accurate. Illegal connection of electricity to the urban informal sections of the city has resulted in the mismeasurement of the supplied energy with reference to its demand.

The lack of tracing the actual registered user with reference to the amount of electricity supplied has made errors in the accuracy measure of the actual resource usage, for City Managers to report on accurate infrastructure output. In the South African context, the efficiency intervention to improve the supply of electricity has included a plan of implementing the Electric Smart Metering. This is a metering system that enables remote and energy supply readings, looking at the pricing implementation and monitors energy quality.

This new system was introduced as a better mechanism to manage, analyse and record the stock and flows of electricity. It became a local content of utilizing equipment's needed to be maximize energy output in order to minimize the costs associated with implementation and operation, as well as the promotion of employment opportunities. It has however not looked at the long term sustainable energy supply mechanism that response to urban growth resulting from urbanization. The metering system has/will require more resources to keep it efficient for usage and data recording for better management. The shortcomings of this concepts has not really looked at the long term energy supply mechanisms that are more environmentally friendly and viable for the city livelihoods.

2.2 *Spatial Transformation*

South African cities have started to embrace a more ecological sustainable approach which will help to enhance long term energy supply. An alternative supply paradigm in developmental planning has been to look at other measures of supplying electricity. The shift in the green energy supply mechanism in the African, predominantly in developing countries includes renewable energy supply through the usage of solar panels. Green energy supply has been the main focus in recent studies with reference to solar energy been an ecologically friendly mechanism to sustain the flow and stock of energy.

Solar energy on recent developmental paradigm is used as a solar radiation conversion tool for electric energy (IADB, 2011). Through the Sun radiation that is converted into electric energy, this mechanism can be used and joint in the main energy supply grid. In developing country like South Africa, it is only now that we are starting to participate in the solar panel energy sector, and the application of this energy intervention can help assist in the energy supply in the deserted rural areas of this country.

Solar panel intervention innovation has major landscape and spatial outlook of any kind of development that ought to occur.

Town Planners can take advantage of this innovative intervention paradigm in assisting with the supply of energy. The solar energy market is still new in the implementation paradigm, which still requires more established national and international enterprises that will give birth to this planning trend in assisting the energy crisis for the coming years. The solar panel market is currently concentrated in the engineering market of innovative inventions, and there is little fall out of this innovation within the planning schemes on things. Policy planning is yet to promote and foster this paradigm for a greater outlook of how we can promote sustainable green energy for long term energy supply. For Metropolitan Cities in SA, this new urban landscape may have less spatial landscape implications to the existing spatial layout, as most implementation of solar energy is likely to be roof top development initiatives; as an additional physical structure to complement existing infrastructure and urban layout.

This can help and save City Managers and Municipal stakeholders a lot of resource in managing the current stock and flow of energy.

2.3 *Energy Resources*

The solar panel green energy move is already a strategic sustainable solution for satisfying the energy demand in the near future (IADB, 2011). Solar energy represents an important alternative to fossil fuels and coal energy in SA and across evolving African Cities. Underpinning the Renewable Energy Strategy is a Macro-economic analysis to guide cost efficient Government financial assistance based on a least-cost and employment maximizing supply model in reaching the energy target that South Africa desires (White Paper on Renewable Energy, 2003).

Environmental vulnerability is a continued concern and cities face the brunt of climate change impacts due to their concentration of people and physical assets, as well as their geographic location (Subir, K.; Morrow, J. W.; Butler, S. J.; & Robertson-Tait, A, 2007).

South Africa and other African developing countries need to rapidly move towards this energy system mechanism as there are many possibilities of application for people living in dispersed rural areas where there is no conventional electrical energy, and also due to their underprivileged geographic position. Although renewable energy technologies often have higher investment costs, their operation and maintenance costs are generally lower than conventional fossil-based energy technologies (White Paper on Renewable Energy, 2003).

Renewable energy can contribute to the diversification of energy resources through the implementation of a properly managed programme of action. This can/will provide sufficient incentive for the sustainable development of the renewable energy-based industries.

Government needs to promote research and development in solar energy technologies by supplying more public funding. The private sector, aided by government subsidies, should seek entrepreneurial opportunities in the growing solar energy market. The planning sector should devote more attention to overcoming the cost and technology barriers that currently limit the contribution of solar energy (IADB, 2011). With the exception of a few African countries, historic underinvestment in solar energy infrastructure expenditures continues to be low. There is considerable interest in private investment in solar panel infrastructure, however with a few exceptions private investment still lags behind expectations (WBGIS, 2015).

3. **Stakeholders and Role Players**

The World Bank is developing a new breed of operations— the Growth Poles Projects—to help African countries deploy a critical mass of reforms, infrastructure investments and skills building for the appropriate environment to foster industrial investment (WBGIS, 2015). Such projects are being implemented or prepared in Cameroon, the Democratic Republic of Congo, The Gambia, Madagascar and Mozambique (WBGIS, 2015).

The World Bank is also working on reforming labor and land regulation, as well as deploying new approaches to improve the business environment, combined with regulatory impact assessment, as a way to reduce the stock and flow of business regulations (WBGIS, 2015). In South Africa, The White Paper policy document on Renewable Energy (2003) was developed in the context of both international and national driving forces. International developments around the United Nations Framework Convention on Climate Change, the world markets for renewables and South Africa's reintegration into the global economy.

3.1 Governance

At present in South Africa the legislation covers the areas of electricity and liquid fuels. There's little on renewable energy and The White Paper on Energy Policy encourages the entry of multiple players into the power generation market.

Opportunities for improvements on the way that energy is used offer more attractive short-term and long-term economic and environmental benefits than the changes in primary energy sources and in energy production technologies (IADB, 2015).

- The World Bank will contribute to activities needed to expand access, including finding low-cost options, exploring new solutions for off-grid electrification, making better use of a proven entity (World Bank Report, 2006);
- Political and electoral changes may continue to affect the timing and composition of policy positions and investment programs in a number of countries;
- A number of infrastructure subsectors in a number of countries face governance and corruption challenges.

4. Urban Growth, City Expansion, Capacity Building in Solar Energy.

The new living urban convictions and access to safe and affordable energy will require enabling urban policies and conditions.

Population growth, economic growth, rapid urbanization has become the founding planning principles in defining the cities that we want to create. Sustainable energy future will require changes not only in the supply side, but in the demand side of the energy equation (IADB, 2015). Boosting energy efficiency is less costly and more rational than procuring additional energy supplies (IADB, 2015). Opportunities for accelerating green investments are significant. Planned projects for the future should include promoting renewable energy. Conferences, workshops and knowledge transfer forums in the near future should be organized in order to promote inclusive growth into the green energy agenda in SA and across Africa.

In South Africa, the financial crisis in electricity supply has dramatically impacted the many cities' ability to secure commercial financing in the energy sector to a far greater extent in comparative terms.

According to the World Bank Group Infrastructure Strategy Update (2015: 54):

- “Capacity of national and local institutions varies, which limits the pace at which transformational projects can be undertaken”.
- “Advanced clients request a quality of support that requires the Bank to strengthen its own capacity to respond, with possibly more reliance on external technical expertise”.

There are different contributing factors to this slow respond of solar energy planning in South African Town planning schemes, due to

- Presence of energy price subsidies:
 - Absence, Lack or Minimal of national financing sources;
 - Lack of funding for equipment and project development;
 - Scarcity of national skilled personnel dedicated to energy efficiency in the Built Environment;
 - Difficulties to accessing technology and knowledge;
 - Under-developed market for energy service companies.
- Weaknesses of government, financial, educational and research institutions;
- Lack of social energy and environmental culture;
- Lack of awareness on the part of energy users;
- Weakness of legal and regulatory framework;
- Limited actions for education and building awareness and promoting energy conservation in different sectors, as well as in individual users;
- Insufficient and unstable policy signals to promote energy efficiency among users (IEA; 2006).

4.1 The Need to Adopt Solar Energy in the Town Planning Scheme

“The issue of rational and efficient energy use is strongly associated, not only with technology, but also with the culture and habits of the societies where the energy efficiency programs are implemented. An effective strategy toward greater energy efficiency needs to address the full range of barriers that inhibit this tendency” (AIDB, 2015: 164).

Technical assistance and advisory programs need to support policy reforms to advance energy market development and pricing reforms in usage of energy efficiently, to provide a conjunction with investment lending and associated services (Inter- American Development Bank, 2011). There is a need for programs to focus on rehabilitation and expansion of existing infrastructure, optimization of systems, demand management and operation efficiency. Town Planning Schemes need to seek opportunities for climate friendly investment to reduce losses in existing coal heating and power generation.

Rothkopf (2007), indicates that, for energy efficiency improvement, additionally to the political will, the priorities of solar energy development should include:

- Development of appropriate legal and regulatory framework;
- Creating, or strengthening in the cases that already exist, government institutions for energy conservation promotion;
- Compliance, monitoring, enforcement and evaluation of national energy efficiency programs;
- Improving information and awareness about energy efficiency opportunities;
- Marketing and consumer education;
- Financing of energy efficiency investments;
- Financial incentives for energy efficiency investments;
- Alignment of private incentives with public objectives;
- Energy pricing that increase incentives for improving energy conservation.

The mandate for energy generation in South Africa (and most other countries) rests with the national authorities.

5. Conclusion

5.1 *Green Energy as the driving force towards the changing Landscape of our Cities*

Eskom (Electricity Supply Commission of South Africa) is the largest producer of electricity in South Africa. Eskom's energy production is not renewable energy. While all electricity generated by Eskom is being injected onto the national grid, Eskom does not distribute electricity to every consumer in South Africa. Recent developments indicate major changes as Eskom is under significant pressure to the supply chain which it currently controls. In 2007 and 2008 there were serious national supply crises, coupled with nation-wide black-outs. That being the case, with 90% of South Africa's electricity originating from coal; South Africa stands for one of the most polluting electricity supplies in the world.

The need for a new planning paradigm is more important now than ever, in envisage the sustainable cities that we ought to build for our landscapes. Even though cities sometimes own transmission lines and power generation infrastructure, all generated power flows into the national grid, and remains under the control of Eskom. New stakeholders need to be part of the planning process, to understand the needs of our citizens.

City authorities do however have the mandate for energy distribution, and the responsibility for environmental policies also rests with the municipality. This opens the door for city authorities to establish policies aimed at influencing energy consumption behavior within its jurisdiction. However, local partnership (private and government), cross border relationships have become essential in building sustainable cities using renewable green energy.

5.2 Opportunities for Public-Private partnership

Lack of accountability in public institutions translates to low quality of infrastructure services and inadequate investment decisions. Now more than ever, the public private partnership is essential to achieve maximum output to the new planning paradigm in the energy sector. Absence of sound cost benefit analysis and an adequate portfolio of projects facilitate investment decisions based on political grounds (World Bank Report, 2006).

Town Planning Schemes need to accommodate the new pressing developmental trends in the planning legislation and policy process. There should be:

- Building codes and certification schemes for new buildings centred around green initiatives and green buildings;
- Smart control for energy systems in buildings;
- Passive energy systems and energy efficiency in low cost housing.

The region's transformational engagements will be those that encapsulate the notion of green and inclusive growth by promoting greater access and more efficient and effective service delivery, improving the quality of life of users and their communities, while protecting or enhancing the natural endowment of the impacted area. There are technical needs in the planning schemes for system integration, subsidy reform and the other underlying policy and economic requirements for greater private sector involvement in sustainable energy provision.

References List

1. G Rothkopf (2007), A Blueprint for green energy in the Americas; IADB.
2. IEA, (2006). International Energy Agency: World Energy Outlook 2006.
www.iea.org
3. IEA ETP (2006). Energy Technology Perspectives, IEA.
www.iea.org
4. IEA, (2006). International Energy Agency: World Energy Outlook 2006.
www.iea.org
5. IEA ETP (2006). Energy Technology Perspectives, IEA.
www.iea.org
6. Inter- American Development Bank, (2011) : SUSTAINABLE: Energy System for Universal Energy Access and to Mitigate Global Climate Change, Mexico City, Regional office for Latin America and Caribbean.
7. Reif, T. (2009) - Profitability Analysis and Risk Management of Geothermal Projects. Geo-Heat Centre Quarterly Bulletin (Klamath Falls, Oregon: Oregon Institute of Technology) 28 (4): 1–4;
<<http://geoheat.oit.edu/bulletin/bull28-4/art1.pdf>>
8. Renewables (2010). Global Status Report. REN 21 Renewable Energy Policy Networks or the 21st. Century. September 2010.
9. Subir, K.; Morrow, J. W.; Butler, S. J.; & Robertson-Tait, A. (2007). Cost of Electricity from Enhanced Geothermal Systems., Proc. Thirty-Second Workshop on Geothermal Reservoir Engineering, Stanford, California,
<http://pangea.stanford.edu/ERE/pdf/IGAstandard/SGW/2007/sanyal1.pdf>
10. The White Paper on Renewable Energy (2003): The Department of Minerals and Energy, South Africa
https://unfccc.int/files/meetings/seminar/application/pdf/sem_sup1_south_africa.pdf
11. The World Bank (2006). Scaling Up Infrastructure: Building on Strengths, Learning from Mistakes < www.worldbank.org/infrastructure>
12. The World Bank Group Infrastructure Strategy Update (2015); Infrastructure Strategy Update FY2012-2015
< www.worldbank.org/infrastructure>

Distributed ledger technologies (blockchain) in urban energy systems, the case study of smart plugs in the U

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Abstract

While the UK government has attempted to initiate smart metering system between households, consumer acceptance of smart meters and its effects on vulnerable groups of society have not been addressed appropriately. Given this, this paper attempts to contribute to this argument by implementing a distributed system between energy suppliers and consumers using blockchain technology. The findings highlight that the blockchain provide an opportunity to improve trust and transparency between stakeholders in energy sector, lessen the cost of energy provision by reducing the role of the central communication centre, and to help government to more efficiently target fuel-poor households in society and manage the resources.

1. Introduction

The introduction of the first distributed ledger technology in 2009, the open-source bitcoin protocol, set an example of a peer-to-peer (P2P) system which works without a central repository or single authority. This technology attempts to provide a permissionless, decentralised and inedible public ledger, collectively maintained and validated by a network of users. All transactions undertaken across the network are verified by participants and recorded in a public distributed database, called blockchain (Bitcoin.org 2016). Despite its main contribution to the field of financial services and industries, the potential of applications and innovations using blockchain technology is rarely being considered in urban fields. Allianz intends to track diamonds from mine to retail sale using public ledgers (Higgins 2015), Phillips has started its research on the possibility of integrating blockchain databases (Rizzo 2016), and AirBnB plans to get customers' trust and authenticate its reputation (Higgins 2016).

Earlier this year in January, the Government Office for Science in England published a report on distributed ledger technology (Walport 2016). The report highlights the capacity of blockchain technology in delivering a new kind of service provision to citizens. Improving transparency, enhancing trust, reducing intermediators, supporting collaborations (i.e. governance), and increasing security are the projected outcomes of this new relationship between the state and citizens. One of the first activities towards this vision is the development of smart meters in February 2016 by Accenture that leverages blockchain technology (BBC 2016). It seeks to help citizens specifically the fuel-poor households in saving money on electricity and gas costs. This paper seeks to elaborate on the vision and performance of smart meters, and explores the potential opportunities and challenges involved in the implication of this initiative. This research is in its infancy and mainly focuses on analysing various documents such as articles, reports, news, blogs and media, and the UK data repositories.

In the following paper, I briefly outline what blockchain technology is, before providing the definitions of the most common terms in understanding this technology and the aspects of blockchain networks. I then provide an overview of energy consumption and fuel poverty in the UK, and how smart meters are likely affect UK consumers. After the consumers' responses to smart meters are explored, I explore the implication of blockchain technology in the smart meter initiative and energy provision. Finally, I conclude with how much trust, transparency, and collaborations improve between society and energy sector with the implication of blockchain technology.

2. Blockchain technology

The *blockchain* innovation started with the introduction of a digital currency called Bitcoin. Bitcoin was introduced in 2008 by an unknown person or entity using the name Satoshi Nakamoto (2008). The main argument of this publication is that the current electronic payment system needs trusted third parties. For example, an electronic payment for a book at Amazon Marketplace should be processed via the customer's bank. This system inherits two weaknesses. First, financial institutions cannot avoid the cost of mediation. For example, there is a charge of £0.50 for transactions less than £10 by credit or debit cards in small shops in the UK. Second, for any transaction all parties involved in the process should have built trust between each other in advance. This trust requires that customers must provide more information than they would otherwise need. For example, Barclays Bank allows its customers to make a payment to someone they have paid before straightaway with the Barclays Mobile Banking application; however, to make a payment to someone new, customers need to enter information of the new payee, as well as the card details of the customer's account with a debit card (Barclays n.d.). Therefore, "*what is needed is an electronic payment system based on cryptographic proof instead of trust, allowing any two willing parties to transact directly with each other without the need for a trusted third party*" (Nakamoto 2008, p. 1).

The Nakamoto's system has four dimensions: it has peer-to-peer electronic transactions and interactions, there is no need for financial institutions to verify electronic payments, cryptographic proof replaces central party, and trust is instantly built in the network rather than in a central institution. The technology behind this system is *blockchain*. Blockchain technology¹ is a distributed ledger of records of all digital events happened among participating parties (Crosby et al. 2015; Swan 2015; Lewis 2016). The main aspect of the technology is its decentralisation. It has been argued that this decentralised scheme is the result of the political movement in the first decade of this century (Mougayar 2016). The financial depression in 2008 promoted people's distrust to financial systems and governments that had acted as centralised anchors of trust. The decentralised configuration of blockchain technology transfers trust and authority to a virtual network.

To avoid puzzling the readers with the technical investigations, the rest of this part is organised in two sections. The terminologies in this paper which are the most common ones in the current arguments about blockchain technology are presented in the first section (for more technical notes, please see Swanson 2015). This is followed by the investigation of three layers of blockchain networks, and how transactions happen, verified and stored. Both sections are accompanied with the real life examples to make the arguments more understandable for the readers with limited background in computer science, cryptocurrency and related fields.

2.1 Terminology of blockchain

itcoin – refers to a type of digital currency which can be used to buy, sell and send goods and assets. This currency does not belong to any land and its home ground is the Internet. It is entirely controlled by users without any requirement for an account with an institution.

P2P – refers to a peer-to-peer network with no central authority, server or bank. In this model, members of a network have all information/data and updates are shared around every member (called peer).

Nodes – refers to a virtual network of computers which validate members' transactions by checking personal details of peers and details of their accounts. Nodes are also called validators.

Distributed – refers to transferring authority and trust from a centralised agency (e.g. government, bank or server) to a virtual network of nodes (i.e. validators). Decentralisation has different configurations (see Figure 1).

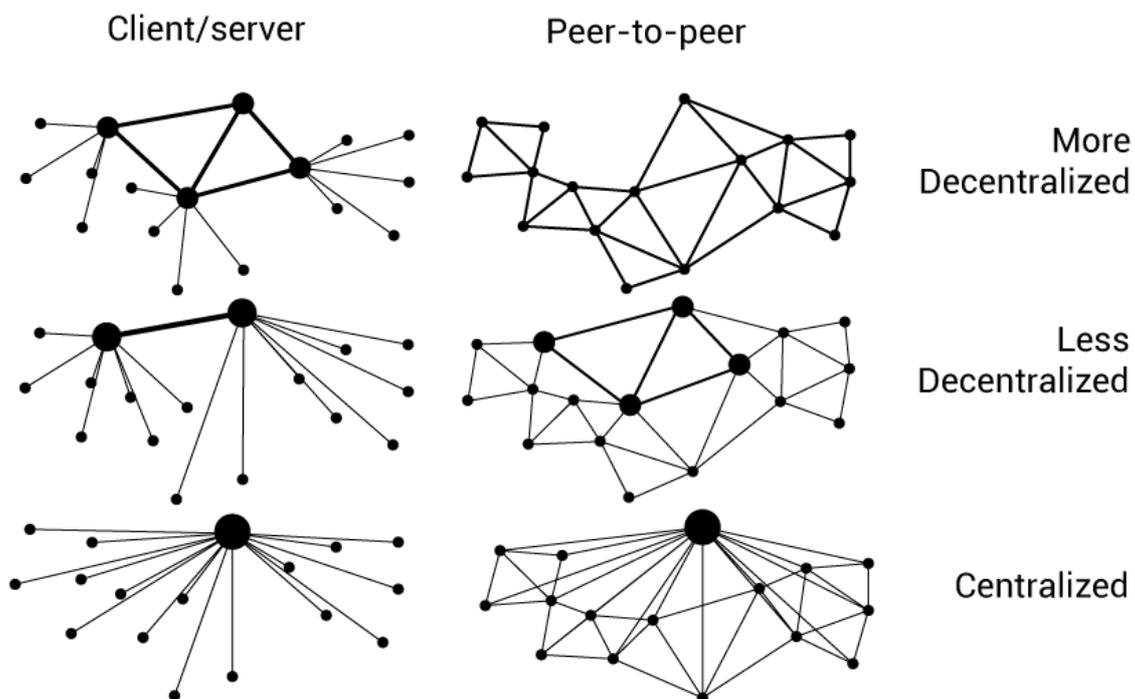


Figure 1: different forms of peer-to-peer decentralisation
Source: (IOPTIO 2016)

ncryption – refers to the process of transforming information into an unreadable format for unauthorised users using algorithms.

Cryptography – refers to the art of encrypting information, called cipher text.

Hash – refers to a unique cryptographic text generated by nodes (i.e. validators) for each transaction.

lock (Ledger) – refers to a repository of recent valid transactions. Each block is timestamped and has a unique hash. Each block includes the hash of the previous block, and is irrefutable. The difference between databases and ledgers is that the former is the trusted repositories with a central authority.

Chain – refers to series of blocks which are linked with their hashes. The chain is designed sequentially as each block links to its preceding block.

lockchain – refers to a distributed database comprising blocks and chains. It maintains a continuously growing list of data records and is hardened against tampering and revision.

2.2 Blockchain networks

The premise of the Bitcoin platform – a decentralised, trustless, replicated ledger of transactions – is the virtual opposite of the centralised, trusted, guarded, model of modern securities processing. In the ideal world, every peer, node or ledger is connected with its neighbours. As a result, there are three bottom-up layers of networks that connect peers, nodes and ledgers (Figure 2).

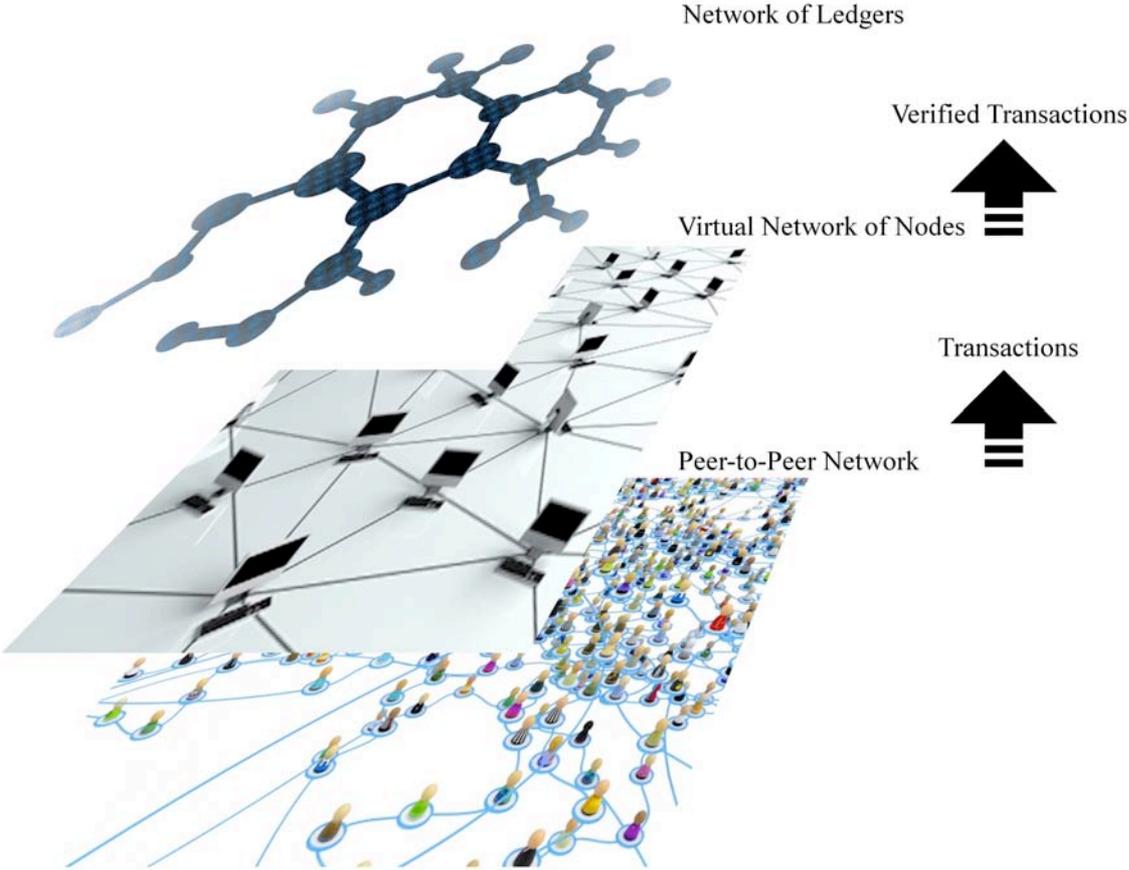


Figure 2: networks in blockchain technology
Source: the author

The first layer is the *P2P network* where participants are connected to each other for various purposes: whether it is about payments to each other, sharing information, or communication. In this layer, individuals may have different degrees of connection with their peers. For example, a mother who is a housewife may only prefer to connect with her two children and partner to manage household costs. However, a company director may prefer to connect with all internal and external bodies involved in her business. Peers should sign the transactions in this layer, but the transactions are not verified and accessible. The verification happens at the second layer called *virtual networks of nodes*.

The network of nodes comprises of virtual entities and their links to each other. At this moment, computers are virtual entities (i.e. nodes); however, cloud computing shows a promising trend as it may replace the role of computers in the future. Information about individuals in the P2P network is stored in nodes. Information about every individual is *not* assigned to only one or all computers. It is assigned to a set of computers. When a transaction happens between two peers, some nodes, which are linked to these individuals, start the verification process of the transaction. If the transaction is valid, it will be stored in ledgers.

Ledgers and their links build the third layer of the *network of ledgers*. Ledgers are places which store valid transactions from the network of nodes. Again here, every node is *not* connected with only one or all ledgers. It is connected to a set of ledgers. The ledgers may store different sets of data about verified transactions. For example, a resident is entitled to childcare benefit. This person and a representative from government sign a contract in the first layer. The information of both parties is sent to the virtual network of nodes to be verified in the second layer. After the verification process, some ledgers store all details about the applicant and about the benefit which an individual received. These ledgers are not accessible to public because of the resident's confidentiality. At the same time, there are some public ledgers with enough information about benefit applicants. However, the ledgers and their information are linked together; thus, it is hardly possible to manipulate data.

3. energy consumption and fuel poverty in England

The energy consumption of the UK households is manually collected and recorded with meters. On average suppliers read households' meters quarterly, and in most cases the quarterly bills are based on estimates made by suppliers. Customers are charged based on two factors of standing charge and unit rate. The former is a fixed amount which suppliers charge their customers every day, regardless of how much energy they use. The latter is the price which customers pay per kilowatt-hour (kWh) of energy. In 2014, the domestic sector consumed above 40,000 equivalent of thousand tonnes of oil, and there were more than 43 million electricity and gas meters installed in England (DECC 2016b). Figure 3 shows the total electricity and gas consumption trend and the amount of energy allocated for domestic use in the UK for more than a decade. The electricity consumption of households has stayed steadily, similar to the total electricity use. However, the total gas consumption in the UK has fallen more sharply than the gas consumption of households. In essence, the total amount of domestic emission has not reduced significantly. In order to reduce domestic energy emission, Smart Energy GB is the body to promote smart meters in the UK. Therefore, it supports suppliers to install smart meters in homes, and rolls out 26 million gas and electricity meters to all homes by the end of 2020 (Smart Energy GB n.d.).

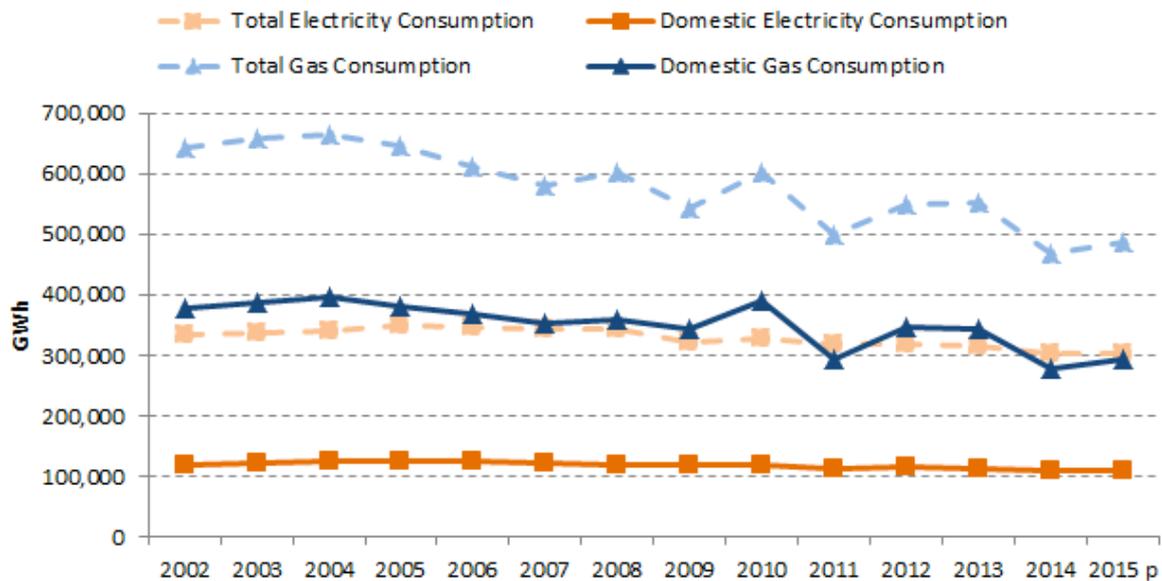


Figure 3: total and domestic energy consumption in the UK between 2002 and early 2015
 Source: data from DECC (2016b)

In addition to carbon savings, smart meters are used to address information difficulties existed for consumers and suppliers. By using in-house displays (IHDs) with smart meters, consumers have almost real-time information about their energy use and cost. It is expected that this information plays a key role in changing consumers' behaviour towards how to buy and use energy. Moreover, data from smart meters help suppliers to identify meter faults, to issue more accurate energy bills, and to develop more sophisticated tariffs based on demand. It is anticipated that smart metering will facilitate challenges in developing smart grids and decentralised electricity systems in the long term (DECC 2014). However, research has recently identified three challenging issues regarding the smart metering initiative.

Jennings (2013) argues that the deployment strategy of smart meters is the central communication model. It means data and information collected from smart meters in homes will be managed by a new data and communication centre (Ofgem E-Serve 2010). By looking at the historical diffusion curve of technology innovations in the UK housing sector, Jennings (2013) argues that smart meters are *means* to manage demand and issue accurate billings for customers. However, this is a one-size-fit-all approach to energy demand management. The government could introduce legislation for energy suppliers to provide accurate information and invoices for energy bills. In essence, suppliers would be in charge of exploring new ways of meeting this requirement.

Moreover, a new research on the people's perception of the smart metering initiative (Buchanan et al. 2016) shows that the UK consumers do not trust energy companies. The consumers do not have a desire to be controlled and managed by suppliers, as they believe smart meters let their electricity companies control their energy use. It is also difficult for the consumers to understand how energy companies would profit from the initiative. The consumers mention that energy suppliers have not been open and transparent in their actions. For instance, there is evidence that some donated users' energy saving to charities. Therefore, the customers do not have willingness to implicate demand responsive enabling

technologies. Finally, the consumers are concerned about being frequently bombarded with different energy tariffs because of the competition between suppliers, being constantly watched and losing their privacy, and being fully responsible for their energy bills.

Furthermore, there is a question about whether the abovementioned objectives of the smart metering initiative can help the UK government to monitor and address fuel poverty in England. According to its latest definition, a household is fuel poor if their fuel cost is above the national median level, and by spending that amount of money, they would have a residual income below the official poverty line (DECC 2016a). In 2014, 10.6% of English households were fuel poor of which 6.8% were living in a property with an energy efficiency rating of band C or above. Lone parents with dependent children and/or unemployed individuals have had the highest level of fuel poverty since 2003. On average, a fuel-poor household needed £371 per annum to meet the fuel poverty threshold in 2014 (DECC 2016c). It is crucial to note that the definition of fuel poverty changes in 2011. Previously, a household was fuel poor if they needed to spend more than 10% of their income on fuel to maintain the adequate standard of warmth in their home.

On March 2016, BBC Panorama investigated the life of families who cannot afford to heat their homes (Navanayagam 2016). The headline criticised the UK government promise to end fuel poverty by 2016. It was revealed that 9,000 people died in 2014-2015 as a result of low indoor temperature, while that year did not have the coldest winter on record. An interesting argument was that if the definition of fuel poverty had stayed the same, the number of fuel-poor households would increase by about 2.5 times more. This documentary also explored the difficult life of some households which were considered to be fuel poor based on the previous definition of fuel poverty; however, they are not fuel poor any more. What is obvious from this documentary is that the UK government has not been entirely successful in developing robust and reliable evidence and records of fuel-poor households.

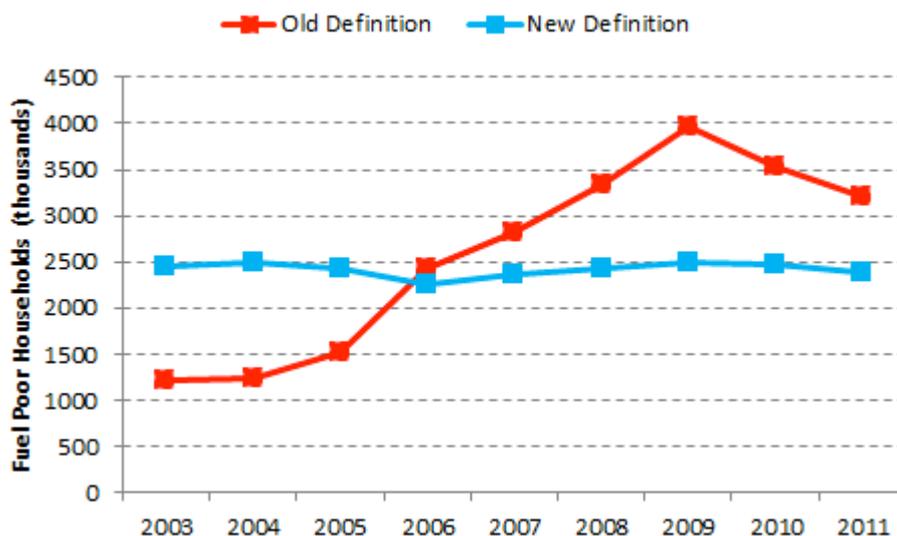


Figure 4: difference between the number of fuel-poor households under the old and new definitions
Resource: data from DECC (2013)

These three challenges are being investigated in the next part with the potential application of blockchain technology in the smart metering initiative

4. Alternative approach to smart meters and energy provision in the U

Potential applications of blockchain technology are broken down into three categories. First, applications related to currency and cryptocurrencies such as digital payment systems and currency transfer. Second, applications related to larger economics and financial market such as loans and mortgages, smart contracts and smart assets. In this category, the structure of financial services transform from centralised to distributed systems by deploying the objectives of blockchain technology – i.e. peer-to-peer electronic transactions and interactions, no central institution, cryptographic proof, and trust in the network. The third category uses this technology beyond economics and financial market such as health, science and government services. These three categories are called Blockchain 1.0, 2.0 and 3.0 respectively (Swan 2015; Mougayar 2016; Swanson 2015).

Blockchain 3.0 is a comprehensive technology with tiers of networks and multiple classes of application that can be implemented in the smart metering initiative. The first and foremost capacity of this technology is its decentralised network of peers. To counter mistrusted energy suppliers, blockchain technology can be used to enact in a decentralised cloud function. Instead of the central communication model and the strategy of smart meter rollout to households, the government could legislate decentralised ledgers of data collected from accurate billings issued by energy suppliers. This legislation would contribute to alleviate the challenging issues mentioned above.

The focus of the blockchain-based legislation is on the end result, leaving enough room open for suppliers to design their means. The information would be recorded and disseminated in a decentralised network. Accordingly, a new data centre would not be required to intermediate data dissemination between energy providers and data users. Nevertheless, the permission to have access to the ledgers should be monitored.

In order to address the abovementioned consumers' concerns about energy companies, less decentralised model of peer-to-peer networks shown in Figure 1 could be applied. In essence, the UK consumers would have access to their billing invoice, and could be linked to the other performance of energy companies (Figure 5). In this model, the coordination, record keeping, and irrevocability of energy transactions using blockchain technology are features that could be fundamental for the innovation policies in the UK. The blockchain serves as the public record repositories for energy users, including the registry of all documents, events, identities and assets. Every property would become smart property which is encrypted with a unique hash that the property can be tracked, controlled, and exchanged on the blockchain. This means that all manner of energy (electricity and gas) and payments could be registered and transacted on the blockchain.

For instance, User 01 is constantly updated with real-time information about her/his energy use because of the peer-to-peer link with her/his energy provider – i.e. Provider A. At the same time, he/she would like to regularly know about how much energy Provider A saves and where it is intended to be used. Therefore, User A requests to be linked with the documentation of the charity work of her/his provider recorded in Ledger I. Moreover, User 1 has willingness to have a peer-to-peer network with User 2. The reason for this network could be personal or family circumstances. For example, a retired couple may ask their child to have access to their energy records, in case of any mistake in their energy bill and also any change in the provider's tariff. User 2 is also linked with Provider A.

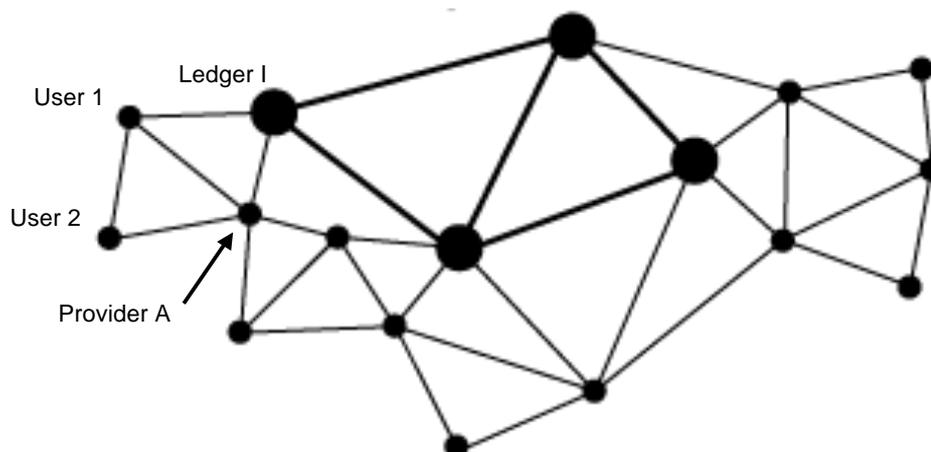


Figure 5: less decentralised model of ledgers, providers and consumers
Source: the author

Beyond these situations in which a public interest must transcend governmental power structures, other industry sectors and classes can be freed from skewed regulatory and licensing schemes subject to the hierarchical power structures and influence of strongly backed special interest groups on governments, enabling new disintermediated business models. In case of fuel poverty in the UK, a household should have an adequate level of warmth. It is defined as 21°C for the main living area and 19°C for other occupied rooms. Blockchain technology could record the level of warmth of fuel-poor households with sensors, as well as the socio-economic status of these families. The ledgers of these records could be used as a resource to develop fuel poverty evidence. It could also be used to give benefit to households according to their precise needs. Households could also request for precise billing invoices and benefit from all advantages that the blockchain brings to other households in the UK. For research purposes, the data recorded in the ledgers could substantially improve the performance of models and analysis to promote evidence-based urban planning and policy (Zhang et al. 2016).

5. Conclusion

It is argued (Swan 2015) that a distinctive aspect of blockchain technology is that almost all information, code and methods related to this innovation are freely available online, because the premise of blockchain is to enhance trust and transparency in different systems. In the present research, I used these available documents to make an argument about the implication of blockchain technology in energy sector. The smart meter initiative in the UK and the blockchain innovation are evolving rapidly. I propose that in order to secure the deployment outcomes of smart meters, to improve trust and transparency between consumers and energy companies, and to maximise the effects of new energy-focused technologies on vulnerable groups of society such as fuel-poor households, blockchain technology should be at the heart of this initiative. The blockchain reduces customers' experience of a sense of control and improves consumers' satisfaction.

ndnotes

¹ The term blockchain is different form blockchain technology. Mougayar (2016) argues that the definition of blockchain technology is only the technical definition for blockchain. From business point of view, blockchain is defined as an exchange network in which transactions and assets move between peers without the assistance of intermediaries. In law, blockchain is about validating transactions via cryptography and replacing previously trusted entities.

References

- Barclays. (n.d.). How do I make a payment to someone new? [Online]. England: Barclays Bank PLC. Available: <https://www.help.barclays.co.uk/faq/payments/payment-information/payee-new.html#mobilebanking> [Accessed 04 July 2016].
- BBC. (2016). Bitcoin could help cut power bills [Online]. Online: BBC. Available: <http://www.bbc.co.uk/news/technology-35604674> [Accessed 20 February 2016].
- Bitcoin.org. (2016). Blockchain [Online]. n.d. Available: <https://bitcoin.org/en/developer-guide#block-chain> [Accessed 11 April 2016].
- Buchanan, K., Banks, N., Preston, I. & Russo, R. (2016). The British public's perception of the UK smart metering initiative: Threats and opportunities. *Energy Policy* [Online], 91, 87-97. Available: <http://www.sciencedirect.com/science/article/pii/S0301421516300039> [Accessed 05 July 2016].
- Crosby, M., Nachi, N., Pattanayak, P., Verma, S. & Kalyanaraman, V. (2015). *BlockChain technology: beyond Bitcoin*. Berkley, California: Sutardja Center for Entrepreneurship & Technology. Available: <http://scet.berkeley.edu/wp-content/uploads/BlockchainPaper.pdf> [Accessed 04 July 2016].
- DECC. (2013). Fuel poverty report - updated August 2013. London: Department for Energy & Climate Change. Available: <https://www.gov.uk/government/statistics/fuel-poverty-report-updated-august-2013> [Accessed 10 February 2016].
- DECC. (2014). Smart meter roll-out for the domestic and small and medium non-domestic sectors (GB). London: Department of Energy & Climate Change. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/276656/smart_meter_roll_out_for_the_domestic_and_small_and_medium_and_non_domestic_sectors.pdf [Accessed 06 July 2016].
- DECC. (2016a). Fuel poverty statistics. London: Department of Energy & Climate Change. Available: <https://www.gov.uk/government/collections/fuel-poverty-statistics> [Accessed 06 July 2016].
- DECC. (2016b). Statistics at DECC. London: Department of Energy & Climate Change. Available: <https://www.gov.uk/government/organisations/department-of-energy-climate-change/about/statistics> [Accessed 06 July 2016].
- DECC. (2016c). Trends in fuel poverty England - 2003 to 2014. London: Department of Energy & Climate Change. Available: <https://www.gov.uk/government/collections/fuel-poverty-statistics> [Accessed 06 July 2016].
- Higgins, S. (2015). Insurance Giant Allianz France Exploring Blockchain Potential [Online]. n.d.: CoinDesk. Available: <http://www.coindesk.com/allianz-france-exploring-use-cases-with-blockchain-startup/> [Accessed 10 March 2016].
- Higgins, S. (2016). Airbnb Exec Hints at How Rental Giant Could Use Blockchain [Online]. Online: CoinDesk. Available: <http://www.coindesk.com/airbnb-exec-use-blockchain/> [Accessed 10 March 2016].
- IOPTIO. (2016). Evolving terminology PT. 2: topology vs. ownership [Online]. n.d.: MaidSafe Blog. Available: <https://blog.maidsafe.net/category/networks/> [Accessed 06 July 2016].
- Jennings, M. G. (2013). A smarter plan? A policy comparison between Great Britain and Ireland's deployment strategies for rolling out new metering technologies. *Energy Policy* [Online], 57, 462-468. Available: <http://www.sciencedirect.com/science/article/pii/S030142151300102X> [Accessed 05 July 2016].

- Lewis, A. (2016). A gentle introduction to blockchain technology: BraveNewCoin. Available: <http://bravenewcoin.com/industry-resources/reference-papers/series-1/> [Accessed 10 February 2016].
- Mougayar, W. (2016). The Business Blockchain : Promise, Practice, and Application of the Next Internet Technology (1st ed.). New Jersey, US: Wiley.
- Nakamoto, S. (2008). Bitcoin: a peer-to-peer electronic cash system [Online]. Cryptography Mailing List. Available: <https://bitcoin.org/bitcoin.pdf> [Accessed 04 July 2016].
- Too Poor to Stay Warm, 2016. Directed by Navanayagam, D. BBC One: Panorama.
- Ofgem E-Serve. (2010). Smart metering implementation programme: communications business model - Supporting Document. London: Ofgem E-Serve. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42724/226-smart-metering-imp-comm-business.pdf [Accessed 07 July 2016].
- Rizzo, P. (2016). Philips Healthcare Launches Blockchain Lab in R&D Push [Online]. Online: CoinDesk. Available: <http://www.coindesk.com/philips-health-care-launches-blockchain-lab/> [Accessed 05 March 2016].
- Smart Energy GB. (n.d.). About the rollout [Online]. London: Smart Energy GB. Available: <https://www.smartenergygb.org/en/the-bigger-picture/about-the-rollout> [Accessed 06 July 2016].
- Swan, M. (2015). Blockchain: blueprint for a new economy (1st ed.). California, US: O'Reilly.
- Swanson, T. (2015). Consensus-as-a-service: a brief report on the emergence of permissioned, distributed ledger systems. n.d.: R3 CEV, Singapore. Available: <https://www.scribd.com/doc/261055188/Consensus-as-a-service-a-brief-report-on-the-emergence-of-permissioned-distributed-ledger-systems> [Accessed 12 February 2016].
- Walport, M. (2016). Distributed Ledger Technology: beyond block chain. London: Government Office for Science. [Accessed
- Zhang, T., Siebers, P.-O. & Aickelin, U. (2016). Simulating user learning in authoritative technology adoption: An agent based model for council-led smart meter deployment planning in the UK. Technological Forecasting and Social Change [Online], 106, 74-84. Available: <http://www.sciencedirect.com/science/article/pii/S0040162516000512> [Accessed 05 July 2016].

Urban Energy Planning for Human Settlements: A taxonomy review

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Abstract

Urbanization is a global phenomenon resulting in an increasing proliferation of social, economic and environmental activities, transforming towns into cities and cities into mega-cities. Urban planning focuses on ensuring the orderly growth of human settlements and their interconnected support systems. The field provides a suitable fit for considerations of the integration of energy policies and programs, which are intricately interconnected. Urban energy planning has emerged as an urban development strategy to mitigate the problems generated by urban population growth, rapid urbanization. Yet little research has sparingly discussed the phenomenon in a holistic manner. Several previous studies purport that traditional planning processes, assessment and decision support tools used in the formation of the development plans of cities are dangerously myopic, are detached and revealed an energy blindness of current urban planning literature to energy issues. Several authors also have suggests that while there are national and regional efforts being made to plan for the long-term energy needs, progress at the urban level is beginning, yet slow. There is a need for improved understanding, processes, and data to support the involvement of decision-makers in energy for urban planning. To close the gap, this paper aims examine the concept of urban energy planning to develop insight into the complexity of the energy related activities in urban planning and urban development planning.

Key Words: urban energy planning, taxonomy, planning process, urban settlements

1. Introduction

Energy contributes to the satisfaction of human needs and aspirations, the major objective of development. Cities represent a rich ground for taking action to tackle energy challenges. It provides a variety of energy services to which access is fundamental to ensure human welfare. The liberalization of the energy market, coupled with the need for sustainable urban development driven by population growth, greenhouse gas (GHG) emissions (Hoorweg et al. 2012), energy consumption and economic diversification, has propelled the need for urban energy planning (UEP). Approximately two-thirds of the primary energy in the world is consumed in urban settlements (The World Bank, 2012). This energy consumption results in approximately 71% of all energy-related direct greenhouse gas (GHG) emissions (OECD/IEA2016). This recent publication "*towards sustainable urban energy system*", emphasize that the 2015 Paris Agreement is a historic milestone for the global energy sector, through its aims to peak global emissions and reach net-zero emissions.

1.1 Transitional Energy Paradigm

UEP is a transitional approach to the energy problem of 70's and 80's, where the International Energy Agency (IEA), along with several states, coined the concept of integrated energy planning (Neves et al. 2015). It aims at planning for an environment with relatively low intrinsic energy requirements and utilize renewable energy resources. The focus is on energy implications of urban form and different spatial structures.

The transition to a new energy paradigm has revealed an energy blindness of current urban planning literature, given that fossil fuels have had an overwhelming role in defining and determining virtually all aspects of contemporary reality (Droege 2011). However, authors such as (Vandevyvere & Stremke 2012; Leduc & Van Kann 2013) explain the synergy relationship between urban planning and energy as a contribution to a carbon society. Due to the fossil fuel dependency, (Droege 2008) refers to all contemporary urban constructs as fossil cities. In recent years, several soberer and specialized urban planning studies (Dhakal 2004; Tillie et al, 2009; European Union 2010) have broadly encompassed the themes of sustainability and climate change with energy consideration. More international studies (EEA 2005; International Standard Organization 2014), on sustainable development of communities only provides decurtate overviews or utilizes negligible indicators to represent energy planning.

1.2 The role of urban decision-makers

Local government occupies a pivotal position for the delivery of UEP, by creating the framework for action (Comodi et al. 2012). As efficacious engines for change, urban decision-makers can augment their capacity for energy for urban planning, to assure responsible resource management. By establishing a strategic agenda, the local authority can lead by example through establishing commitment to the city's energy goals, which can help them, deliver on their political "public good" objectives (Bale et al. 2012; Hannon & Bolton 2015). They can establish processes within which stakeholders can collaborate to integrate and optimize clean and efficient energy use in urban settlements (Dodd 2008; Deshmukh 2015). They can also develop strategies for UEP that clearly state what measures to be taken, where, in what domain and at what temporal scale. However, the urban energy system is an intricate system. It is a microcosm of the global system, consisting of a complex interaction between environmental, economic, social, governance and spatial factors. To cope with complexities, a holistic approach is needed to cultivate synergetic energy strategies. These strategies should also consider the cumulative impacts of each decision on the city.

1.3 Obstacles to energy in urban planning Integration

Urban planning is technical, participatory and political process (Cajot et al. 2015; Ouhajjou et al. 2015), and given all the competing demands, priorities, and informational gaps, getting local governments to agree on an energy policy is a major event. Local governments face formidable obstacles to greater participation in UEP (Lantsberg et al. 2005; Droege & Todec 2008; Dobriansky 2009;). These obstacles can be categorized as: technical, financial, awareness, regulatory and institutional, (Table 1). Collectively, these obstacles enhance each other, fostering a path dependence that creates an inhospitable environment for action. This undermines the capacity of local governments to participate in UEP efforts or adopt policies to improve energy efficiency, integrate renewable energy and deploy advanced energy technologies.

Barriers to UEP	Explanation	Sources
Knowledge and Awareness	Lack of technical awareness and expertise	Dobriansky, 2009
	Planners have not traditionally thought of themselves as having a role in the logistics of energy infrastructure.	Dobriansky, 2009; Todoc & Droege, 2012
	Planning curriculum sparsely incorporate “energy” as a singular issue within their curricula.	Lantsberg, 2005; Todoc & Droege, 2012
	There is limited to no information about the magnitude of energy usage and consumption trends in many cities.	Lantsberg, 2005; Todoc & Droege, 2012
	Planners and officials are not aware of the direct link between energy and urban development	Lantsberg 2005; Todoc & Droege, 2012
Financial	Competing priorities that draw scarce attention and financial resources	Dobriansky, 2009
	Little incentives to undertake energy-related activities	Dobriansky, 2009
Technical	Local planners do not have the tools to make UEP a regular part of their jobs.	Todoc & Droege, 2012
	Historical avoidance of energy issues within the urban planning process	Lantsberg, 2005; Todoc & Droege, 2012
	Environmental concerns are addressed separately by cities	Lantsberg, 2005; Todoc & Droege, 2012
Regulatory	Regulatory obstacles caused by the shifting policy terrain and fractured decision-making	Lantsberg, 2005; Todoc & Droege, 2012
Institutional	Energy suppliers control energy market in cities	Lantsberg, 2005; Todoc & Droege, 2012
	Institutional incongruities between overall system issues and the scope of local action.	Lantsberg, 2005

Table 1: Justification for not integrating energy into urban and development planning

Source: Compiled by author

This paper presents an ontology-based approach based on literature review (Hart, 1998; Ravitch et al, 2012; Shields et al, 2013) for UEP support. This paper firstly presents a definition of UEP, objectives, trends and components. Secondly, it presents a detailed review of the UEP process, in which the planning activities are divided into four main phases. This review will form the starting-point towards the development of an integrative framework that can be used to examine how decision-makers are envisioning UEP initiatives. The review identifies directions and agendas for urban energy research and outlines practical implications for urban planning professionals.

2.0 Urban Energy Planning Trends

The transition to a modern urban energy system holds its development trajectory to increasing historical complexity of the structural and technological processes in human settlement. The anecdote of how modern human settlements came to fossil cities (Droege, 2012) is edifying for assimilating future transitions. Contemporary cities dynamic interconnectivity and functions depends on the energy system to deliver a wide variety of services. To progress from the fossil fuel electric age, to defining the characteristics of future urban energy system (Rutter & Keirstead 2012), rationalize that, the focus should be “increasing efficiency under constraints”, Table 2. This can be accentuated by innovative strategies and integration of technology in the wider society to increase quality of life. (Singh et al 2015) suggests that the impetus for transformation and innovation depends on the level of research and development, and the policies to promote change. They outline that dominant trends between cities includes technological development and integration, carbon neutral strategies and reducing ecological footprint, shift from centralized energy system, mobility and the seamless assimilation of citizen’s participation in the energy planning process.

There has been a recent escalation of interest in urban energy issues and trends. This curiosity was propelled by three main reports. Firstly, the GEA’s “global energy assessment-towards a

sustainable future” sees energy has essential for human development and energy systems are crucial entry point for addressing the most pressing global and urban challenges of the 21st century (Johansson, et al 2012). Secondly, the United Nation’s 2015 world urbanization prospect shows that over 54% of the world population lives in urban areas, which is expected to increase to 66 per cent by 2050, a large number that is expected to continue rising especially in India, China and Nigeria (United Nations, 2015). Thirdly, the (OECD/IEA 2016), noted that the precipitous fall in oil prices, continued geopolitical instability and the Paris climate agreement are witness to the dynamic nature of energy markets. This uncertainty provides an opportunity for an understanding of the implications for shifting energy focus for sustainable development goals and for energy security.

On a global scale, these trends will be constraint and exasperated by existing system configuration and challenges, such as climate change, rising fuel prices, and supply constraints, which will affect urban environment and its citizens. Coupled with global drivers, at a local scale, spiraling urban demographic shift, environmental quality, quality of life, social equity and environmental justice, reliability for public health and safety and access to basic quintessential energy services will be the driving force for the next transition. These trends combined with the deployment of renewable energy technologies and policies, energy efficiency strategies, thrust to reduce CO₂ emissions in urban areas and the activities of international, regional, national, local organizations reflects a growing recognition that energy use in cities is a key impetuous in the battle against global climate change.

Key transition trends and features	Elaboration	Constraints
		Drivers
Fuel shift and Intensification of energy use	Increase per capita energy uses despite technological innovations.	Peak oil, aging infrastructures, climate change, rapid urbanization, barriers to adopting and use of proven technologies, institutional and market changes.
Complexity of urban energysystem structural and technological complexity	Initial energy system required small lines of supply, local area, and biomass. Transition to different approaches requires expansion to the surroundings. The need for modern electricitys supply & gas networks.	
Benefits from advance policies, strategy and long-term aims	Engagement of governments and privates sector. Mitigation of downsides in current systems.	Smart-grids, Smart metering, improved Energy efficiency, changes in cost structures, proliferation of ESCO, ICT, integrated mobility services, online consumer access, net-zero developments, real-time grid control, data security and control would be of increasing challenge, aging infrastructure, integration of renewables in urban systems, utility restructuring, distributed generation
Rapid transition to, modern grids and oil based economic development	Overall innovation needs to advance. Exhaustion of available resources and market vulnerability. High-energy consumption.	
Technological development continues at an astounding pace	Advancement in energy storage, smart energy systems and increasing levels of automation as well as controls with the use of state-of-the-art information and communications technologies.	
Planning emphasizes accuracy of modeling & the optimization of options.	Incorporating increasingly real-time monitoring on the existing distribution assets and loading them to higher levels.	
Greater public engagement and participation	Increasingly integration of stakeholders from the early stage of the UEP process results in greater public acceptance of the option chosen as well as the better overall design of urban projects.	Meaningful and socially inclusive
Eco-friendly designs and aiming for a net zero carbon footprint	Shift towards an optimized eco-friendly, resilient designs, and which has a net zero carbon footprint in residential and industrial designs.	Pollution density leading to development of carbon-neutral (low carbon) “city”

Table 2: Main constraints and drivers in energy transition trends

Source: Modified from Rutter and Keirstead (2012) and Singh et al, (2015)

3.0 Definition of Urban Energy Planning

Although what constitutes UEP is a subject undergoing intense debate, an international homogenous definition of the concept is yet to be formulated. Being a decisive instrument for sustainability, UEP is an approach to support the development of a city's energy strategy by means of coherent planning and holistic management principles. The concept has many different facets ranging from sustainable development components, low carbon and eco-city planning, smart energy planning, and integrated energy planning. This brings about a multitude of disparate interpretations and assumptions, which leads to variation in the contextualization of the essential nature of the concept. Defining and characterizing what constitutes UEP, helps create a common language that facilitates a clear and systematic dialogue among urban policy makers, researchers, and industries. It also provides the basis for a holistic, comprehensive picture of actions that can be taken in complex urban systems.

A taxonomy of the concept using keyword analysis was conducted based on the following words "definition", "define", "characterize" against "sustainable urban energy planning", "urban energy planning", "smart energy planning", "low carbon emission planning", "integrated energy planning", "community energy planning", "local energy planning". Ninety-three gray kinds of literature and academic publications were identified and reviewed.

Traditionally, the concept was promulgated with the purpose of influencing the urban energy system according to the specific goals of local energy policy. Within this context, (Walker et al. 2015), defined UEP as the sectors and processes needed to satisfy the energy service demands of an urban area. Currently, we are observing a shift to urban sustainability and a planned optimization of the energy system under liberalized market conditions. Consequently, many researcher (Table 3), (Mirakyan, et al. 2008; Mirakyan, et al. 2009; UN-Habitat 2009; Coelho et al. 2009; UN-Habitat 2012; Walker et al. 2015), elaborated the integration of sustainable development components (social equity, economic and quality of life, environment-particularly carbon mitigation, institutional capacity with an interplay of affordable, reliable and accessible energy). Integral to UEP is transparency and participatory planning (Mirakyan, et al 2008 & Mirakyan, et al 2009). (Dobriansky 2009) expounded that the concept seeks to strike a new balance by fusing energy and resource efficiency smart systems with smart systems and similar urban strategies within frameworks of community planning and design principles.

With this contextualization, UEP is an important function for both local government and local utilities. This process should also include a variety of different stakeholders, who should be involved in the decision-making processes. Therefore, UEP is a long-term iterative process, rather than a short-term planning task. However, only in recent years have features of a consistent methodology emerged in response to the requirements of such an integrated or holistic approach. Their research highlight that an essential prerequisite for achieving the goal of sustainability at the urban level is consistent system optimization. This allows for interaction between the different components of the local energy system. Comparatively, this new approach enables UEP to be different from the traditional approach. Furthermore, other differences have been observed pertaining to societal aspects, by including aspects of motivation and communication, group dynamics, as a means of developing consensual solutions.

Definitions	Characteristics	Source
IEP is an approach to find environmentally friendly, institutionally sound, socially acceptable and cost-effective solutions of the best mix of energy supply and demand options for a defined area to support long-term regional sustainable development.	Transparency, participation, transparent & structure process to support planning decisions.	Mirakyan, et al 2008 & Mirakyan, et al 2009
SUEP Integrates sustainable energy, clean energy technologies and responsible resources management strategies for the development of economically, socially and environmentally healthy communities.	Balance between energy and resource supply and demand: energy conservation, energy efficiency, renewable energy	Dobriansky, 2009
LEP is a process in which one often tries to overview and analyze a complex energy system in a municipality in several perspectives.	Energy conversion, energy efficiency measures & climate impacts	(Ottosen; et al. 2009)
UEP implies a broad perspective on energy policy by focusing on all forms of energy carriers and on energy consumption in all end-use sectors. UEP is characterized as the decision-making process of selecting the local energy infrastructures to invest in, the energy efficiency initiatives to promote, as well as all policies with impact on energy consumption patterns. It is a crucial task to contribute to sustainable development, enabling to match future energy supply with future energy demand.	Reducing energy consumption & create less carbon-intensive energy supply. Stakeholder-led process & values, energy demand focus, complex integrated process, sustainable development criteria	Coelho, 2010.
The aims of SEAP are optimal energy-efficiency, low- or no-carbon energy supply and accessible, equitable and good energy service provision to users. Planning is based on consideration of the broader concerns of the whole economy, environment (particularly carbon mitigation) and society, not just a 'least financial cost' focus.	Led by the demand for energy services; energy efficiency, accessibility, supply, equitability, energy service, sustainable development aspects	ICLEI, UN-HABITAT, 2009
IEP is a unique process that is mainly focused on issues relating to energy extraction, transportation, transmission, distribution, and use. The planning can be multifaceted, including economic, environmental, social or institutional aspects.	Balance demand and supply with sustainable development components.	UN-HABITAT, 2012
UEP are traditionally defined as the sectors and processes needed to satisfy the energy service demands of an urban area. SUES are those that not only meet service demand but also promote: economic and human development; healthy environment and people; and affordable, reliable and accessible energy.	Integration of energy service demands with sustainable development components and energy equity.	Walker, et al 2015

Table 3: Definitions of Urban Energy Planning. IEP-Integrated Energy Planning; SUEP-Sustainable Urban Energy Planning; LEP-Local Energy Planning; UEP-Urban Energy Planning; SEAP- Sustainable Energy Action Planning; SUES: Sustainable Urban Energy System

4.0 Aims and Characteristics of Urban Energy Planning

According to (Coelho et al. 2009), the aim of UEP is to improve the quality of life and health of residents, as well as, strengthen the local economy and in the meantime, help to mitigate and adapt to climate change. Moreover, (Dobriansky 2009) added that UEP aims to bring a paradigm shift to energy and resource use within all of the functions of a community, and to change infrastructure parameters and development patterns by affecting “how and where we build” and “how we generate, deliver and use energy. (UN-Habitat 2012) provides a detailed overview of the main characteristics of UEP and outlines that it aims at optimal energy-efficiency, low or no carbon energy supply and accessible, equitable and good energy service provision to users in the urban settlement. Additionally, (Chu & Majumdar 2012) states that in order to realize a sustainable urban future, the threefold concepts of energy conservation, energy efficiency, and renewable energy are to be integrated. However, (Sampaio et al. 2013) recommends that an optimization analysis

is conducted before both renewable and non-renewable energy sources must be considered in a long-term horizon.

5.0 Nexus of urban planning and energy

Urban planning is concerned with the planned growth of human settlements and the systems that support them. The field is applicable for the integration of energy policies and programs within municipal governance. Through its specializations like urban growth dynamics, land use and urban design, transportation and mobility, buildings, environmental and natural resource planning, economic development, social equity and quality of life, participation, institution and governance, and energy and ICT infrastructure. According to the (Peter Droege 2008; Ouhajjou et al. 2015) UEP energy, urban planning and urban development are intricately linked. However, cities are complex systems regarding the amount of components and interactions they comprise. Ouhajjou et al, 2015 highlights the components into the city covering physical, human and regulatory. All these components, as well as their interactions, are to be taken into consideration by the decision-makers in order to develop energy strategies. In the following sub-sections, we discuss each components involved along the related research works.

5.1 Urban Growth Dynamics

Urban growth dynamics has attracted increasing academic interest by researchers and international organizations over the last two decades (Campbell & Fainstein 1996; Mcgeough & Wrobel 2004; Han et al. 2009; Barles 2010; Leduc & Kann 2013; Kumar et al. 2013; Mikovits et al. 2014). Tsolaskis et al (2015), elaborates empirical evidence from the UK and Netherlands that significant relationships exist between energy use in the built environment, transportation and other land use activities, such as population size and density.

5.1.1 Demographic Characteristics

Nearly one-fifth of the world's population currently 7.2 billion live without access to electricity (Jones & Warner 2016). With 54% of the global population living in cities (United Nations, 2015), and expects to grow to two-thirds of global population, OECD/IEA (2016) suggests that the energy consumption and carbon footprint of urban areas will increase with urbanisation and the growing economic activity of urban citizens. Furthermore, (Grubler et al. 2012) estimates that between 60-80% of final energy use globally is urban, with central estimate of 75%. The study suggest that this growing trend will catapult urban energy challenges, such as energy access and housing for the urban poor, energy demand and air pollutions densities. However, it will also provide an opportunity to create an optimal sustainable energy system in urban settlements, through appropriate response and the formulation of informed institutional governance in order to improve quality of life people. Moreover, (Liu 2009; Liddle 2014) summarize evidence from empirical studies on the way demographic factors and processes—specifically, population, age structure, household size, urbanization, and population density—influence carbon emissions and energy consumption.

5.1.2 Density and compact city

Urban compactness paradigm is a modernist urban development concept that affect urban sustainability. (Chen et al. 2008) characterize compact cities as relatively high density, mixed land-use and pedestrian-oriented urban settlements. High urban density is commensurate with lower levels of energy consumption and emissions, as well as energy resource savings. Empirically studies such as, (Mitchell et al. 2011; OECD 2012) have analyze the effect of urban density on

energy intensity. According to the analysis, the efficiency of energy consumption is higher for densely populated cities. Under this context, (Breheny 2009), sought to challenge conventional wisdom relying on their experience in an empirical assessment in the UK and highlight that transport energy consumption and pollution, can substantially be reduced by promoting compact cities. Moreover, (Rérat 2012) motivated by the urban trends in Switzerland, assess the spatial dimension of human settlements and the influence of location and urban morphology on resource and energy consumption. Furthermore, (Yamagata & Seya 2013) presents an integrated model for designing a future smart city that copes with reduction of CO₂ to authenticate the importance of compact planning in energy consumption. In this model, they combine appropriate land use, transportation and smart grid systems. At a greater extent, (Dieleman & Wegener 2004; OECD 2012; OECD/IEA 2016) endorse the international initiatives towards compact city and supports the comprehensive application of the approach to integrate land use, transport planning and energy consumption.

5.1.4 Land use and urban design

Urban forms have substantial influence on the balance of energy use (Weng & Yang 2006; Jabareen 2006). Urban form, defined as the spatial configuration of urban land use within an urban area, has profound influences on energy consumption of a city (Chen et al. 2011) and greatly affects the potential of using renewable energy sources for electricity production and climitization of buildings. (Chen et al. 2011) in an empirical study of five mega-cities on the Pearl River Delta in south China estimates that, urban size positively correlates with energy consumption and irregularity of urban land use patterns, positively correlates with energy consumption. Moreover, (Ewing & Rong 2008) went further and present a conceptual framework linking urban form to residential energy use via three causal pathways: electric transmission and distribution losses, energy requirements of different housing stocks, and space heating and cooling requirements associated with urban heat islands. In addition, the value of mixed land use and development is in the reduction of energy consumption and reducing greenhouse gas emissions (Hachem 2015; Hachem-Vermette et al. 2015). On the other hand, (Dale et al. 2011) examine the relationship between energy production and the use of fossil energy is one of the key driver as behind land use changes. They establish that energy production, including alternative-energy options, can have a wide range of effects on land productivity, surface cover, albedo, and other factors that affect carbon, water, and energy fluxes and, in turn, climate.

5.2 *Urban Transportation and Mobility*

Urbanisation, population growth and rising incomes are increasing the demand for urban mobility (OECD/IEA, 2016). Urban transport accounts for an estimated 40% of transport energy use, while the sector is responsible for approximately 28% of the total final energy demand and 60% of world oil consumption (OECD/IEA, 2012). Energy use in transport is a function of mode used, distance travelled, and frequency of trip (Hickman & Banister 2007; Zain 2011). Urban transportation is a major indirect cause of greenhouse gas concentration (Ross et al. 2010; Harvey 2013), and as far as 1970's, (Gilbert & Dajani 1974) examine strategies for reducing travel demands by altering the patterns of land uses in cities. Moreover, a reduction in the use of private vehicles (Choguill 2008) and the development of demand reduction strategies such as the promotion of green trips/modes is a pivotal urban planning component for designing urban settlements. In China, (Yan & Crookes 2010), presents status and mitigation measures, as growing energy demand and emissions from road transportation vehicles in the last two decades due to concerns over oil security, urban air pollution and global warming. To that end, (Poudenx 2008) investigates twelve major cities in Europe and Singapore, assessing various policies to curb private vehicle use. The

research purports that policies for reducing the use of private vehicles are ineffective as they do not incorporate the reality of human tendencies for accessibility and comfort. The study proposes raising the competitiveness of alternate modes through investments in a conducive design for non-motorized modes and designing competitive mass transit system.

5.3 *Buildings*

The global contribution from buildings towards energy consumption, both residential and commercial, has steadily increase reaching 40%, (Grubler et al. 2012). This energy used in lighting heating, cooling, and artificial ventilation systems (Pacheco et al. 2012) accounts for one-third of energy-related CO₂ emissions (Costa et al. 2013). (Fumo 2014) highlights the importance of building energy consumption strategies in achieving the goals of energy consumption and emissions reduction standards set by the European Commission through the Europe 2020 strategy (European Commission 2010; Landis et al. 2013). Urban areas offer an important opportunity to improve building energy efficiency and realise low-carbon, integrated energy communities (Pérez-Lombard et al. 2008). In new buildings and retrofitted, even existing energy efficiency technologies, can save up to 40 percent of energy use cost-effectively (OECD/IEA 2016). Integrated zero-emission building designs combine energy-efficiency measures with on-site power and heat generation from solar and biomass (Wang et al. 2010). They are technically and economically feasible—and their costs are falling (Marszal et al. 2011). Furthermore, (Iwaro & Mwashia 2010) suggests that most of the developed countries are implementing building energy regulations such as energy standards, codes and certification programmes, to reduce building energy consumption.

5.4 *Environment*

There exist an intimate relationship between energy, the environment and sustainable urban development (OECD/IEA 2016). All energy production and consumption resources have environmental impacts on climate, air, land, biodiversity, waste and water (Lund 2007; Peidong et al. 2009; Akella et al. 2009; Panwar et al. 2011; Edenhofer et al. 2012; Walker et al. 2015). However, to protect the natural environment equally represents an opportunity to pursue sustainable economic growth with the requisite ecological safeguards. In a technical report, (EEA 2008) assesses the key drivers, environmental pressures and impacts from the production and consumption of energy. The report took into account the main objectives of the European policy on energy and environment and in this regard, identified key objectives.

On a global scale, the adaptation of international agreements such as the Agenda 21 (Doyle 1998; Falkner 2014), the Kyoto Protocol (UNFCCC 2014) and the Paris landmark climate change agreement (United Nations 2015; Savaresi 2016), demonstrates that energy and environment cannot be divorced from each other. These agreements call for new policies and programmes to increase the contribution of environmentally safe and sound, cost-effective energy system, particularly new and renewable ones, less polluting and more efficient energy production, transmission, distribution and use (Curry 2015). However, (United Nations, 2015) has identified that since the increasing concentration of greenhouse gases in the atmosphere has its roots in local activities, cities -the major energy consumers have become focal points in order to take action towards establishing sustainable energy systems and cultures.

5.5 *Economic*

Cities concentrate disproportional parts of the economic power in most countries (Madlener & Sunak 2011). (Dobbs et al. 2011) estimates that about 80% of the global gross domestic product (GDP) in 2007 was produced in cities. (Tillie et al. 2009) allude that the biggest social problem is the depletion of energy reserves, which is a socio-economic problem rather than a technical one. This is justified given that energy is an input to nearly every good and service in the economy.

Millions of urban residents in low- and middle-income nations lack access to electricity and are cannot afford fuels, which affects health and urban air quality (Johansson, et al. 2012). Most are in low-income nations in Southeast Asia and sub-Saharan Africa (UN-Habitat 2012). Fuel poverty is usually recognized in households spending more than 10% of their income in homes heating to ensure indoor thermal comfort (Howden-Chapman 2006; Marmot et al. 2011; Moore 2012). Innovations have reduced access costs, but urban energy access also faces political and institutional obstacles (UN HABITAT, 2012). Moreover, technological advances in the urban energy sector have led to remarkable increases in employment through the provision of green jobs (Lesser 2010; Wei et al. 2010; Yi 2013).

5.6 *Social Equity and Quality of Life*

There are several social issues that affect and are affected by the way energy is produced and used, including poverty, urbanization and population (Roberts 2008; Grimsby 2011). According to (Ekanayake et al. 2015), 30% or 700 million people in low and middle-income urban population afford clean fuel and electricity. However, according to (Heindl & Schuessler 2015), in many middle-income and all high-income nations, nearly all low-income urban dwellers have legal electricity connections and access to clean fuels. The shift to clean fuels and the availability of a reliable electricity supply bring many advantages in terms of health, convenience, and time saved in accessing and using energy (Sovacool 2015). The costs of connection to an electricity grid and the use of electricity can be beyond the reach of low-income groups (Winkler et al. 2011; Tseng et al. 2013). Additionally, (Mazur 2011; Pasten & Santamarina 2012; Lambert et al. 2014), assess the complimentary relationship between energy consumption and per capita energy on the quality of life.

5.7 *Participation*

To safeguard political acceptance, public participation further legitimacy and rationality towards collective decision-making by involving citizens and facilitating exchange of information and arguments (Innes & Booher 2004; Gutmann & Thompson 2000; Bryson et al. 2013). To overcome barriers, address concerns of local residents, and ease conflicts, (McLaren Loring 2007), explore the dynamics of the planning process for wind energy in England, Wales and Denmark in order to better understand the factors influencing project success. However, improve stakeholder participation, there is increasing focus on alternative methodologies (Hanzl 2007). (Higgs et al. 2008; Simão et al. 2009) in their study explores the possibility of using an integrated information technology approaches-Geographical Information Systems (GIS) and Multi-Criteria Decision Analysis (MCDA) techniques, to promote public participation in renewable energy planning. Moreover, (Brabham 2009) argues for a crowdsourcing model, a successful, web-based, distributed problem solving and production model for enabling the citizen participation process in public planning projects.

5.8 *Institutional and Governance*

The transformation of the urban energy system will have profound implications for urban governance and institutional capacity (Monstadt 2007; Hawkey et al. 2013; Jaglin 2013; Goldthau 2014). This new pattern of urban governance will dramatically be reconfigured given the adaptation of new technologies, regulatory framework, management approach, marketing strategies and environmental focus (Bernauer & Schaffer 2012; Khan 2013). (Morlet & Keirstead 2013) develop an innovative framework for quantifying the combined governance of cities and energy systems. Meanwhile, (Mosannenzadeh et al. 2016- under review), identify and classify governance of smart energy cities towards in transitional energy management. Moreover, (Jasbi 2012) identifies several authors who developed crucial factors that shape local capacity to address climate change consideration and energy efficiency. An international comparative study conducted by (Sovacool 2011), found that using a polycentric urban governance approaches fosters holistic capacity that result in the resolution of climate and energy related problems.

5.9 *Energy and ICT Infrastructure*

The peak oil concept has necessitated the need to actualize the implementation and scale-up of a modern sustainable energy infrastructure. Achieving sustainable energy development in urban settlement requires rational use of energy resources, ICT technologies and the implementation of appropriate policies. A growing body of research have examined the role urban-scale renewable energy, energy efficiency and ICT-based infrastructures plays in addressing climate change, energy security and challenges they encounter (Riaz et al. 2009; Jacobson & Delucchi 2011; Kramers et al. 2014; Bulkeley et al. 2014; Bolton & Foxon 2015). Smart energy systems (Mosannenzadeh et al. 2016) are the enablers of future energy systems. Innovative energy system infrastructure plays a critical part in the growth of renewable energy technology. It includes, smart charging solutions, demand side management, energy storage, distributed energy production and microgrids.

6.0 Urban Energy Planning Process

Although local authorities in some developed countries have taken on energy-related activities as part of their energy in urban planning and sustainable development strategies (Alex Lantsberg 2005) there is no international consensus on UEP process. The development of effective energy for urban planning process will support urban decision-makers and target groups make a decision towards smarter energy use in the built environment.

The formulation of an urban energy plan is only one of several processes that are necessary for local government to achieve its target for reduction of greenhouse gas emissions, and increase utilization of renewable energy and energy efficiency optimization. To cope with the complexity of cities, adequate planning support systems is required to formalize this complexity and systematise the interactions that cannot be handled manually, by urban energy planners (Ouhajjou et al. 2015). A large variety of UEP processes exists already and they address different aspects of planning with a variance of scopes and fields of interest. These range from sustainability, climate change, energy planning, low carbon (GHG) emission, local energy planning and community energy planning. A more comprehensive list is provided in Table 4. The various reviewed processes were categorized into four generic urban planning process, preparation and conceptualization, detailed analysis and design, planning optimization and decision, and action formulation, implementation and monitoring. The various processes were categorized and integrated into this standard

planning process. The steps within each stage, and the stages themselves, overlap on occasion, as planning, is not a neatly linear process.

6.1 Participatory Process

The process requires that the main stakeholders participate in each of the four stages. The fundamental objective is to ascertain a multi-disciplinary vision, with the involvement of all categories of local stakeholders (Cardinaletti 2015). Political involvement and building support from stakeholders should be seen as a continuous process.

Source	Preparation and Conceptualization	Detailed analysis and Design	Planning Optimization and Decision	Action formulation, Implementation, and Monitoring
Todo L. Jessie (2009)	Socio-economic analysis	Energy-environmental, stakeholder & problem analysis.	Options finding	Strategies and action plan definition
ICLEI, UN-HABITAT (2009).	Designation; partnerships; Vision, goals, and policies of	Energy & GHG audit; Analyse information and develop a draft plan;	Build public and internal support; Finalize the plan	Implement and finance; monitor and; Publicize the benefits
Ivner, Jenny, et al., (2010)	Form working group & seek commitment; collect of background information	A collection of background information; appointment of citizens' panel. Environmental assessment	Develop vision; external scenarios; Select of action; valuation and choice of robust strategies; feedback	Development of implementation part in energy plan
European Commission; Covenant of Mayors., (2012)	Initiation Secure commitment and signing of the covenant; adapt city administrative structure; build stakeholders & citizens support.	Compilation of baseline emissions inventory (assessment of the current framework: where are we?)	Planning Establish long-term vision & clear; elaboration of there; development and approval of the action plan with stakeholders.	Implementation, Monitoring, and Evaluation Implementation of concrete CO2 reduction policies and measures; monitoring and report progress; review.
IBRD and The World Bank (2012); Ostojic, D.R, et al (2013)	Commitment: Create a vision statement; Establish governance structure; Identify stakeholders and links	Urban energy and GHG emissions diagnostics: Inventory energy and emissions; Catalog existing projects and initiatives; Assess potential energy and emissions projects	Goal setting: Make the case for SUEEP; Establish goals; Prioritize and select projects Planning: Draft the plan; Finalize and distribute the plan	Implementation Develop high-priority projects; Improve policy environment; ID financing mechanisms; Monitoring and reporting:
Mirakyan A, and Guio De R., (2013)	Organize Workshop, define goals, structuring problems	Compile database, specific scenario, and strategies, sensitivity analysis, evaluate the impact. Modelling	Organize workshop, compare options, select strategies,	Implementation, monitoring
Neves, R. A, et al, (2015),	Energy Modeling: Modeling the local energy system,	Problem Structuring and Model Building: Identifying the local actors; identify and structure the objectives; select the attributes; generate alternatives	Energy Modeling: Assess the impact of alternatives in each objective	Multi-criteria Evaluation Determine overall benefit value score; perform a robustness analysis and; analyze benefits vs. investment.

Table 4: Taxonomy review of urban energy planning process

Source: Compiled by Author.

7.0 Discussion and Conclusion

The response of planning system to urban transformational trends and the contribution of planning practice to towards sustainable urban development, through the promotion of widespread use of appropriate energy interventions, will drive future urban settlements. There is no doubt that the utilization of energy resources—will influence the pattern of growth and land uses. Energy technologies will shape the spatial structure, the landscapes and cityscapes of tomorrows urban environments. Theoretically, it has been noted that energy offers a good “entry-point” to a variety of urban sustainability issues. In the planning process, energy imperatives should begin at the start of the urban planning and urban development processes. To realize real change energy for urban planning needs to be holistic, rather than piecemeal, integrating all nexus components. To avoid poor representation of energy issues in traditional sustainability assessment, it would be critical to include energy as a sub-sector of planning, along with issues such as housing, transportation and land use.

Systematic and strategic development of the urban energy system will require multi-stakeholders since human activities are intricately linked to energy use. The urban decision-makers will require augmenting and developing innovative urban planning approaches to encourage participation from target groups. The introduction of sustainable energy technologies can be a particularly contentious issue, therefore, the combined use of soft and hard tools helps to improve the decision support system framework.

Taking action in cities has also been the tenet of Agenda 21, in terms of improving quality of life to achieve urban sustainability —sustainable cities. It can be said that the importance of cities, in energy and environmental context, have well coincided with worldwide social and economic changes. More competitive nature of new world economy, information industry and the associated network society not only necessitate changes in energy market and energy systems, but also shape new style of future energy demand. UEP requires the maximum production of energy from the local sources, and the optimization of service delivery to users. This will optimize equity in distribution among all citizens (irrespective of income).

Smart urban planning which, have higher density, spatially compact, and mixed-use urban design that permits growth abutting city centers and transit corridors—can substantially reduce energy demand and CO₂ emissions. This translates to the creation and maintenance of livable and sustainable environments. Fundamental to driving the future of the urban energy system is the amplification of smart energy cities component, using information and communication technologies.

The UEP process should be develop to provide cities with a holistic framework for their energy for urban planning activities, and should not be excessively inflexible or conventional. Every city will be required to work through the process that suits its distinctive conditions. The process should begin with commitment, the first stage in securing political and stakeholder support for the energy planning activities. A strong commitment from local leaders is essential to the plan’s long-term success and lays the groundwork for future action.

Future research will seek to compile and analyse a list of appropriate tools, to complement the optimization and simulation tools that currently exists. These tools should then be integrated into a new UEP process, which will be used as a decision support tool for urban local bodies.

References

- Akella, A.K., Saini, R.P. & Sharma, M.P., 2009. Social, economical and environmental impacts of renewable energy systems. *Renewable Energy*, 34(2), pp.390–396.
- Alex Lantsberg, 2005. *SUSTAINABLE URBAN ENERGY PLANNING A ROADMAP FOR RESEARCH AND FUNDING*, California.
- Bale, C.S.E. et al., 2012. Strategic energy planning within local authorities in the UK: A study of the city of Leeds. *Energy Policy*, 48, pp.242–251.
- Barles, S., 2010. Society, energy and materials: the contribution of urban metabolism studies to sustainable urban development issues. *Journal of Environmental Planning and Management*, 53(4), pp.439–455.
- Batty, M., Xie, Y. & Sun, Z., 1999. Modeling urban dynamics through GIS-based cellular automata. *Computers, Environment and Urban Systems*, 23(3), pp.205–233.
- Benhabib, S., 1994. Deliberative Rationality and Models of Democratic Legitimacy. *Constellations*, 1(1), pp.26–52.
- Bernauer, T. & Schaffer, L.M., 2012. Climate Change Governance. In *The Oxford Handbook of Governance*.
- Bolton, R. & Foxon, T.J., 2015. Infrastructure transformation as a socio-technical process - Implications for the governance of energy distribution networks in the UK. *Technological Forecasting and Social Change*,
- Brabham, D.C., 2009. Crowdsourcing the Public Participation Process for Planning Projects. *Planning Theory*.
- Breheny, M., 2009. The compact city and transport energy consumption. *Transactions of the Institute of British Geographers*, 20(1), pp.81–101.
- Bryson, J.M. et al., 2013. Designing Public Participation Processes. *Public Administration Review*, 73(1), pp.23–34.
- Bulkeley, H., Castán Broto, V. & Maassen, A., 2014. Low-carbon Transitions and the Reconfiguration of Urban Infrastructure. *Urban Studies*, 51(7), pp.1471–1486.
- Cajot, S. et al., 2015. Energy Planning in the Urban Context: Challenges and Perspectives. *Energy Procedia*,
- Campbell, S. & Fainstein, S.S., 1996. *Readings in Planning Theory*,
- Cardinaletti, M., 2015. *EASY Plan - Tools and Concepts for the Local Energy Planning: Methodological guidelines for the development of Sustainable Energy Communities and Systems in urban decentralized areas of the Mediterranean Region*, Italy.
- Chen, H., Jia, B. & Lau, S.S.Y., 2008. Sustainable urban form for Chinese compact cities: Challenges of a rapid urbanized economy. *Habitat International*, 32(1), pp.28–40.
- Chen, Y. et al., 2011. Estimating the relationship between urban forms and energy consumption: A case study in the Pearl River Delta, 2005-2008. *Landscape and Urban Planning*, 102(1), pp.33–42.
- Choguill, C.L., 2008. Developing sustainable neighbourhoods. *Habitat International*, 32(1), pp.41–48.
- Chu, S. & Majumdar, A., 2012. Opportunities and challenges for a sustainable energy future. *Nature*, pp.294–303.
- Coelho, D., Antunes, C.H. & Martins, A.G., 2009. Using SSM for Structuring an MCDA Model for Sustainable Urban Energy Planning. *Knowledge-Based Technologies (KORS-2009)*, pp.102–107.
- Comodi, G. et al., 2012. Local authorities in the context of energy and climate policy. *Energy Policy*, 51, pp.737–748.
- Costa, A. et al., 2013. Building operation and energy performance: Monitoring, analysis and optimisation toolkit. *Applied Energy*, 101, pp.310–316.
- Curry, J., 2015. Global climate agreements could be counterproductive. *Judith Curry*.
- Dale, V.H., Efromson, R.A. & Kline, K.L., 2011. The land use-climate change-energy nexus. *Landscape Ecology*.
- Dempsey, N., 2010. Revisiting the compact city? *Built Environment*, 36(1), pp.5–8.
- DESHMUKH, S., 2015. Role of Energy in Sustainable Urban Development Planning. *Advances in Environmental and Agricultural Science*, 978-1-6180.

- Hunter G, Guanzeng Z, Vettorato D., Urban Energy Planning of Human Settlements, 52nd ISOCARP Congress 2016
- Dhakal, S., 2004. Urban Energy Use and Greenhouse Gas Emissions from Asian Mega-Cities: Policies for a Sustainable Future. *IGES EnviroScope*.
- Dieleman, F. & Wegener, M., 2004. Compact city and urban sprawl. *Built Environment*, 30(4), pp.308–323.
- Dobbs, R. et al., 2011. Urban world : Mapping the economic power of cities. *Journal of Monetary Economics*.
- Dobriansky, L., 2009. Sustainable Urban Energy Planning: a Strategic Approach To Meeting Climate and Energy Goals.
- Dodd, N., 2008. *Community Energy: Urban planning for a low carbon future*, UK.
- Doyle, T., 1998. Sustainable development and Agenda 21 : The secular bible of global free markets and pluralist democracy. *Third World Quarterly*, 19(4), pp.771–786.
- Droege, P., 2007. *The renewable city: a comprehensive guide to an urban revolution*, UK: John Wiley & Sons.
- Edenhofer, O., Pichs Madruga, R. & Sokona, Y., 2012. *Renewable Energy Sources and Climate Change Mitigation (Special Report of the Intergovernmental Panel on Climate Change)*,
- EEA, 2005. *EEA core set of indicators*,
- EEA, 2008. *Energy and environment report 2008*, Available at: www.europa.eu.
- Ekanayake, P., Moriarty, P. & Honnery, D., 2015. Equity and energy in global solutions to climate change. *Energy for Sustainable Development*, 26, pp.72–78.
- Endre, Ottosen; Johnsson, John; Jonas, L., 2009. Modelling of cost effective energy systems—a regional approach to sustainable energy planning.
- European Commission, 2010. Communication from the Commission EUROPE 2020 A strategy for smart, sustainable and inclusive growth. *Com(2010)2020*, Brussels(3 March), p.Commission of the European Communities.
- Ewing, R. & Rong, F., 2008. The impact of urban form on US residential energy use. *Housing Policy Debate*.
- Falkner, R., 2014. Global environmental politics and energy: Mapping the research agenda. *Energy Research and Social Science*, 1, pp.188–197.
- Farnaz Mosannenzadeh; Adriano Bisello; Roberto Vaccaro; Valentina D'Alonzo; Garfield Wayne Hunter; Daniele, V., 2016. Smart Energy City Development: a Story Told by Urban Planners. *Cities*.
- Foley, J. a et al., 2005. Global consequences of land use. *Science (New York, N.Y.)*, 309(5734), pp.570–4.
- Fumo, N., 2014. A review on the basics of building energy estimation. *Renewable and Sustainable Energy Reviews*.
- Gilbert, G. & Dajani, J.S., 1974. Energy, urban form and transportation policy. *Transportation Research*, pp.267–276.
- Goldthau, A., 2014. Rethinking the governance of energy infrastructure: Scale, decentralization and polycentrism. *Energy Research and Social Science*, 1, pp.134–140.
- Grimsby, L.K., 2011. Securing energy equity. *Energy Policy*, 39(11), pp.6912–6913.
- Grosso, M., 1998. Urban form and renewable energy potential. *Renewable energy*, 15(1 -4 pt 1), pp.331–336.
- Grubler, A. et al., 2012. Urban Energy Systems. In *Global energy assessment: Toward a sustainable future*.
- Gutmann, A. & Thompson, D., 2000. Why Deliberative Democracy Is Different. *Social Philosophy and Policy*.
- Hachem, C., 2015. Design of a base Case Mixed-use Community and its Energy Performance. *Energy Procedia*.
- Hachem-Vermette, C., Cubi, E. & Bergerson, J., 2015. Energy performance of a solar mixed-use community. *Sustainable Cities and Society*.
- Han, J. et al., 2009. Application of an integrated system dynamics and cellular automata model for urban growth assessment: A case study of Shanghai, China. *Landscape and Urban Planning*, 91(3), pp.133–141.
- Hannon, M.J. & Bolton, R., 2015. UK Local Authority engagement with the Energy Service Company (ESCo) model: Key characteristics, benefits, limitations and considerations. *Energy Policy*, 78, pp.198–212.

- Hunter G, Guanzeng Z, Vettorato D., Urban Energy Planning of Human Settlements, 52nd ISOCARP Congress 2016
- Hanzl, M., 2007. Information technology as a tool for public participation in urban planning: a review of experiments and potentials. *Design Studies*, 28(3), pp.289–307.
- Harvey, L.D.D., 2013. Global climate-oriented transportation scenarios. *Energy Policy*, 54, pp.87–103.
- Hawkey, D., Webb, J. & Winskel, M., 2013. Organisation and governance of urban energy systems: District heating and cooling in the UK. *Journal of Cleaner Production*, 50, pp.22–31.
- Heindl, P. & Schuessler, R., 2015. Dynamic properties of energy affordability measures. *Energy Policy*, pp.123–132.
- Hickman, R. & Banister, D., 2007. Transport and Reduced Energy Consumption: What Role Can Urban Planning Play? *Environment*, (September). Available at: <http://www.tsu.ox.ac.uk/>.
- Higgs, G. et al., 2008. Using IT approaches to promote public participation in renewable energy planning: Prospects and challenges. *Land Use Policy*, 25(4), pp.596–607.
- Holden, E. & Norland, I., 2005. Three challenges for the compact city as a sustainable urban form: Household consumption of energy and transport in eight residential areas in the greater Oslo Region. *Urban Studies*, 42(12), pp.2145–2166.
- Hoorweg, D. a, Campillo, G. & Linders, D., 2012. Mainstreaming Urban Metabolism: Advances and Challenges in City Participation. *Sixth Urban Research and Knowledge Symposium 2012 MAINSTREAMING*.
- Howden-Chapman, P., 2006. Housing, fuel poverty and health: A pan-European analysis. *Australian and New Zealand Journal of Public Health*, 30, pp.194–195.
- Innes, J.E., 1998. Information in communicative planning. *Journal of the American Planning Association*, 64(1), p.52.
- Innes, J.E. & Booher, D.E., 2004. Reframing public participation: strategies for the 21st century. *Planning Theory & Practice*, 5(4), pp.419–436.
- International Standard Organization, 2014. ISO 37120 Sustainable development of communities — Indicators for city services and quality of life. , 37120, p.14.
- Iwano, J. & Mwashia, A., 2010. A review of building energy regulation and policy for energy conservation in developing countries. *Energy Policy*, 38(12), pp.7744–7755.
- Jabareen, Y.R., 2006. Sustainable Urban Forms: Their Typologies, Models, and Concepts. *Journal of Planning Education and Research*, 26(1), pp.38–52.
- Jacobson, M.Z. & Delucchi, M.A., 2011. Providing all global energy with wind, water, and solar power, Part I: Technologies, energy resources, quantities and areas of infrastructure, and materials. *Energy Policy*, 39(3), pp.1154–1169.
- Jaglin, S., 2013. Urban Energy Policies and the Governance of Multilevel Issues in Cape Town. *Urban Studies*.
- Jasbi, G., 2012. Urban Governance and Contribution of Climate Change Consideration and Energy Efficiency: Case Study of Hashtgerd New Town, Iran. In *Proceedings REAL CORP 2012*. Tagungsband.
- Johansson, T.B., Patwardhan, A., Nakicenovic, A., & Luis, G.E., 2012. Global Energy Assessment. *Laxenburg: IIASA: Cambridge University Press*, ISBN 9781.
- Jones, G.A. & Warner, K.J., 2016. The 21st century population-energy-climate nexus. *Energy Policy*, 93, pp.206–212.
- Kankal, M. et al., 2011. Modeling and forecasting of Turkey's energy consumption using socio-economic and demographic variables. *Applied Energy*, 88(5), pp.1927–1939.
- Khan, J., 2013. What role for network governance in urban low carbon transitions? *Journal of Cleaner Production*.
- Kramers, A. et al., 2014. Smart sustainable cities - Exploring ICT solutions for reduced energy use in cities. *Environmental Modelling and Software*, 56, pp.52–62.
- Lambert, J.G. et al., 2014. Energy, EROI and quality of life. *Energy Policy*, 64, pp.153–167.
- Landis, F., Schenker, O., Tovar Reaños, M., Vonnahme, C. and Zitzelsberger, S., 2013. *An Overview on Current Climate Policies in the European Union and its Member States. ENTRACTE Project Report n.1, A*
- Lantsberg, A. et al., 2005. SUSTAINABLE URBAN ENERGY PLANNING. A roadmap for research and funding.

Hunter G, Guanzeng Z, Vettorato D., Urban Energy Planning of Human Settlements, 52nd ISOCARP Congress 2016

Leduc, W.R.W.A. & Van Kann, F.M.G., 2013. Spatial planning based on urban energy harvesting toward productive urban regions. *Journal of Cleaner Production*, 39, pp.180–190.

Leduc, W.R.W.A. & Van Kann, F.M.G., 2013. Spatial planning based on urban energy harvesting toward productive urban regions. *Journal of Cleaner Production*, 39, pp.180–190.

Lesser, J.A., 2010. Renewable Energy and the Fallacy of “Green” Jobs. *Electricity Journal*, 23(7), pp.45–53.

Liddle, B., 2014. Impact of population, age structure, and urbanization on carbon emissions/energy consumption: Evidence from macro-level, cross-country analyses. *Population and Environment*, 35(3), pp.286–304.

Liu, Y., 2009. Exploring the relationship between urbanization and energy consumption in China using ARDL (autoregressive distributed lag) and FDM (factor decomposition model). *Energy*, 34(11), pp.1846–1854.

Lund, H., 2007. Renewable energy strategies for sustainable development. *Energy*, 32(6), pp.912–919.

Madlener, R. & Sunak, Y., 2011. Impacts of urbanization on urban structures and energy demand: What can we learn for urban energy planning and urbanization management? *Sustainable Cities and Society*, 1(1), pp.45–53.

Marmot M, Geddes I, Bloomer E, Allen J, G.P., 2011. *The health impacts of cold homes and fuel poverty*.

Marszal, A.J. et al., 2011. Zero Energy Building - A review of definitions and calculation methodologies. *Energy and Buildings*, 43(4), pp.971–979.

Mathiesen, B. V., Lund, H. & Nørgaard, P., 2008. Integrated transport and renewable energy systems. *Utilities Policy*, 16(2), pp.107–116.

Mazur, A., 2011. Does increasing energy or electricity consumption improve quality of life in industrial nations? *Energy Policy*, 39(5), pp.2568–2572.

McCormick, K. et al., 2013. Advancing sustainable urban transformation. *Journal of Cleaner Production*, 50, pp.1–11.

McGeough, U. & Wrobel, J., 2004. Model for Sustainable Urban Design. *Water*, p.83.

McGranahan, G. et al., 2005. Urban Systems. *Millennium Ecosystems Assessment: Ecosystems and Human Well-being: Current State and Trends*, pp.795–825.

McLaren Loring, J., 2007. Wind energy planning in England, Wales and Denmark: Factors influencing project success. *Energy Policy*, 35(4), pp.2648–2660.

Mikovits, C., Rauch, W. & Kleidorfer, M., 2014. Dynamics in urban development, population growth and their influences on urban water infrastructure. In *Procedia Engineering*. pp. 1147–1156.

Mirakyan, A., Lewald, N., and I.P., 2008. *The Dynamics of Regional (Sub-national) Integrated Energy Planning and Requirements for Methods and Models*.

Mirakyan, Atom; LELAIT, Laurent; Khomenko, Nikolai; Kaikov, I., 2009. Methodological Framework for the analysis and development of a sustainable, integrated, regional energy plan – A French region case study. In Karlsruhe, Germany: European Institute for Energy Research.

Mitchell, G. et al., 2011. Land use, transport, and carbon futures: The impact of spatial form strategies in three UK urban regions. *Environment and Planning A*, 43(9), pp.2143–2163.

Monstadt, J., 2007. Urban governance and the transition of energy systems: Institutional change and shifting energy and climate policies in Berlin. *International Journal of Urban and Regional Research*, 31(2), pp.326–343.

Moore, R., 2012. Definitions of fuel poverty: Implications for policy. *Energy Policy*, 49, pp.19–26.

Morlet, C. & Keirstead, J., 2013. A comparative analysis of urban energy governance in four European cities. *Energy Policy*, 61, pp.852–863.

Neves, A.R., Leal, V. & Lourenço, J.C., 2015. A methodology for sustainable and inclusive local energy planning. *Sustainable Cities and Society*, 17, pp.110–121.

Nico Tillie, Andy Van Den Dobbelsteen, Duzan Doepel, Marc Joubert, Wim De Jager, Dave Mayenburg (2009), 2009. Towards CO2 Neutral Urban Planning: Presenting the Rotterdam Energy Approach and Planning (RE AP).

OECD, 2012. *Compact City Policies: A Comparative Assessment*, oecd,

Hunter G, Guanzeng Z, Vettorato D., Urban Energy Planning of Human Settlements, 52nd ISOCARP Congress 2016

OECD/IEA, 2016. *Energy Technology Perspectives 2016: Towards Sustainable Urban Energy Systems*, Paris.

Ouhajjou, N. et al., 2015. Stakeholder-oriented Energy Planning Support in Cities. *Energy Procedia*, pp.1841–1846.

Pacheco, R., Ordóñez, J. & Martínez, G., 2012. Energy efficient design of building: A review. *Renewable and Sustainable Energy Reviews*, 16(6), pp.3559–3573.

Panwar, N.L., Kaushik, S.C. & Kothari, S., 2011. Role of renewable energy sources in environmental protection: A review. *Renewable and Sustainable Energy Reviews*, 15(3), pp.1513–1524.

Pasten, C. & Santamarina, J.C., 2012. Energy and quality of life. *Energy Policy*, 49, pp.468–476.

Peidong, Z. et al., 2009. Opportunities and challenges for renewable energy policy in China. *Renewable and Sustainable Energy Reviews*, 13(2), pp.439–449.

Pérez-Lombard, L., Ortiz, J. & Pout, C., 2008. A review on buildings energy consumption information. *Energy and Buildings*, 40(3), pp.394–398.

Peter Droege, 2011. *100% Renewable: Energy Autonomy in Action*, UK: Earthscan.

Peter Droege, 2008. *Urban Energy Transition: From Fossil Fuels to Renewable Power* 1st ed., U.k.: Elsevier Ltd.

Poudenx, P., 2008. The effect of transportation policies on energy consumption and greenhouse gas emission from urban passenger transportation. *Transportation Research Part A: Policy and Practice*, 42(6), pp.901–909.

Rabianski, J.S. et al., 2009. Mixed-Use Development and Financial Feasibility: Part I - Economic and Financial Factors. *Real Estate Issues*, 34(1), pp.11–17.

Rérat, P., 2012. Housing, the Compact City and Sustainable Development: Some Insights From Recent Urban Trends in Switzerland. *International Journal of Housing Policy*, 12(2), pp.115–136.

Riaz, M.T., Gutiérrez, J.M. & Pedersen, J.M., 2009. Strategies for the next generation green ICT infrastructure. In *2nd International Symposium on Applied Sciences in Biomedical and Communication Technologies, ISABEL 2009*.

Roberts, S., 2008. Energy, equity and the future of the fuel poor. *Energy Policy*, 36(12), pp.4471–4474.

Ross Morrow, W. et al., 2010. Analysis of policies to reduce oil consumption and greenhouse -gas emissions from the US transportation sector. *Energy Policy*, 38(3), pp.1305–1320.

Rowley, A., 1996. Mixed-use Development: Ambiguous concept, simplistic analysis and wishful thinking? *Planning Practice and Research*, 11(1), pp.85–98.

Rutter, P. & Keirstead, J., 2012. A brief history and the possible future of urban energy. *Energy Policy*, (April).

Sadownik, B. & Jaccard, M., 2000. Sustainable energy and urban form in China: The relevance of community energy management. *Energy Policy*, 29(1), pp.55–65.

Sahely, H.R., Kennedy, C. a & Adams, B.J., 2005. Developing sustainability criteria for urban infrastructure systems. *Canadian Journal of Civil Engineering*, 32(1), pp.72–85.

Sampaio, H.C., Dias, R.A. & Balestieri, J.A.P., 2013. Sustainable urban energy planning: The case study of a tropical city. *Applied Energy*, 104, pp.924–935.

Sathish Kumar, D., Arya, D.S. & Vojinovic, Z., 2013. Modeling of urban growth dynamics and its impact on surface runoff characteristics. *Computers, Environment and Urban Systems*, 41, pp.124–135.

Savaresi, A., 2016. The Paris Agreement: a new beginning? *Journal of Energy & Natural Resources Law*, pp.16–26.

Simão, A., Densham, P.J. & (Muki) Haklay, M., 2009. Web-based GIS for collaborative planning and public participation: An application to the strategic planning of wind farm sites. *Journal of Environmental Management*, 90(6), pp.2027–2040.

Singh B., Roy P., Spiess T., V.B., 2015. *Sustainable Integrated Urban & Energy Planning, the Evolving Electrical Grid and Urban Energy Transition.*, Toronto, Canada.

Sovacool, B.K., 2011. An international comparison of four polycentric approaches to climate and energy governance. *Energy Policy*, 39(6).

- Hunter G, Guanzeng Z, Vettorato D., Urban Energy Planning of Human Settlements, 52nd ISOCARP Congress 2016
- Sovacool, B.K., 2015. Fuel poverty, affordability, and energy justice in England: Policy insights from the Warm Front Program. *Energy*, 93, pp.361–371.
- Streeton, R., Cooke, M. & Campbell, J., 2004. Researching the researchers: using a snowballing technique. *Nurse researcher*, 12(1), pp.35–46.
- The World Bank, 2012. *Sustainable urban energy and emissions planning guidebook : a guide for cities in East Asia and Pacific*,
- Thompson, Susan; Maginn, P., 2012. *Planning Australia: An Overview of Urban and Regional Planning*, UK: Cambridge University Press.
- Tseng, H.K., Wu, J.S. & Liu, X., 2013. Affordability of electric vehicles for a sustainable transport system: An economic and environmental analysis. *Energy Policy*, 61, pp.441–447.
- UNFCCC, 2014. Status of Ratification of the Kyoto Protocol. *Kyoto Protocol*, pp.1–8.
- UN-Habitat, 2009. Sustainable Urban Energy Planning. A handbook for cities and towns in developing countries, p.84.
- UN-Habitat, 2012. Sustainable Urban Energy Planning: A Sourcebook for Asia. *Waste Management*.
- Union, E., 2010. *How to develop a Sustainable Energy Action Plan*, Belgium. Available at: <https://ec.europa.eu/jrc/>.
- United Nations, 2015. Adoption of the Paris Agreement. *Conference of the Parties on its twenty-first session*, 21932(December), p.32.
- United Nations Department of Economic and Social Affairs, P.D., 2015. *World Population Prospects, The 2015 Revision: Key Findings and Advance Tables*, New York.
- Vandevyvere, H. & Stremke, S., 2012. Urban planning for a renewable energy future: Methodological challenges and opportunities from a design perspective. *Sustainability*, 4(6), pp.1309–1328.
- Villarroel Walker, R., Poponi, D. & Lefevre, B., 2015. Advancing Toward a more Sustainable Urban Energy System Policy and Technology Considerations., pp.1–9.
- van der Waals, J., 2000. The compact city and the environment: a review. *Tijdschrift voor Economische en Sociale Geografie*, 91(2), pp.111–121.
- Wei, M., Patadia, S. & Kammen, D.M., 2010. Putting renewables and energy efficiency to work: How many jobs can the clean energy industry generate in the US? *Energy Policy*, 38(2), pp.919–931.
- Weng, Q. & Yang, S., 2006. Urban air pollution patterns, land use, and thermal landscape: An examination of the linkage using GIS. *Environmental Monitoring and Assessment*, 117(1-3), pp.463–489.
- Winkler, H. et al., 2011. Access and Affordability of Electricity in Developing Countries. *World Development*, 39(6), pp.1037–1050.
- Xiaodong Wang, Nouredine Berrah, Subodh Mathur, F.V., 2010. *Winds of Change: East Asia's Sustainable Energy Future*, The World Bank.
- Yamagata, Y. & Seya, H., 2013. Simulating a future smart city: An integrated land use-energy model. *Applied Energy*, 112, pp.1466–1474.
- Yan, X. & Crookes, R.J., 2010. Energy demand and emissions from road transportation vehicles in China. *Progress in Energy and Combustion Science*, 36(6), pp.651–676.
- Yi, H., 2013. Clean energy policies and green jobs: An evaluation of green jobs in U.S. metropolitan areas. *Energy Policy*, 56, pp.644–652.
- York, R., 2007. Demographic trends and energy consumption in European Union Nations, 1960-2025. *Social Science Research*, 36(3), pp.855–872.
- Zain, M.Z.M. and M.F.M., 2011. To Promote Future Sustainability with Integrated Design of Urban and Transportation System. In *6th Malaysian Universities Transport Research Forum Conference*. School of Housing, Building & Planning University Sains, Pulau Pinang.

ighting Citizens Priorities for Deep Energy Retrofit: a Multiple Benefits Approach

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Abstract *Currently, within each urban-regeneration project, an ambitious improvement in the energy performance of existing buildings is foreseen. Consequently, refurbishing the building stock should be approached as a piece of a wider, complex project. This means no longer treating it as a mere technical problem, to be solved simply by upgrading energy systems, introducing renewable sources, or enhancing energy efficiency by adopting the latest technologies. The technological innovation in buildings should be considered not as the final goal, but as a way to improve citizens' quality of life and to meet their expectations.*

Why are energy-efficient buildings attractive for citizens? What are the motivations driving the choice in deciding to undertake such refurbishment works? Are the economic benefits the most relevant argument underpinning their decisions?

Recent studies in this field suggest the relevance of other co-benefits, mainly dealing with the health and well-being of building occupants, environmental consciousness, the pleasure of enjoying spatial quality, and the higher evaluation by the real-estate market of energy-efficient dwellings. A deep understanding of customers' awareness and preferences is, therefore, necessary for the decision-making process, to avoid project failures or underperformance.

Starting from these considerations, this paper tackles the issues of motivations of choice in asking for energy-refurbished buildings by adopting a multi-criteria approach. We implement a decision tree following the analytic hierarchy process methodology (AHP), assuming the unitary relevance of a high-quality energy refurbishment as an expression of multiple benefits. Through learning from previous works in this field, this complex decision is reduced to a limited, although significant, series of characteristics, grouped into criteria. Then, a panel of experts including engineers, architects, and professionals in building sector makes a series of pairwise comparison. Finally, by aggregating expert judgments, we verified and weighted the multiple benefits suggested by the literature on a local urban market. The case study presented here is from the European smart-city project SINFONIA. The method sensitizes developers and decision makers to consider citizens' priorities from the early design phase up to communication strategies. The purpose of this paper is also to contribute to a better understanding of the socio-economic aspects connected to the implementation of sustainability measures in buildings. It shows a replicability potential in other contexts that undertake the smart-city approach.

1. Introduction

Buildings are responsible for about 40% of global energy consumption and they emit one-third of CO₂ emissions. While these figures are also similar at European Union (EU) level, buildings represent a key intervention sector to reach the EU climate-energy goals by 2020 and to move toward a low-carbon economy by 2050. Because 35% of the EU's building stock is over fifty years old, with very poor energy performance, "the potential for cost-effective energy savings is about 30% of the whole sector's expected energy consumption by 2020, which would lead to significant economic, social and environmental benefits" (EC 2008). This

is particularly evident if we consider that generally, new high-performance buildings require one fifth of that of old buildings' average consumption to satisfy their energy need. Again, the Copenhagen Economics (2012) reported how "*harvesting renovation opportunities could bring huge benefits to the EU economy over the coming decades*"; it estimated "*a monetized permanent annual benefit to society of €104–175 billion in 2020 depending on the level of investments made from 2012 to 2020*".

This research, therefore, argues that, besides the "cultural" relevance, the "economic benefits" side also plays a relevant role and owners probably make several considerations, when they decide to undertake energy retrofitting activities. Indeed, the success of the "deep energy retrofit" approach lies in the opportunity to achieve much wider benefits (exceeding the pure energy needs and energy expenses-related savings), by taking a whole-building approach. One can consider the "deep energy retrofit" as a "macro" decision-making problem, which can be further decomposed into "micro" elements, representing the different values attributed by house owners to detailed benefits achievable by the execution of this kind of intervention.

Currently, the EU main act addressing this topic is the 2010 Energy Performance of Buildings Directive (EPBD); it provides the legal framework for the member states to define national policies and measures to reduce the energy consumption of buildings. The EPBD, by considering the different realms for improvement in energy use for space and water heating, cooling, ventilation, and lighting, calls for the definition of legal minimum energy-performance requirements and information-based instruments, such as energy certificates. The first must be applied to new buildings at the time of construction or to existing ones when a major renovation work occurs (this means every 25–40 years approximately); the latter must be drawn up when the building is constructed, sold, or rented (and expires after ten years).

To encourage the undertaking of major renovation works, and to increase the annual renovation rate (actually 1% at EU level), member states are designing various supporting schemes. For example, in Italy since 2007, energy upgrading of existing buildings has been promoted through a related tax benefit. The Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA) points out how the International Energy Agency "*recently mentioned this measure as a best practice at international level, with specific reference to its role in the spreading of an energy efficiency culture at local level*" (ENEA 2015; 13).

Since energy behaviors and public awareness may be very context-dependent, and because the city of Bolzano in Northern Italy is currently experimenting on an innovative, deep-retrofitting approach through the SINFONIA FP7 smart-city project, which ultimately aims at stimulating wider renovation of the urban-building stock, the local context of Bolzano and the surrounding South Tyrol province need to be further investigated. A better knowledge of citizens' expectations will enable developers and decision makers to better consider their priorities in promoting similar activities, from the early design phase up to devising tailored communication strategies. Starting from these considerations, this research devised a structured interview, focused on the multiple benefits of deep energy-refurbishment works, to gather a few significant figures concerning house-owners expectation. The problem is tackled by interviewing a pool of local experts in this field, using a multi-criteria decision analysis approach. The following sections report an overview of the selected methodology, undertaken activities, and the results obtained, after the first round of interviews.

2. Method

To investigate citizens'/consumers' expectations, we interviewed professionals in the residential building-refurbishment sector, adopting an multi-criteria decision analysis (MCDA) approach. The MCDA methods are helpful tools in setting up problems characterized by a set of possible solutions (also called alternatives) that are evaluated on multiple points of view (usually called criteria); by including in the decision-making process in all the relevant arguments and interactions, the MCDA methods enables finding compromise solutions along a rational path. In this case, the overall methodological problem of setting relative values for the expected utilities from deep energy-retrofitting interventions has followed the methodological approach defined by the Analytic Hierarchy Process (AHP), developed by (Saaty 1980). AHP is one of the most widely applied MCDA technique, often used in energy-related decision making, from planning (Pohekar & Ramachandran 2004) to indoor comfort assessment (Chiang & Lai 2002), that helps in structuring complex decision problems in a hierarchical form. The AHP follows three main steps: (i) structuring the problem as a hierarchy; (ii) setting priorities among the elements of the same level of the hierarchy, by means of pairwise comparisons; and (iii) checking for the logical consistency of the pairwise comparisons. The AHP is usually used to compare alternatives based on a set of criteria structured as a hierarchy. However, it proves to be a powerful tool also for setting the relative importance of a set of criteria (structured or not hierarchical).

The choice of the AHP method is justified by the possibility of producing the basis for comparison, which enables evaluation of qualitative criteria through a pairwise comparison method which is easy to set up. It also enables one to work on judgments of verbally-expressed preference through a semantic scale (Saaty 1980) and, at the same time, it takes into account the limited number of levels of judgment that the human mind can handle.

After having defined the main decision problem in the form of a complex question, the problem is detailed through a set of criteria, which are detailed via sub-criteria in turn. Through the pairwise comparisons and using the semantic scale proposed by Saaty, it is possible to assess the relative importance of criteria and sub-criteria for each respondent.

For each respondent, a pairwise comparison matrix is obtained, and its eigenvectors, whose components represent the relative importance expressed by a respondent for each criterion, are calculated. Formally, the relative importance (or 'local weight' in the hierarchical level of 'criteria') of the criteria are given by the right-hand eigenvector corresponding to the highest eigenvalue of the pairwise-comparison matrix (Saaty 1980; Attardi et al. 2015).

Since the procedure used to express preferences does not provide for the collection of information about the absolute importance of the criteria, but only about their relative importance, there may be some inconsistencies, i.e., violations of transitivity in expressed judgments. Therefore, a check for the logical consistency of each matrix is required.

The specific rules and general recommendation recalled for the application of AHP in multi-criteria decision analysis literature (Ishizaka & Nemery 2013) are the following:

- the number of criteria and relative sub-criteria should be kept as small as possible, without exceeding seven, which is considered the borderline value, to enable consistent comparisons;
- the fundamental numerical scale by Saaty (1-9) should be adopted, also flanked by verbal definitions, to help respondents in expressing the degree of importance;
- the decision-tree structure and contents are formulated through brainstorming sessions, involving authors and test respondents, and, as usually, analyzing similar problem studies;

- the inconsistency level of answers within each node (i.e., pairwise-comparison matrix) must always be below 10% (Saaty 1980; Saaty 1994).

Indeed, we structured the complex question (defining the possible benefits of a deep energy retrofit) as a set of criteria (the main categories of benefits). Then each one was better specified by additional sub-criteria (detailed benefits), asking for pairwise comparisons, up to obtainment of a degree-of-relative importance between each of them. Consequently, the decision tree was organized around three cluster levels:

- Level 1 – (GOAL) – Possible benefits of a deep energy retrofit;
- Level 2 – Categories of the benefits;
- Level 3 – Detailed benefits of each domain.

At each level, except the GOAL, the fundamental scale of Saaty (see Table 1) expresses the degree of importance.

Degree of importance		Degree of importance		Degree of importance	
Numeric	Verbal	Numeric	Verbal	Numeric	Verbal
1	Equal	4	Moderate plus	7	Very strong
2	Weak	5	Strong	8	Very, very strong
3	Moderate	6	Strong plus	9	Extreme

Table 1: The fundamental scale of Saaty (numeric and verbal)

We asked the local public agency “CasaClima – Klimahause”, responsible in south Tyrol province for buildings energy audit and certification and our partner in the SINFONIA Project, to contribute to our work by inviting its associates to join the research. As a result, during June and July 2016, we conducted eight phone interviews, collecting information from local engineers, architects, and experts in the building sector. We invited respondents to answer based on their personal and professional experiences with local customers, asking for a “deep energy retrofit” intervention. We established the general framework with the introductory phrase:

“Please, think about your local customers. In asking for a deep energy retrofit of their dwelling/house, what are the most relevant benefits they expected, among the following?”

As previously recalled, the set of criteria and related sub-criteria was defined on the basis of research questions and results suggested by previous studies in this field. Looking at the economic benefits, the international literature argues that monetary savings, basically due to reduced energy needs (Krause & Bitter 2012) and lower maintenance costs of new and efficient appliances (Ürge-Vorsatz et al. 2010), are evident. Moreover, it is widely recognized how the real-estate market appreciate the green attributes of efficient buildings, translating them into price or rent premiums (Bonifaci & Copiello 2015; Eichholtz et al. 2010; De Ayala et al. 2016). Investigating deeper the improvement of living conditions, it has been found that expected benefits come from the reduction of external noise, due to the better acoustic insulation of windows (Ürge-Vorsatz et al. 2010; Jakob 2006) and the achievement of a better indoor comfort, due to thermal bridges reduction (Jakob 2006). Acre & Wyckmans (2015) also investigate the meaning of having better spatial conditions, including the physical distribution of rooms, glazing surfaces, and daylight. Moreover, we included in our investigation a criterion related to sustainability, trying to trace the attitude of house owners to environmental issues as well as their social behavior. Thus we explicitly mentioned the decrease of air-pollutant emission produced by energy generation and the expression of an

individual green social status, due to the adoption of sustainability measures, as a benefit for themselves and an incentive for others; Dastrup et al. (2012) identified this as an expression of the “warm glow” phenomenon.

The definition of criteria and sub-criteria was later refined according to the test-phase results. We carried this out in May 2016 on five respondents having a professional background comparable to the sample. After this phase, the sub-criterion “*tax deduction*” was added under “*economic benefits*” and the sub-criteria under “*external noises*” better distinguished between “*noise disturbances from outside the building*” and “*noise disturbances from next apartments*”. While the specification concerning noises is self-explaining, “*tax deduction*” deserves an explanation. This particular feature relates to the specific national Italian construction sector, where, since 2007, energy upgrading of existing buildings has been promoted through tax benefits. The mechanism consists of the deduction from income tax of a share of the costs incurred for the energy refurbishment (actually, 65% over ten fiscal years). Beneficiaries include all taxpayers, such as individuals, professionals, companies, and other enterprises. The deductions are awarded under the condition that the intervention conforms to the standards prescribed and is certified by a qualified technician, who is held responsible by law. Eligible activities and related maximum deductions, defined by law n° 190/2014, concern the overall energy refurbishment of existing buildings (100,000 euros), thermal insulation of the building’s envelope (60,000 euros), purchase and installation of solar thermal panels or solar shading systems (60,000 euros), and purchase and installation of new efficient-heating systems (30,000 euros).

Finally, as shown in Fig. 1, we obtained a decision tree with five criteria and 15 sub-criteria: four in “*thermal and hygrometric comfort*”, three in “*design and architectural quality*”, “*acoustic comfort*” and “*economic benefits*”, and two in “*sustainability*”.

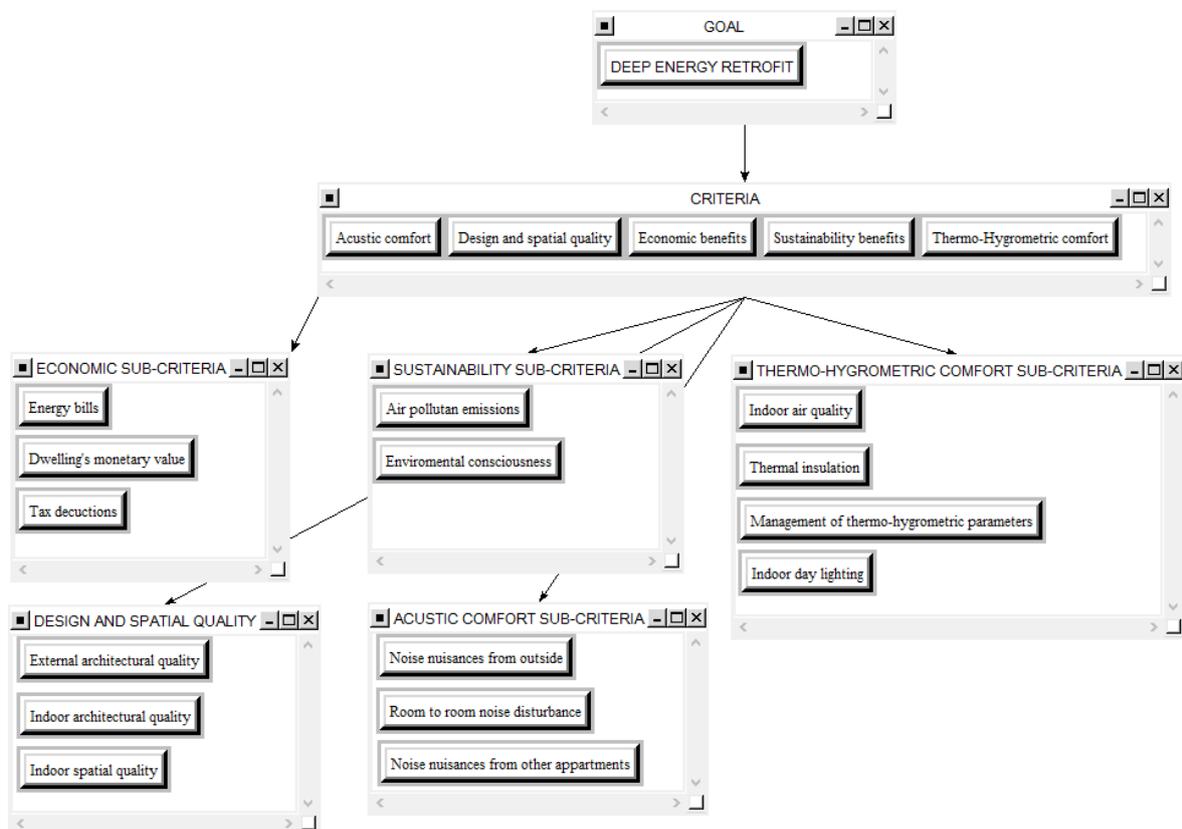


Figure 1: The decision tree of deep energy refurbishment implemented in the Super Decision software

According to the procedures required for the implementation of the AHP, we asked respondents to express their judgment, firstly among the five criteria and then among each set of sub-criteria. Because of the reciprocity rule (Saaty 1980), the overall number of questions required to fill the interviews was limited to 26: ten pairwise comparisons for level 2 (one matrix 5x5), 16 pairwise comparisons for level 2 (one matrix 4x4; three matrixes 3x3; one matrix 2x2). This reduces the average time required for the completion of one interview to 20–30 minutes. The results of each phone interview were simultaneously recorded in the “Super Decisions” free software, specifically developed to support the data collection and results validation by implementing this technique (see: www.superdecisions.com). For our purpose, since we don't have alternatives to compare or rank, the most relevant feature offered by the “Super Decisions” is the inconsistency check, monitoring step by step after each answer the coherence of pairwise comparisons (see Fig. 2).

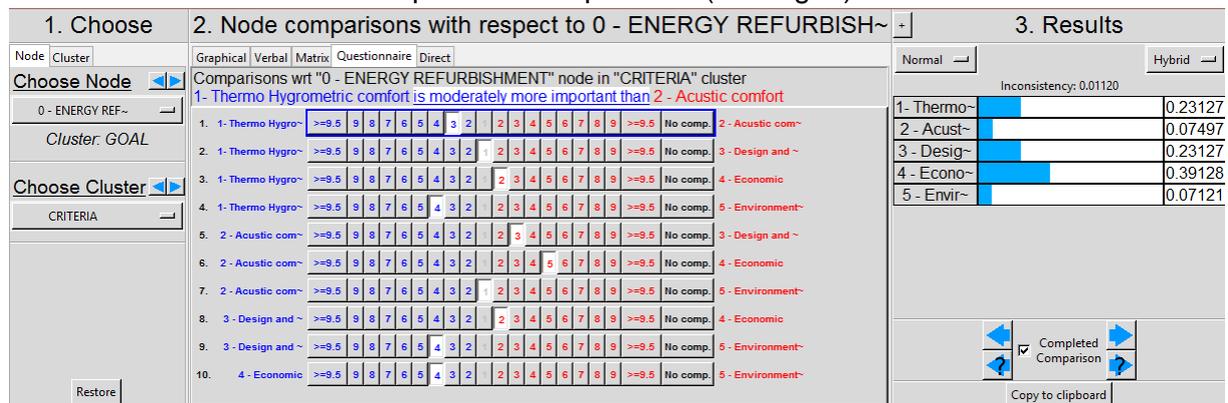


Figure 2: Example of pairwise comparison accomplished and related inconsistency check in the Super Decision software

3. Results

In this section, we report the main results obtained by the execution of eight phone interviews, using the AHP approach, with South-Tyrolean professionals in the residential building-refurbishment sector. We aimed to identify the relative importance (weight) of different benefits claimed in the decision to undertake refurbishment activities and to describe the overall and individual results. We considered recommendations expressed in Sect. 2 for the design phase, and we recorded the results, also by checking the inconsistency of pairwise comparisons, through the “Super Decisions” software.

The main results of our survey are summarized in Table 2. The median and mean of the sample are similar in quite all the variables, therefore the center of the data seems to be not too much influenced by outliers.

Criteria	Min	1 quart	Median	Mean	3 quart	Ma	Var.	SD
Thermo-Hygrometric comfort	7%	11%	20%	23%	38%	41%	1,6%	12,5%
Acoustic comfort	6%	8%	8%	9%	11%	14%	0,1%	2,4%
Design and spatial quality	5%	13%	17%	21%	30%	44%	1,4%	11,7%
conomic benefits	22%	32%	38%	38%	45%	56%	0,9%	9,5%
Sustainability benefits	3%	4%	6%	9%	14%	21%	0,3%	5,9%

Table 2: Main figures of the survey

As graphically expressed in Fig. 3, the mean of the judgments deduced from the pool of experts assigns the first place to economic benefits (38%), and a remarkable similar importance both to thermo-hygrometric comfort (23%) and design and spatial quality (21%). The less-relevant values result in an equal level (9%) for acoustic comfort and sustainability benefits.

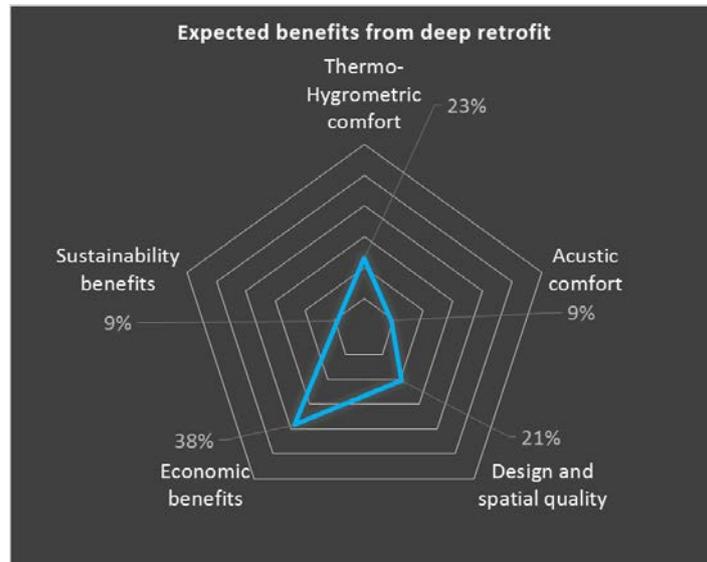


Figure 3: Overall results of weighting process from phone interviews

However, as Figs. 4 and 5 show, respondents provide varying interpretations of citizens'/customers' expectations, suggesting different profiles. Weights expressed from respondent #2 and #4 remain completely within the 1st and 3rd quartile, while others exceed this interval from one (#3 and #5) to three judgments (#1, #6, and #8).

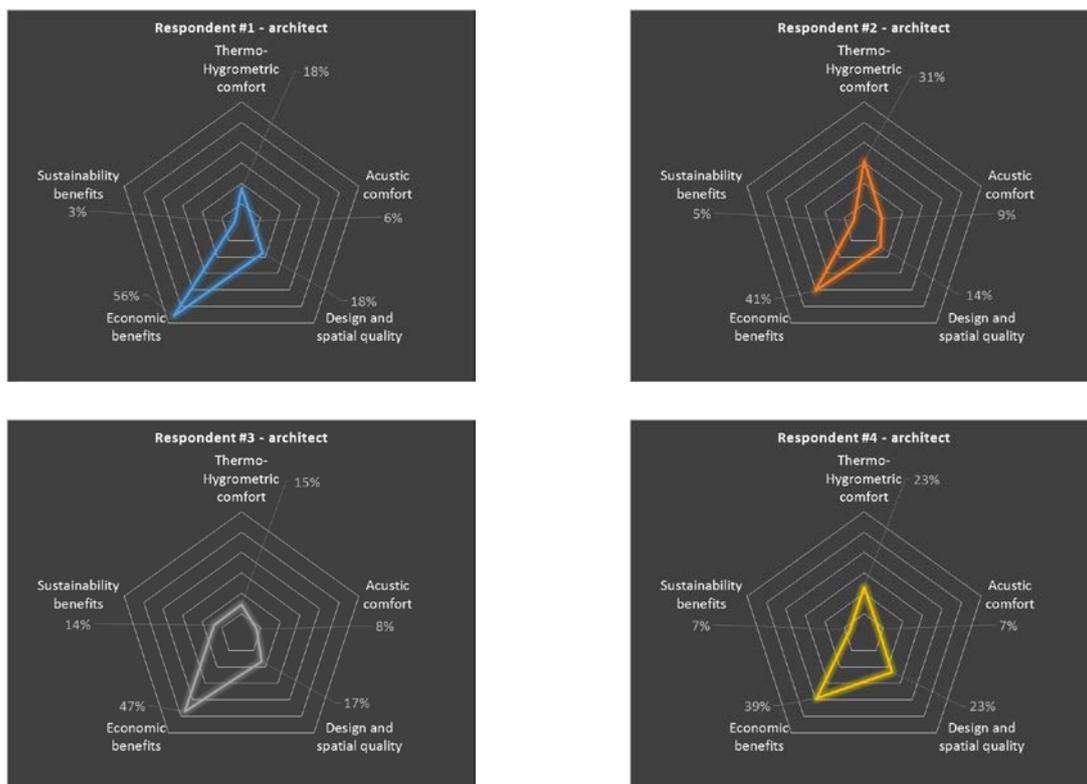


Figure 4: Individual results of weighting process from phone interviews

We note that the profile described by respondent #2 and #5 is very similar: they only remarkably exchange the weight assigned to thermo-hygrometric comfort and economic benefits. Also, #5 is not very different from #7, except for the lower relevance attributed by the latter to design and spatial quality.

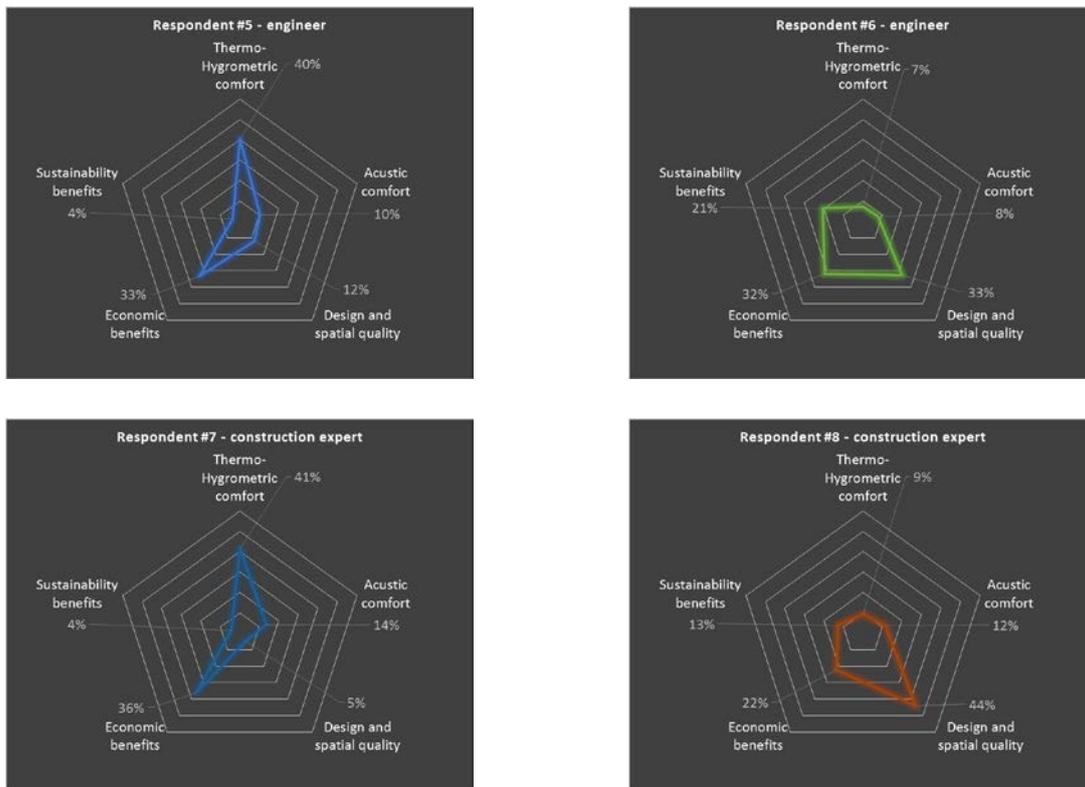


Figure 5: Individual results of weighting process from phone interviews

A deeper analysis of the relative importance attached to sub-criteria reveals an acceptable agreement among the respondents, since values mostly converge in the majority of sub-criteria, resulting in values included in short intervals. Only a few outliers can be found, and larger intervals concern only the “tax deduction” and “thermal insulation”, which are also the sub-criteria with the highest average values (respectively 24% and 12%), as in Fig. 6.

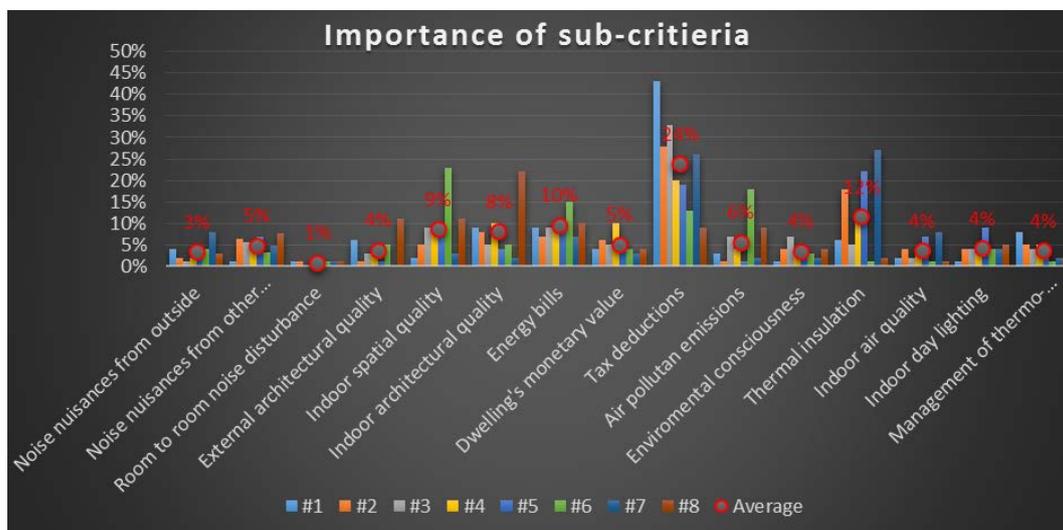


Figure 6: Individual and average importance attached to sub-criteria

In the middle of the rankings, and with similar values, lie “energy bills” (10%), “indoor spatial quality” (9%) and “indoor architectural quality” (8%). The majority of other sub-criteria achieve values between only 4 and 5%, and the lower importance is attributed to the two acoustic sub-criteria: “noise nuisances from outside” (3%) and “room-to-room noise disturbance” (an average of approximately 1%).

Concerning the distribution of weights among sub-criteria belonging to the same benefit (criterion), we found different situations:

- half of the total thermo-hygrometric comfort benefit is expected to come from better thermal insulation, with a small contribution given to the same extent by enhanced management systems (intelligent thermostats for space-heating control), technologies such HVAC (heating, ventilating, and air conditioning systems), or glazing surfaces and shadings;
- design and architectural quality are basically considered relevant only from the indoor perspective, and also relevant is the expected benefit of changing the spatial arrangement of rooms;
- acoustic issues are less considered, although avoiding or reducing noise nuisance from adjoining apartments is the key point in this factor;
- economic benefits are at the top of householders' expectations, and, in this particular context, the incentive of the tax deduction is the main driver (i.e., currently and during recent years in Italy), more than twice as important as monetary savings from reduced energy bills. The expected increase of value related to better energy performance is the less perceived economic benefit;
- sustainability benefits related to pollutant-emissions reduction are slightly stronger than the desire to be a positive example for the neighborhood (i.e., personal gratification for shifting to a greener lifestyle).

Looking at values attached by individual experts, we found a higher score (over 15%) for sub-criterion “thermal insulation” by respondents #2, #5 and #7, over “airpollutant emissions” and “indoor spatial quality” sub-criterion by #6 and for “Indoor architectural quality” sub-criterion by #8.

Beside attribution of priorities, respondents also took the opportunity in the interview to comment on some questions and to express interesting remarks. Table 3 reports the most relevant, contributing to shedding light on arguments behind numeric values.

Resp.	Remarks
#1, #4, #5, #7, #8	There is an extremely high level of complexity and uncertainty expressed by the social environment of the apartment building. Householders belonging to different ages, social status, or income bracket have different expectations, time horizons, or spending capacities. This heterogeneity of interests toward the refurbishment investment conflicts only with the legal needs to achieve a majority to approve the working plan and even more with the real possibility of some householders to afford additional expenses. Therefore, in fact, not only the majority but also the 100% consensus should be reached (#7) and the unique argument considered is often the final cost (#8). Consequently, in most of the cases, the intervention on the apartment building is only external, on the facades or roof. The single flats are not involved in refurbishment activities, also because occupants are unwilling to move out for some months or to bear discomfort and the hassle.
#1, #7, #8	The relevance of external noise nuisance, in most of the cases from road traffic, widely varies in a different context and is very place specific. Therefore, it is hard to estimate it on average and in the abstract (#1). However, there is growing interest from the general public about this (#7).
#5	Having better daylight inside the flat is often a desire, although not easy to achieve in the condominium, where permission to change windows' dimension or position is difficult to obtain. On

	the contrary, in single-house refurbishment, where possible, an increase in transparent surfaces is often required and realized.
#3, #5, #8	There is a growing interest from general public in having better indoor air quality, besides the specific cases of particular disease (asthma or mold allergy) requiring high hygienic conditions (#3), even if these kind of systems are quite unknown by the general public and their operation requires behavioral changes by occupants very difficult to be accepted in the residential market (i.e., to avoid opening windows frequently) (#5). Similarly, thermal management systems are sometimes too fancy for unskilled users (#8).
#4, #5	The necessity to undertake aesthetical refurbishment activities on the facades, basically repainting them, may act as the driver stimulating more complex work, also involving the thermal insulation, by changing windows or by applying exterior insulation (#4). Nevertheless, the apartments are often in very bad thermal-comfort condition, therefore improving the energy performance and solving thermal bridges results at the end as being more relevant than improving the external appearance of the building (#5).
#1, #4, #5, #7	The economic benefit of the tax deduction is the main argument underpinning the decision to undertake relevant works. The main threat is that, once it has been done, the system is in danger of collapse, if the environmental awareness of citizens is not adequately rooted (similarly to the Italian PV market, that, after brilliant growth sustained 2008—2013 by the feed-in tariffs, is now suffering and stagnant). Unfortunately, sustainability and environmental benefits are currently perceived as “a drop in the ocean” (#4), due to the inequality between the air pollution saving achievable by a single home in comparison with the amount of emissions generated by other local sources (e.g., the road transportation on the street next to the house). In fact, there is a lack of perception of positive cumulative effects at urban scale and “only single house owners consider sustainability and environmental issues” in the decision-making process (#1), and those very interested in are “a niche in the market, and mainly based in the countryside” (#5), while, for most of the people, it is “optional” (#7). Therefore, although environmental consciousness seems to be not so relevant in driving the decision to invest, this point should be not neglected in approaching the problem.
#7	The tax deduction is a real motivation only for those having enough income. Low-income or retired people can't benefit from it, and therefore they are much more against works on common spaces in the condominium.
#7	In South Tyrol, the building law enables a volumetric increase of refurbished buildings, achieving the required energy performance (up to 200-cubic-meters bonus for residential buildings below 1,000 cubic meters, or up to 10% of larger buildings). In most of the cases, a single house reaches a 150 cubic meters bonus, which in fact is an increase in the building's value.
#4	Acoustic refurbishment of existing buildings is perceived as much more complicated as thermal refurbishment, due to the lack of diagnostic tools, enabling the designer to investigate and discover technical weaknesses (i.e., there isn't something comparable to a thermographic camera, which shows where thermal bridges are).
#4, #5, #7	Overall, there is a lack of a long-term vision, and the ability to compare the immediate expenditure with the advantage of a constant flow of future monetary savings or the expected increased property value on the market, which is currently still difficult to estimate. People investing in deep energy retrofitting are willing to stay longer in the refurbished house; therefore, they don't consider a possible increase in the selling price nor its asset value (#7).
#4	Concerning the architectural and spatial features, customers are willing to spend more for increasing the indoor quality, with high-value products, instead of the external appearance of the building, although this last point may be considered as a way to show others how they are “going to live greener” in a highly energy-efficient house.
#8	In South Tyrol, due to severe winter conditions, the reduction of space heating bills is a strong motivation for undertaking energy refurbishment, while this is less important in milder Italian regions.
#8	In general, customers tend to prefer the installation of technical systems for cooling, instead of designing adequate passive solutions (e.g., shadings).

Table 3: Comments and remarks by the respondents of the phone interview

4. Discussion and Conclusions

The analysis of the results reveals that among experts there is an overall agreement on judging the majority of the benefits related to the “deep energy retrofit”. Interestingly, the

larger disparities concern “*tax deduction*” and “*thermal insulation*” sub-criteria, which are also the sub-criteria with the highest average values.

By decomposing the “deep energy retrofit” into “micro” elements, the research confirms, on one hand, how the “economic-benefits” side plays a relevant role in the decision to undertake a deep energy retrofit (38% of the global importance), while, on the other hand, it reports how house owners only less seriously considered other potential benefits, such as the acoustic insulation improvement (9% of the global importance). Similarly, other elements positively contributing to the indoor comfort such as better air quality or improved daylight are not fully understood. There is a need to increase citizens’ awareness about the possibility to adopt in refurbishment activities the whole-building approach, achieving multiple benefits, and to find different management and business models to approach the complexity expressed by the social environment of the apartment building. To support this, “cultural” and “educational” activities should be more envisaged, also to stress the cumulative positive environmental effect of a multitude of single interventions, currently underestimated (9% of the global importance). Similarly, citizens’ need to familiarize themselves with the technological innovation in buildings possible today and to appreciate how they can improve the quality of life given by better indoor comfort. Otherwise, this will be not fully accepted and exploited. Acoustic design probably needs a deeper investigation also from the experts’ side, because currently they consider this as uncertain in potentially achievable results.

There is also room for improvement in the experimental design: one additional field of investigation could be the co-benefit of remaining in a familiar place, saving the trouble of changing dwelling and neighborhood, and preserving the local social capital (OECD 2001). Although there may be even more interesting arguments, any increase in the overall length of the interview and in the number of pairwise comparisons deserve careful consideration. Moreover, the results of this survey should be considered as a picture of a particular context at a certain time: weights currently assigned by experts in South Tyrol may be useful only to interpret the decision-making process of the local population and to define specific strategies while the legal framework does not change. Any inference of applicability within a larger population or in other places may lead to biases in the priorities. However, on the other hand, the methodological approach and the experimental design can be replicated in other contexts and to sustain the design phase of smart-city projects.

Results achieved by this research can therefore be effectively used for a deeper investigation into a building’s marginal value related to its energy efficiency in the city of Bolzano, following the operational points suggested in Bisello et al. (2016) or to compare whether experts’ perceptions and beliefs really capture the citizens’ expectations, making the latter more explicit through a massive local online or phone survey.

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References

- Acre, F. & Wyckmans, A., 2015. Dwelling renovation and spatial quality. *International Journal of Sustainable Built Environment*, 4(1), pp.12–41.
- Attardi, R., De Rosa, F. & Di Palma, M., 2015. From Visual Features to Shared Future Visions for Naples 2050. *Applied Spatial Analysis and Policy*, 8(3), pp.249–271.
- De Ayala, A., Galarraga, I. & Spadaro, J. V., 2016. The price of energy efficiency in the Spanish housing market. *Energy Policy*, 94, pp.16–24.
- Bisello, A., Marella, G. & Grilli, G., 2016. SINFONIA Project Mass Appraisal: Beyond The Value Of Energy Performance In Buildings. *Procedia - Social and Behavioral Sciences*, in press.
- Bonifaci, P. & Copiello, S., 2015. Price premium for buildings energy efficiency: empirical findings from a hedonic model. *Valori e Valutazioni*, (14), pp.5–15.
- Chiang, C.-M. & Lai, C.-M., 2002. A study on the comprehensive indicator of indoor environment assessment for occupants' health in Taiwan. *Building and Environment*, 37(4), pp.387–392.
- Copenhagen Economics, 2012. *Multiple benefits of investing in energy efficient renovation of buildings: Impact on Public Finances*, Copenhagen.
- D'Alpaos, C. et al., 2002. La valutazione ex-ante degli effetti sul valore immobiliare di interventi di salvaguardia ambientale nell'isola di Sant'Erasmo nella laguna di Venezia: un approccio gerarchico. In P. Gaio & S. Stanghellini, eds. *La valutazione degli investimenti sul territorio. Atti del XXXII Incontro di Studio*. Venezia: Ce.S.E.T.
- Dastrup, S.R. et al., 2012. Understanding the Solar Home price premium: Electricity generation and "Green" social status. *European Economic Review*, 56(5), pp.961–973.
- EC, 2008. Proposal for a recast of the energy performance of buildings directive (2002/91/EC). Impact assessment.
- Eichholtz, P., Kok, N. & Quigley, J.M., 2010. *The Economics of Green Building*, ENEA, 2015. *Italian Energy Efficiency Annual Report 2015. Executive Summary*, Rome.
- Ishizaka, A. & Nemery, P., 2013. *Multi-Criteria Decision Analysis: Methods and Software*, Wiley.
- Jakob, M., 2006. Marginal costs and co-benefits of energy efficiency investments. *Energy Policy*, 34(2), pp.172–187.
- Krause, A.L. & Bitter, C., 2012. Spatial econometrics, land values and sustainability: Trends in real estate valuation research. *Cities*, 29, pp.S19–S25.
- OECD, 2001. *The Well-being of Nations. The role of human and social capital*, Paris: OECD Publishing.
- Pohekar, S.D. & Ramachandran, M., 2004. Application of multi-criteria decision making to sustainable energy planning-A review. *Renewable and Sustainable Energy Reviews*, 8(4), pp.365–381.
- Saaty, T., 1994. *Fundamentals of Decision Making and Priority Theory with the Analytic Hierarchy Process*, Pittsburgh: RWS Publications.
- Saaty, T., 1980. *The Analytic Hierarchy Process*, New York: McGraw Hill.
- Ürge-Vorsatz, D. et al., 2010. *Employment impacts of a large-scale deep building energy retrofit programme in Hungary*, Budapest.

Track 6

Planning for an interlinked and integrated rural-urban development



Regional Planning in South Africa: An absent mandate from 1994

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Synopsis

Exploring the relational complexity between regional planning and public policy deployment in the case of South Africa, using the case of iLembe district municipality, the paper traces regional planning post democracy and argues that the role of regional planning is largely absent in the current suite of planning instruments.

1. Introduction

Globally, regional planning is widely used in different scales of national, regional, metropolitan and economic spatial planning, and is seen as essential for supporting the economic development and competitiveness of nations in the epoch of globalisation (Amin, 1999, Storper, 1997, Castells, 2014, Brenner and Wachsmuth, 2012, Porter, 1998, Dawkins, 2003). This paper will focus on regional planning from the formation of the democratic republic in South Africa to the present, and considers what kind of local and regional planning has emerged in dealing with the challenges of economic growth and sustainable development. Whilst the South African space economy is considered to be relatively diverse, long term structural weaknesses persist (Padayachee, 2006, Marais, 2011). Poverty, inequality and unemployment continue to be serious challenges, despite major expenditure on socio economic infrastructure by the state since 1994 to close the gap between the apartheid and post-apartheid period (Marais, 2011, Platjies et al., 2016). The analysis that follows outlines regional planning as mandated by the Constitution of the Republic of South Africa and the role of the local state in planning to meet these challenges. The analysis is drawn from insights using a range of existing secondary literature in which regional planning and public policies relating to competitive regions are mentioned. Included are official state documents. Interviews with practicing planners from the iLembe District municipality and associated entities have helped enrich the study. The study is a work in progress on regional planning in South Africa.

The paper is structured in the following way: section 2 reviews the literature and international influences on regional planning theory, section 3 locates regional and spatial planning policy in South Africa since 1994, the global economic context, and recent national economic policies, *inter alia*, the Industrial Policy Action Plan (2008), New Growth Plan (2009), Rural Development Strategy (2010), National Development Plan (2011) and Strategic Infrastructure Programme (2012) provide the framework. Section 4 explores regional planning through the case of the iLembe District Municipality in the Province of KwaZulu-Natal. The paper concludes that the role of regional planning is largely absent in the current suite of planning instruments, that a number of sectoral policies that have spatial consequences are lacking coherence and synchronisation, and that the intergovernmental system for co-ordination is complex and burdensome for the size and shape of the South African system.

2. Analytical framework and international influences

The analytic approach is informed by a review of the international literature on regional planning to support analysis of the complex and multi scalar relationships that exist between

policy deployment, institutional and integrated development, and capital formation in the political economy in South Africa. The origins of regional planning are found in wide ranging disciplines, including spatial and economic geography, sociology, spatial planning, economics, politics, social science and public management (Campbell and Fainstein, 2003, Pike, 2007) and can be considered, not surprisingly, as contentious. Definitions of regional planning depend on context, including institutional and legal, particular planning cultures and traditions, and identities (Friedmann, 1963, Friedmann, 2001, Healey and Upton, 2010, Paasi, 2012, Scott and Storper, 2007, Hillier and Healey, 2008). Hall (1992) states it “refers specifically to economic planning with a view to the development of regions which, for one reason or another, are suffering serious economic problems, as demonstrated by indices such as high unemployment or low incomes in relation to the rest of the nation,” and referred to in the literature as ‘problem regions’, ‘lagging regions’, ‘less favoured regions’ and ‘underperforming regions’ (Pike et al., 2007).

Other definitions include “the methods used ... to influence the future distribution of activities in space” (CEC 1997b cited in Glasson and Marshall, 2007). Whilst others suggest that co-ordination of spatial impacts of other sectoral policies, interventions associated with distribution of economic development between regions as a result of market failures, and land use regulations (CEC, *ibid*). Regions take on various forms, such as administrative, cultural, economic, functional, governmental, and historical, in which the conditions for capital formation and accumulation in a regional configuration significantly lead to the organisation of economic and social life for its citizens in which optimum arrangements, including use of land and other resources to meet social, economic and environmental needs for current and future generations, and to ensure resilience to external and internal disruptions. Analysis of the complex flows of capital, labour, resources and raw materials, sector markets, competitive and comparative advantage of local economies, value chains across contiguous spaces and regions, land markets and infrastructure, institutional context (conventions, practices and policies), and the role of social partners, are necessary to inform regional planning interventions.

Regional planning approaches are considered to be heterogeneous, with common elements relating to: territory that is regionally defined, that form part of sub-national administrative units, and that require spatial planning. At least seven elements are identified in the literature relating to what national framework should guide and enable the development of regional planning. They include competitive and comparative advantage (McGuirk, 2005, Harrison, 2010, Storper and Scott, 1995), cluster theory (Porter, 1998), flexible specialisation and agglomeration, networking and co-operative competition (Markusen, 2003, Wood and Valler, 2004); territorial (Brenner, 1998), co-operative governance and institutions as complex - including government agencies, trade unions, civil society and multi-lateral agencies (Jessop, 2004, Amin and Thrift, 2000, Amin, 1999, Andrew and Feiock, 2010), strategic spatial planning (Hillier and Healey, 2008), regional identity (Paasi, 2012), and redistributive concerns (Peck et al., 2010).

Related concepts include “New Regionalism” (Keating, 1998) in a post-Fordism and subsequent globalisation context in which new regional spaces and descriptors such as city regions, cross border regions, and metropolitan regions have emerged. Key shifts are a result of major changes in the “production of space” (Lefebvre, 1991), the global context of economic reconfiguration, and resultant influences of digital processes on production and consumption under contemporary capitalism. These include the push to innovation and learning nations, the transforming role of the modern state and greater decentralization to the local state (Keating

and Loughlin, 2013, Keating, 1998, Jessop, 2002). In addition there is public policy focus on revitalizing local economies through the generation of new technologies and commercialization and production thereof, an expanded definition inclusive of relational effectiveness of supply chains, public and private sectors, civil society, building social capital and collaborative efforts, and co-operative competition (Nalebuff and Brandenburger, 1997). Pike et al, (2007) argue that “*no singularly agreed homogeneous understanding of development of or for localities and regions exist*”, reinforcing heterogeneity associated with defining regions. Regions thus can be defined as the functional spaces of economic planning and governance in which capital formation in relation to land, labour, capital and the regulatory environment intersect, and in which conditions to support markets and social concerns are deliberated.

A key objectives for planning in an increasing complex world, is the need to support economic competitiveness, territorial cohesion, equity, and sustainability. Exemplars of new regionalism mainly located in developed nations, are Silicon Valley, Baden-Württemberg and Emilia Romagna (Hospers and Beugelsdijk, 2002). Whilst advanced economies emphasise these elements, a major gap in the regional planning literature relates to developing countries, peripheral, and poorer locations, who do not share these experiences. Regional planning is largely absent and situations prevail in which inter alia, complexity, heterogeneity, informality, alternative land arrangements exist side by side with private land ownership, and where coherent formal markets are largely absent, and yet where complex inter and intra government administrative systems co-exist with Traditional systems (Pike, 2014, Scott and Storper, 2007, Rogerson, 2010, Turok, 2010, Harrison and Todes, 2001, Todes, 2004, Todes, 2011). Even though some indicators of regional planning discussed earlier are valid for advanced capitalist economies and may not be wholly applicable to the context of developing countries, they are useful for a country like South Africa attempting to modernise its own economy, where elements of contemporary industrial capitalism exist alongside deprivation and poverty.

For the purposes of this research, the term regional planning is defined as it refers to space, territory and place, its relationship to the political economy (*inter alia* the relationship between the formal and informal economy, social, political, ecological, institutional and cultural processes) with particular interest in the location of economic and industrial activity and the related competitive drivers of economic performance. Successful regions display markets that are organised and networked in which co-opetitionⁱ and the use of the digital economy as integrator find expression in the more efficient utilisation of the space economy. This includes being locations of knowledge and learning that support innovation and creativity, an attractive investment environment, well developed human capital, infrastructure and connectivity, economic diversity and specialisation, and governance arrangements (Clarke and Eyal, 2013). In summary, the concept of capital formation in the production of space, using land, labour, capital and the regulatory environment, inclusive of competitive and comparative advantage scrutiny, is key.

3. National Context: Regional, Economic and Spatial Planning

Regional planning in South Africa under Apartheid (1949-1994) has been a relatively effective planning instrument in establishing the political economy of separate development and spatial fabric, albeit with its skewed and morally reprehensible objectives. This is well documented in the establishment of the Homelands system, de-concentration growth points and low wage industrial areas, often in rural and peri-urban areas in pursuit of racial capitalism (Dewar et al., 1986, Wellings and Black, 1986, Rogerson, 1998, Rogerson and Rogerson, 2010, Wittenberg,

2003). Furthermore, the planning system under apartheid reinforced racial capitalism through linkages to an industrial strategy that supported the traditional mineral energy complex (Fine and Rustonjee, 1996). The social, economic and spatial expression of the apartheid system was one of inequality at every level of society and set the context for transformation of post-apartheid South Africa.

However, two decades into democracy and economic development in South Africa (1994 to the present), the spatial divide in relation to socio-economic development persists, the spatial expression of the political economy has in the main remained intact leading to the exacerbation of the triple crises of structural unemployment, poverty and inequality as identified in the National Development Plan (National Planning Commission, 2011). The public expression of poor service delivery inter alia is articulated in the voices of the urban and rural marginalised through growing protest action. Growth centres are seen in the core, such as Gauteng, Durban and Cape Town, whilst the periphery and outer periphery continue to decline. The salient feature of structural unemployment is an expression of both “market” and “government” failure within the current political economy, despite twenty years of democratic informed policy making. The economy is increasingly divided between a formal economy that is not job producing, and a growing informal sector that contributes approximately R160 billion into the economy and is estimated to contribute 28% to GDP (SALGA, 2016). The intended transformation of spatial planning has been slow to respond to these challenges and in the main been a policy ‘taker’ rather than a proactive policy maker. And one of the key contributors to the current scenario is the perceived disarticulation of the policy frameworks driving economic development and growth (Kaplan, 2013, Malikane, 2016)

Since 1994, regional planning has largely fallen away as an instrument for growth and development, and been replaced with newly demarcated political and administrative boundaries defined by the Local Government Municipal Government Demarcation Act of 1998, the Municipal Structures Act of 1998 and the Local Government Municipal Systems Act of 2000, and others, with defined responsibilities (Berrisford, 2011). The key purpose of spatial planning as defined in the Constitution (Republic of South Africa, 1996), is to provide ethical, fair, just and sustainable solutions to the built environment and mandates local government to provide equitable and efficient services, build local democracy, promote social and economic development, collect revenues, ensure safe and healthy environments and create sustainable local government systems. However many local government structures have been insufficiently resourced by way of skills and organisational systems to function as entities, and thereby able to fully engage within their mandate. In addition the main impetus driving the demarcation appears to be political rather than criteria based on the economic potential, socio-economic, revenue and other considerations. ⁱⁱ

With the introduction of the above local government legislation, the planning system has been overhauled to establish “wall to wall” local government systems. The current spatial planning framework in South Africa is derived from the Constitution (Republic of South Africa, 1996) listed in Schedule 4 Part A, provincial planning listed in Part A of Schedule 5 and “municipal planning” listed in Part B of Schedule 4. It is also recognized that there are overlapping functions between the different spheres of government. Regional/provincial planning and development is perhaps the least developed of all the planning instruments and are allocated to provinces in terms of Schedule 5.

Similarly, governments redistributive approach to meet the basic needs of the poor have placed greater burden on local municipalities to deliver. The government system is complex, with a total of 45 ministries at national government level, 9 provinces, 8 metropolitan municipalities, 44 district municipalities and 226 local municipalities (<http://www.gov.za/>), to service a population of 54,9 million (Statistics South Africa, 2015). Figure 1 below outlines the complex planning architecture and intersecting policy, legislation and intergovernmental linkages. Moreover, an intergovernmental system to achieve maximum impact on government investment in a given locale was introduced through the Municipal Finance Management Act 2003 and the Intergovernmental Relations Framework Act of 2005.

Funding of decentralised local government has also undergone complex transition and is carried out through the National Treasury as mandated by the Constitution and Intergovernmental Fiscal Relations Act of 1997. Provinces and municipalities are funded through a system of grants, a provincial unconditional equitable share grant based on population distribution in which basic services to poor households, institutional administrative support and community services are considered, and other conditional grants as determined by the Fiscal and Finance Commission (Treasury, 2014, Pearson et al., 2016, Wittenberg, 2003). This was considered necessary due to insufficiently developed administrative structures and tax base from which to operate as municipal entities. The equitable share formulae has recently been reviewed as it was considered to be lacking in coordination and cohesion in effectiveness of impact in planning and management of infrastructure (Finance and Fiscal Commission, 2012, Treasury, 2014, van Donk et al., 2008). Moreover, the National Treasury has increasingly played a co-ordinating role within the State, across government departments and entities, through an intergovernmental system and framework of “co-operative governance” across national, provincial and local government spheres (Pearson et al., 2016). In particular, this has been done through budget and financial management reform measures devolved to local government, whilst maintaining a degree of centralised control. This is realised through the instruments of the Medium Term Expenditure Framework (MTEF) and Public Finance Management Act (PFMA)ⁱⁱⁱ.

Figure 1 illustrates the relational complexity between government spheres, legislation, and supporting institutions for policy deployment to improve policy coherence. The intergovernmental relations system, made up of cross-cutting ministries, clusters, and technical committees, is complex and burdensome for the size and shape of the public administration system, population characteristics and market needs. Whilst there are spatial planning instruments at provincial, district and local municipal spheres, at national level these are lacking.

From 1994 a number of national economic plans with spatial implications, have been undertaken to address apartheid legacy deficits, spatially rooted poverty and associated spatial inequalities, whilst at the same time enabling investment and economic growth requirements. Rogerson (2010) suggests there has been somewhat confusing and uncoordinated application of regional planning at government level. Recent national policies include the New Growth Path (2010), supported by the Industrial Policy Action Plan-(IPAP), which argues for the re-

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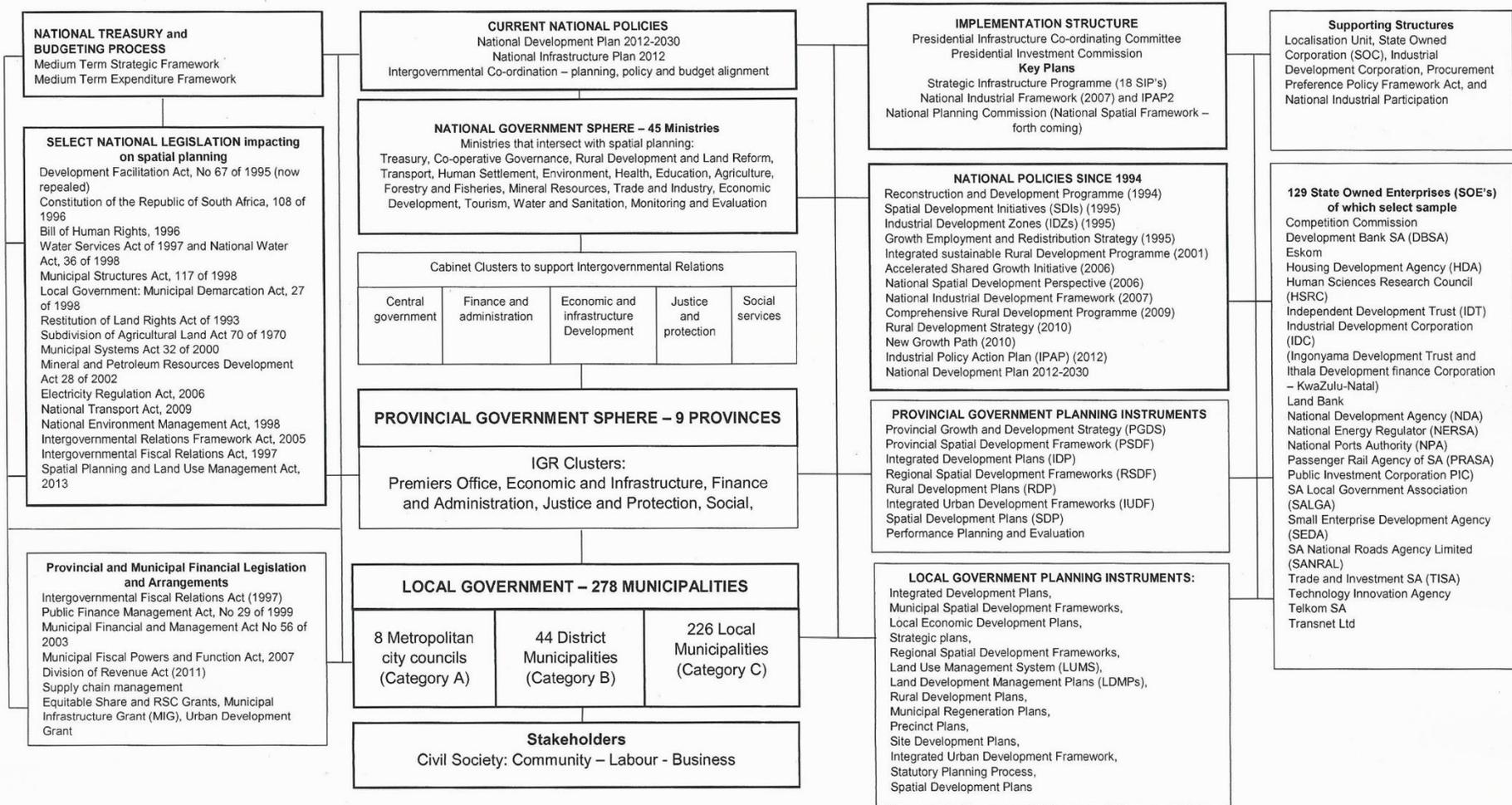


Figure 1: Post 1994 National, Provincial and Local Planning System and Key National Economic Policies (with spatial dimensions). Reference: Author's compilation using various government documents

industrialisation of the South African economy and a focus on the green economy; however, the 2007 National Industrial Development Framework (NIDF) is administered by the National Department of Trade and Industry (DTI) to facilitate inter alia, economic diversification, labour absorbing industrialisation and developing a knowledge based economy; but yet again, governments R1Trillion infrastructure spend through the Presidential Infrastructure Coordinating Commission (PICC) focussing mainly on energy and transport infrastructure; and in addition, the National Development Plan Vision for 2030, argues for a developmental state and a more inclusive and dynamic competitive economy in which the benefits are shared more equally, including an ambitious 5% growth rate target. Table 1 outlines the plans and intended outcomes.

1995 National Development Spatial Framework	Attempt to map government investment and co-ordinate public spending and infrastructure through the office of the RDP
1997-1999 Spatial Development Initiatives (SDI)	11 SDI's – Using investment corridors as a means to link economic nodes with spread effects
2003 2006 National Spatial Development Plan (NSDP) 2006 Draft Regional Industrial Development Strategy (RIDS)	Spatial analysis and mapping of South Africa's economic, social and spatial trends to guide future discussions on infrastructure and government productive expenditure. Key interventions: spend in areas of highest economic potential and target social development spending in high poverty areas. Key spatial concept: growth nodes and corridors Industrial Development Zones introduced
2009 New Growth Path (NGP)	State led drive for job growth, revitalise rural development (especially former homelands), 5 key drivers - boost public investment in infrastructure and energy; support main economic sectors (agriculture and agro-processing, mining, manufacturing; support new economies (green and knowledge economy); social capital and public sector; spatial development opportunities in rural areas and broader region
2010 Rural Development Strategy	Key concerns are: agrarian transformation - system and patterns of ownership and control of land, livestock, cropping and community, an integrated programme of rural development, land reform and agrarian change (mobilising productive agriculture, rural tourism potential, reviving secondary towns, exploiting opportunities in mining and manufacturing)
2011 National Development Plan (NDP)	Multiple development objectives with a 20 year time frame and 5% growth target
2012 National Infrastructure Plan	Supports the NGP and NDP - job creation, service delivery, tackling poverty and inequality (18 Strategic Infrastructure Projects)
2014 Industrial Policy Action Plan (IPAP)	Special Economic Zones (EPZ) legislated – geographically designed areas for targeted economic activities (Manufacturing activities qualify for financial and other incentives and reduced corporate tax)

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Reference: Oranje and Merrifield, 2010 and authors compilation.

Government defines itself as a 'developmental state' in which state-led intervention has been a key driver in economic development initiatives as identified in the above policies, but all the above-mentioned policy complexity and low outputs raise questions. These relate to scalar spatial planning, and realisation of policies in the absence of national, regional, sub regional, and local planning with supporting delivery instruments. Turok (2010) suggests that "the contribution of regional and local authorities to the developmental state have been somewhat neglected" and the National Development Plan acknowledges the weakness of spatial planning and the lack of a national spatial framework (National Planning Commission, 2011). Hence the impact on an evolving planning architecture renders spatial planning playing "catch up" in the built environment rather than as a proactive instrument determining economic development and infrastructure requirements.

In the absence of coherent national planning, uncoordinated responses to critical development issues ensue at various spheres of government. For example, choices relating to the energy supply mix such as proposed fracking, nuclear power and renewable energy appear to be unplanned responses to urgent energy needs required for a 5% growth trajectory as set in the NDP. At provincial level, the Provincial Growth and Development Strategies identify competitiveness in areas such as education, innovation, human resources and industrial growth. Likewise, in the absence of an agreed urbanisation policy framework since 1994, and introduced only in 2016, recent efforts at introducing new regionalism at city scale include the Gauteng City Region initiative, and increasingly the discourses of metropolitan councils include branding concepts such as “gateways”, “learning cities”, “smart cities” with each city, in the pursuit of its own investment. Development Agencies such as the Johannesburg Development Agency, Enterprise iLembe^{iv} and the Department of Co-operative Government and Traditional Affairs (COGTA) Economic Development Agencies (EDAs), largely based on EU examples, to drive economic development have been established. Similarly, there are one hundred and twenty nine State Owned Enterprises (SOE’s), of which some are identified in Table 1, that are meant to facilitate and cross-subsidise capital formation at local level. However, they tend to represent vested interest, operate in siloes and are weakly linked to municipalities and their planning systems. Moreover, there are decisions at a national level that have negative local impact, such as South African National Roads Agency Limited’s (SANRAL) tolling of roads that cut across local municipalities.

Almost all the policies in Table 1 refer to spatial planning, and occasionally to regional planning, all speak to the need to be competitive, but its meaning is seldom articulated, and almost never in spatial terms. More recently, the urgency of considering regions in spatial development planning to support the NDP has been expressed in various government forums (Department of Trade and Industry, 2007, Department of Economic Development, 2013) but to date there has been little tangible progress. The intersecting and sometimes competing legislation, jurisdictional concerns, government structures, supporting institutions, SOE’s and plethora of cross cutting policies across spheres of government, demonstrate a complex government system. At a municipal level this is complicated further by the inclusion of Traditional Authorities alongside democratic municipal institutions, as will be highlighted in the case study. A persistent weakness remains poor linkages between market requirements and supportive planning tools.

4. Case Study of the iLembe District Municipality

The case study uses the analytical lens of the production of space through capital formation in the context of formal and informal markets, and the regulatory and spatial planning environment to support economic growth and development. The iLembe District Municipality (DC 29) (hereafter referred to as the District) is located on the east coast of KwaZulu-Natal, to the north of the eThekweni Metro, and south of the uThungulu District and is made up of four local municipalities, Mandeni, KwaDukuza, Ndwedwe and Maphumulo. The District is a relatively fast growing region, yet facing serious economic, infrastructure delivery, and social challenges, including poverty and inequality mostly experienced in small towns associated with commercial agriculture, and former apartheid homeland areas (current Ingonyama Trust area). iLembe has a population of approximately 606,809 and is growing at a rate of 0, 8%, with an age profile of 34% under the age of 15, 61% (between the age of 16-65) is made up of the working age population, and 5% are 65 and over. The gender breakdown is 52% female and 48% male. The unemployment rate is 31%, and among the youth (aged 15-35) is 37%. Almost 40% of households earn no income, the majority of the population live on less than R500 per

month and are grant dependent. The size of the informal sector is estimated at 23% against the national average of 30% (iLembe District Municipality, 2014, Statistics South Africa, 2011). The population analysis closely mirrors the national picture where the size and shape of the double youth bulge will not necessarily yield the youth dividend – where 34% are under the age of 15, and the highest unemployment figure of 31% is felt by the youth between 15-35, resulting in rising poverty, informality, high dependency ratios and increasing grant dependency.

The iLembe Integrated Development Plan (iLembe District Municipality, 2014), describes the District as well located between two of Africa's busiest ports, Durban and Richards Bay, and closely located to the King Shaka International Airport and Dube Trade Port, and on the primary KwaZulu-Natal Provincial economic development corridor (N2). As such is well positioned in terms of local and international markets. The main economic activities are commercial farming (mainly sugar, some forestry and emerging mixed farming), and associated milling industry (Gledhow and Darnell mills), Sappi Paper mill at Mandeni, and tourism. Land holdings in the District present an interesting case. According to the IDP, the majority of land (63%) is controlled by Traditional Authorities, jointly managed by the State and Ingonyama Trust, 31% contributes to commercial farming and is under mainly privately owned sugar cane. It is worth noting that Tongaat-Hulett (TH) is a major private land owner in iLembe, primarily engaged in agricultural activity and release of land for high end residential development, resulting in monopolistic control of land release and land prices. This begs the question of its role as pro-active development player or a patient land seller that has potential to constrain the local municipality who may have different development objectives.

The case study poses interesting problems in relation to regional planning. Whilst the District is strategically located, it represents contrasting economic and social development challenges. There are high levels of inequality in settlement patterns with a major concentration of wealth in the western coastal corridor and high levels of poverty in the rural inland areas, there is uneven development, represented by Ballito with a high degree of services yet still fragile for an emerging large town, and the rest with poor quality of services, the commercial farming sector being well serviced, whilst trust land areas still have very poor access to services. Furthermore, whilst there has been some land reform and redistribution outcomes, there has been insufficient progress in scale, and there are outstanding claims that have not been settled. In effect this represents the spatial construct of apartheid that has not been broken 20 years into democratic local government in South Africa. The sugar industry is under threat from global competition and its future is uncertain. The tourism industry also faces competition from other regions in South Africa.

The District is linked to the national IGR through the provincial system and the KZN Provincial Growth and Development Plan, organised by clusters, technical committees and stakeholder processes which mirror the national and provincial IGR system and constrained by national treasury requirements. Additionally, a District IGR structure co-ordinates 10 fora at district level. The system is clearly cumbersome, in which diary synchronisation has been identified as a challenge. Whilst alignment to national policy is evident in the statements of the IDP, there is little corresponding evidence on the ground. Achieving co-ordination, integration and alignment between departments presents a challenge. For example the key built environment functions of housing, transport, land management, energy, environmental planning, economic

planning and development, land reform, amongst others, cut horizontally and vertically across the different spheres of government.

Municipal planning and related spatial planning is governed by the Municipal Systems Act as indicated in Figure 1. Briefly, the alignment of national policies to municipal planning are through the Provincial Growth and Development Strategy (PGDS), the Municipal Integrated Development Plan (IDP), and supporting hierarchy of spatial plans, inter alia iLembe District Spatial Economic Development Strategy, Spatial Development Framework, Regional Spatial Development Plan and underpinned by an Environmental Development Management Framework. In all the planning instruments, there is little evidence of a coherent regional plan, and in the main, regional planning is mentioned as a component of strategic mapping with little underpinning strategy, either in the IDP or the local economic development strategy for the District. The key mandate for District municipalities and local authorities is efficient service delivery to people and business. Responsibility for economic planning is shared and contested between province, the District and local municipalities (PGDS, provincial Economic Development Department, and LED units located in the District and 4 local municipalities) in which strategies are weakly developed, that tend to be government driven and funded, and do not account for market demand.

A cursory review of iLembe's planning documents reveals a mainly descriptive account of current context, weak analysis of the challenges to the local economy, and largely ignores issues relating to a local industrial strategy, weak identification of the competitive and comparative advantage of the District economy, and no clear strategies for developing long term manufacturing capabilities, labour absorbing employment, and innovative capabilities associated with new sectors of the economy. For example, LED projects identified include 6 live projects and 10 pending funding, largely dependent on provincial government funding cycles, SOE's or external funding, and mainly engaged in low order activities such as block making and mini mobile bakeries. Enterprise iLembe membership comprises mainly service sector companies supporting agriculture, franchises, retail, tourism, and professional services. The IDP is largely silent on informality, albeit a major influence in the District, and there is little evidence of partnership coalitions to mobilise support in this sector.

There is little mention of the constitutional mandate relating to regional planning, or relationships with adjacent municipalities, and strategic partnerships, alliances and cooperation amongst stakeholders are absent. Interviews conducted with spatial planners from the municipalities confirm that few of the NDP, DTI or economic development mechanisms are incorporated or inform spatial planning. Instruments for capital formation are weak and primarily linked to traditional economic sectors like tourism and service industries all of which are insufficiently labour absorbing. In brief, the study reveals disparity at local district level; economic activity is concentrated in KwaDukuza (Ballito) and Mandeni (Isithebe); that the environment for capital formation is weak; there are high levels of informality, and governance systems are lacking inclusive coalitions.

From the above analysis, the current spatial planning instruments do not sufficiently consider the economy, trade and production systems, commodity and value supply chains across sectors, competitive considerations, and most importantly the mobilisation of economic stakeholders. The result is a local planning system that conforms to compliance practices and

insufficiently engages with local developmental needs of people or developing competitive business clusters. To illustrate the point, the following examples indicate the potential for developing a regional planning framework to allow planning to become more effective.

As one of the key economic activities in iLembe, the sugar industry is under threat across the Province, *inter alia* declining global prices, lack of government policy direction and support, a fractured industry facing internal transformation challenges, including land reform, and lacking a coherent industry strategy between industry players, and facing competition from SADC countries. The key challenge is how to increase and diversify productivity. Agriculture requires added value to its activities or it could be lost to competing land uses, such as housing and commerce. Hence shifts to mixed farming, utilising organic farming practices, are some strategies already being employed by farmers. Existing midstream production includes milling and its offshoots such as molasses and sucrose derivatives. New downstream industries such as biofuels and bagasse could stimulate new technology and value chains into the green economy as well as opportunities for co-generation into the national power grid. Mixed farming provides new opportunities such as pharmaceuticals (e.g. Maringa, cannabis, rooibos, and traditional medicinal plants). The potential linkage to industrial policy, beneficiation, and other government policy imperatives are obvious, but there is little evidence of this in the economic development strategy and District IDP, or that the stakeholders themselves (growers, millers, representative associations, downstream suppliers) have shared strategic objectives.

Another example of potential is that of the digital economy. Several undersea cables are landed at Mtunzini in the Mandeni Local Municipality (SEACOM, SAT-3, SAex and EASSy) that provide international connectivity. Direct access to the cables with manual switches represents the fastest internet and digital economic opportunities to develop competitive advantage of the region, support industrialisation and job creation. Currently, neither the District nor Mandeni local municipality have the resources to pursue this, and are dependent on national and provincial imperatives. This also raises the interfaces between districts and municipalities and opportunities that regional planning could bring.

The case of informality is a further case. The main activities relate to the taxi industry and hawkers in which the interface between technology, vendors and consumers could intersect more productively and help mainstream and develop SMME activities. In the main the planning system is ineffectually engaged with this sector, in particular around mobilising partnerships to support access to *inter alia* finance, information, and markets.

iLembe is also well situated in relation to the EThekweni metro and the broader region, well positioned in terms of transport connectivity including rail, road and air, as well as two ports, suggesting opportunities for co-opetition across government spheres. Possibly the greatest opportunity is the land holding of the area known as Compensation Flats, the last remaining largest segment of flat land at scale, in the Province that could be utilised to develop rail and intermodal structure to support industrial development with major opportunities for employment, creating opportunities for value chains, logistics and supply chains, and innovation. Finally, without the mobilisation of a coalition of stakeholders including business, industry, community, informal sector, women and youth around a common vision, economic opportunities would be difficult to realise.

5. Conclusions

This paper forms part of early research into regional planning in South Africa. It has shown how spatial planning is being shaped by complex institutional arrangements, competing policy and regulatory dynamics set in a context of intergovernmental co-ordination and co-operative governance. The case study has highlighted some of the complexities of spatial alignment between spheres of government, sometimes resulting in incoherent policy deployment and alignment rather than dynamic interaction with civil society, markets and informality. From the above discussion, it has been suggested that the current spatial planning architecture is largely compliance and process driven, resulting in limited ability to engage with economic competitiveness and emerging new capital formations as supported by current industrial policy on the one hand, and increasing social marginalisation on the other.

However, successful regions and related theory suggest that regional planning could be a catalyst for collaborative efforts of planning authorities in specific localities to plan, target and deliver resources, close the generation gap in the space economy and allow regions to gain competitive advantage, sustainable development outcomes and positive benefits for communities. Regional planning could potentially lead to policy integration in practice and provide the necessary confidence for the private sector to invest and create new capital which could lead to competitive advantage and the development of downstream industries. Finally, it could be argued that regional planning as a potential catalyst for socio economic transformation in South Africa is untested, and requires further investigation. A limitation of this paper is its reliance on secondary information. Interviews with a wider group of stakeholders are still to be conducted, and forms part of a broader study on regional planning. Furthermore, for the purpose of this paper, the spatial planning documents of the local districts have not been interrogated and forms part of the wider study.

References

- AMIN, A. 1999. An institutionalist perspective on regional economic development. *International Journal of Urban and Regional Research*, 23, 365-378.
- AMIN, A. & THRIFT, N. 1995. *Globalization, institutions, and regional development in Europe*, Oxford University Press.
- AMIN, A. & THRIFT, N. 2000. What Kind of Economic Theory for what Kind of Economic Geography? *Antipode*, 32, 4-9.
- ANDREW, S. A. & FEIOCK, R. C. 2010. Core-Peripheral Structure and Regional Governance: Implications of Paul Krugman's New Economic Geography for Public Administration. *Public Administration Review*, 70, 494-499,348.
- BERRISFORD, S. Unravelling apartheid spatial planning legislation in South Africa. *Urban Forum*, 2011. Springer, 247-263.
- BRENNER, N. 1998. Global cities, glocal states: global city formation and state territorial restructuring in contemporary Europe. *Review of International Political Economy*, 5, 1-37.
- BRENNER, N. & WACHSMUTH, D. 2012. Territorial competitiveness: Lineages, practices, ideologies. *Planning Ideas That Matter: Livability, Territoriality, Governance and Reflective Practice*, 179-204.
- CAMPBELL, S. & FAINSTEIN, S. S. 2003. *Readings in planning theory*, Blackwell Malden, Massachusetts.
- CASTELLS, M. 2014. *Technopoles of the world: The making of 21st century industrial complexes*, Routledge.

- CLARKE, R. & EYAL, K. 2013. Microeconomic determinants of spatial mobility in post-apartheid South Africa: Longitudinal evidence from the National Income Dynamics Study. *Development Southern Africa*, 31, 168-194.
- DAWKINS, C. J. 2003. Regional development theory: Conceptual foundations, classic works, and recent developments. *Journal Of Planning Literature*, 18, 131-172.
- DEPARTMENT OF ECONOMIC DEVELOPMENT 2013. The Space Economy: An important consideration in spatial development planning. Pretoria: South African Cities Network.
- DEPARTMENT OF TRADE AND INDUSTRY 2007. A National Industrial Policy Framework. Pretoria: Department of Trade and Industry.
- DEWAR, D., TODES, A. & WATSON, V. 1986. *Regional Development and Settlement Policy. Premises and Prospects*, London, Allen and Unwin.
- FINANCE AND FISCAL COMMISSION 2012. Local Government Equitable Share Formula Review. Analysis of the Current Local Government Equitable Share Formula. Pretoria: National Treasury.
- FINE, B. & RUSTOMJEE, Z. 1996. *The political economy of South Africa: From minerals-energy complex to industrialisation*, London, Hurst.
- FRIEDMANN, J. 1963. Regional planning as a field of study. *American Institute of Planners, Journal*, 29, 168.
- FRIEDMANN, J. 2001. Regional development and planning: The story of a collaboration. *International Regional Science Review*, 24, 386-395.
- GLASSON, J. & MARSHALL, T. 2007. *Regional planning*, London, Routledge.
- HALL, P. 1992. *Urban and Regional Planning*, London, Routledge.
- HARRISON, J. 2010. Networks of connectivity, territorial fragmentation, uneven development: The new politics of city-regionalism. *Political Geography*, 29, 17-27.
- HARRISON, P. & TODES, A. 2001. The Use of Spatial Frameworks in Regional Development in South Africa. *Regional Studies*, 35, 65-72.
- HEALEY, P. & UPTON, R. 2010. *Crossing Borders: International Exchange and Planning Practices.*, London and New York, NY: Routledge, Wiley Online Library.
- HILLIER, J. & HEALEY, P. 2008. *Critical essays in planning theory*, Aldershot, England, Ashgate.
- HOSPERS, G.-J. & BEUGELSDIJK, S. 2002. Regional Cluster Policies: Learning by Comparing? *KYKLOS*, Vol. 55, 381-402.
- ILEMBE DISTRICT MUNICIPALITY 2014. iLembe District Municipality Integrated Development Plan 2014/2015 Review. iLembe District Municipality.
- JESSOP, B. 2002. Liberalism, Neoliberalism, and Urban Governance: A State-Theoretical Perspective. *Antipode*, 34, 452-472.
- JESSOP, B. 2004. Critical semiotic analysis and cultural political economy. *Critical Discourse Studies*, 1, 159-174.
- KAPLAN, D. 2013. Policy Gridlock? Comparing the Proposals made in three economic policy documents. In: BERNSTEIN, A. (ed.). The Centre for Development and Enterprise.
- KEATING, M. 1998. *The new regionalism in Western Europe: territorial restructuring and political change*, Cambridge University Press.
- KEATING, M. & LOUGHLIN, J. 2013. *The political economy of regionalism*, Routledge.
- LEFEBVRE, H. 1991. *The Production of Space*, Oxford, Blackwell Publishing.
- MALIKANE, C. 2016. Who is in charge of the economy of the developmental state? the state, economic power and the National Development Plan. In: PLAATJIES, D., CHITIGA-MABUGU, M., HONGORO, C., MEYIWA, T., NKONDO, M. & NYAMNJOH, F. (eds.) *State of the Nation South Africa 2016: Who is in charge?* Cape Town: HSRC Press.
- MARAIS, H. 2011. *South Africa pushed to the limit. The political economy of change*, Cape Town, UCT Press.
- MARKUSEN, A. 2003. Fuzzy Concepts, Scanty Evidence, Policy Distance: The Case for Rigour and Policy Relevance in Critical Regional Studies. *Regional Studies*, 37, 701-717.

G. Lincoln. Regional Planning in South Africa: An absent mandate from 1994? 52nd ISOCARP Congress 2016

- MCGUIRK, P. M. 2005. Neoliberalist Planning? Re-thinking and Re-casting Sydney's Metropolitan Planning. *Geographical Research*, 43, 59-70.
- NALEBUFF, B. J. & BRANDENBURGER, A. M. 1997. Co-opetition: Competitive and cooperative business strategies for the digital economy. *Strategy & leadership*, 25, 28-35.
- NATIONAL PLANNING COMMISSION 2011. National Development Plan: Vision for 2030. Pretoria: The Presidency.
- ORANJE, M. & MERRIFIELD, A. 2010. National spatial development planning in South Africa 1930-2010 : an introductory comparative analysis. *Town and Regional Planning* [Online]. Available: http://reference.sabinet.co.za/webx/access/electronic_journals/sm_town/sm_town_n56_a5.pdf.
- PAASI, A. 2012. Regional Planning and the Mobilization of 'Regional Identity': From Bounded Spaces to Relational Complexity. *Regional Studies*, 47, 1206-1219.
- PADAYACHEE, V. 2006. *The development decade?: Economic and social change in South Africa, 1994-2004*, Cape Town, HSRC Press.
- PEARSON, J., PILLAY, S. & CHIPKIN, I. 2016. State-Building in South Africa after Apartheid: The History of the National Treasury. Public Affairs Research Institute (University of the Witwatersrand).
- PECK, J., THEODORE, N. & BRENNER, N. 2010. Postneoliberalism and its malcontents. *Antipode*, 41, 94-116.
- PIKE, A. 2007. Editorial: Whither Regional Studies? *Regional Studies*, 41, 1143-1148.
- PIKE, A. 2014. Local and regional development in the Global North and South. *Progress in development studies*, 14, 21-30.
- PIKE, A., RODRÍGUEZ-POSE, A. & TOMANEY, J. 2007. What Kind of Local and Regional Development and for Whom? *Regional Studies*, 41, 1253-1269.
- PLAATJIES, D., CHITIGA-MABUGU, M., HONGORO, C., MEYIWA, T., NKONDO, M. & NYAMNJOH, F. 2016. *Sate of the Nation South Africa 2016: who is in charge?*, Cape Town, HSRC Press.
- PORTER, M. E. 1998. Clusters and the New Economics of Competition. *Harvard Business Review*, 76, 1-90.
- REPUBLIC OF SOUTH AFRICA 1996. *Constitution of the Republic of South Africa Act (No. 108 of 1996, as Amended)*.
- ROGERSON, C. 2010. Re-thinking the role of regional development funds in South Africa: reflections on international experience. *Town and Regional Planning*, 13-24.
- ROGERSON, C. M. 1998. Restructuring the post-apartheid space economy. *Regional Studies*, 32, 187-197.
- ROGERSON, C. M. & ROGERSON, J. M. 2010. Local economic development in Africa: Global context and research directions. *Development Southern Africa*, 27, 465-480.
- SALGA. 2016. *The Informal Economy* [Online]. The South African LED Network. [Accessed].
- SCOTT, A. J. & STORPER, M. 2007. Regions, Globalization, Development. *Regional Studies*, 41, 191-205.
- STATISTICS SOUTH AFRICA 2011. Census 2011 results.
- STATISTICS SOUTH AFRICA 2015. Mid-year population estimates. In: STATISTICS SOUTH AFRICA (ed.). Pretoria.
- STORPER, M. 1997. *The regional world: territorial development in a global economy*, London, Guilford Press.
- STORPER, M. & SCOTT, A. J. 1995. The wealth of regions: Market forces and policy imperatives in local and global context. *Futures*, 27, 505-526.
- TODES, A. 2004. Regional planning and sustainability: limits and potentials of South Africa's integrated development plans. *Journal of Environmental Planning and Management*, 47, 843-861.
- TODES, A. Reinventing planning: Critical reflections. Urban Forum, 2011. Springer, 115-133.
- TREASURY, N. 2014. Review of Local Government Infrastructure Grants. Draft Report to Budget Forum - September 2014. National Treasury.

G. Lincoln. Regional Planning in South Africa: An absent mandate from 1994? 52nd ISOCARP Congress 2016

TUROK, I. 2010. Towards a developmental state? Provincial economic policy in South Africa. *Development Southern Africa*, 27, 497-515.

VAN DONK, M., SWILLING, M., PIETERSE, E. & PARNELL, S. 2008. *Consolidating Developmental Local Government: Lessons from the South African Experience*, Cape Town, UCT Press.

WELLINGS, P. & BLACK, A. 1986. Industrial decentralization under apartheid: The relocation of industry to the South African periphery. *World Development*, 14, 1-38.

WITTENBERG, M. 2003. Decentralisation in South Africa. *Econometric Research Southern Africa*.

WOOD, A. & VALLER, D. 2004. *Governing Local and Regional Economies. Institutions, Politics and Economic Development*, Burlington, Ashgate.

ⁱ The term “co-opetition” is used to define competing and cooperating for business share of market using game theory and was coined by Ray Noorda, founder of Novell.

ⁱⁱ For example the recent experience of iLembe Municipality in their application for the redetermination of municipal boundaries in 2012 to the Demarcation Board and indecisiveness of outcomes, and current disputes relating to demarcation processes in Limpopo resulting in widespread protests

ⁱⁱⁱ The MTEF is a multi-year budget framework and supports 3 year rolling expenditure plans for national and provincial departments based on department plans, linked to delivery and affordability, the PFMA provides a framework to design planning and budgeting

^{iv} Enterprise iLembe was established by the iLembe District Municipality in 2009 for the primary purpose to drive economic development and promote trade and investment

Residential Spatial Integration of Rural Migrant Population in China¹—A Case Study of Nanjing

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[ABSTRACT] With the end of rapid urbanization period, the urbanization of rural migrants will become the main driving mode of urbanization in China. However, the conversion of rural migrants is tough due to the Urban-rural Dual Economic Structure and Household-registration System. This article takes the rural migrant population in Nanjing as an example to research their residential stability and residential conditions in dynamic perspective and compared in different social attributes, further on, analyze the residential spatial integration of sub-districts in Nanjing. Eventually complement city comprehensive integration system in a newly spatial view and propose appreciated strategies to help rural migrant population integrate into city life.

[KEYWORDS] Rural Migrant Population; Residential Spatial Integration; Residential Condition; Residential Stability

1. Introduction

China urbanization rate has already reached 56.1% in 2015 and entered a deceleration period of urbanization .In order to ensure the healthy transformation of the development of urbanization in the future, the key focus of the urbanization will be on the rural migrants. According to “Report on China’s Migrant Population Development 2015 ” issued by National Health and Family Planning Commission of China, which pointed that China's urban migrant population grew by an average of about 8 million per year and has reached to 253 million (32.2% of the total urban population) by the end of 2014. Among them, the rural household migrant population accounted for more than 80% of the total. Therefore, whether it can be successfully integrated into urban life will be the key to the urbanization of rural migrant population.

Not only does the migrant population’s individuality impact the Integration degree of rural migrant population, it’s also depends on the correlative policies of the inflow destination. In present China, degree of economic development, infrastructure improvement and per capita consumption level in urban areas is much higher than in rural due to the Chinese Urban-rural Dual Economic Structure. Meanwhile, because of the Household-registration System, the rural migrants in cities have inequality opportunities in social welfare and employment as the destination residents have, which brings them a weak position in the destination and difficulties to integrate into the healthy local city life. As the consequence, social segregation, obstacle to the rural migrant population urbanization, appeared.

Thus, this article takes Nanjing as an example, based on the analysis of the rural migrant population questionnaires, to comprehend the residential stability and condition of the migrant

population through a dynamic perspective and analyze their residential spatial integration into the degree, help to determine the status of rural migrant population in urban China and put forward relevant policy recommendations.

2. Literature Review

In this article, "urban integration" refers specifically to rural migrants who integrate into urban in the field of sociology, namely that migrant workers in the mode of production, lifestyles, social psychology generally integrate into urban society and identify their own new social identity and values in the process of this study and status (Yang Jin, 2008; Lv Ke, 2004).

On urban integration, The Western scholars mainly take urban migration as object, and focus on the status of urban integration of foreign immigrants, which take integration of immigrants into the measure using geometric mathematical model, concerning mainly about the immigrant culture, language, level of economic integration. Before 1850s, the Western researchers mainly took European and American countries, Africa and Oceania migrants as the research object, and mainly concerned about the status of immigrants into the city. After the twentieth century, the study of cultural integration was mainly focus on immigrant poverty and the life of the slums and the adaptation of the daily activities. Karl Polanyi in view of the large transition theory put forward an idea of "embedding": immigrants with increasing residence time to adapt to the language, economic integration, cultural identity, immigration will eventually integrate into mainstream American society (Bian Yanjie, 1999). American sociologist Gordon (1964) the first time divided social integration into 7 sub-processes or aspects of cultural integration, structural integration, marriage integration, attitude integration, identity integration, behavior integration and civilized integration. Entzinger (2003) and others believed that the migrants flowing into the community needed to face four dimensions, namely, the social and economic integration, political integration, cultural integration, the subject of social acceptance or rejection of immigrants and so on.

In China, due to the Migrant Worker Tide late in 1980s, it has been a gradual transition to the problem of sufficient urbanization of these rural migrants, and in the mid-1990s the theory of rural immigrant integration problem has appeared. Tian Kai (1995) holds the opinion that the process of urban integration must have three basic conditions for a relatively stable career, a new social status and the same values with the locals, involving three levels of economic, social, psychological or cultural. Ju Li (2002) thus believes that the integration of economic, social and psychological is progressive relations, and economic integration is the foundation. Feng Xiaotian (2004) propose that social integration should be analysed from family economy, daily life, relationships with local residents, productive labor, community identity. Zhang Jijiao (2004) put forward that social integration should be analysed from feelings of urban life, economic life, lifestyle, social interaction, love and marriage and other aspects. Zhang Wenhong (2009) think that social integration of the city's new immigrant contains cultural, psychological, identity (or system) and economy. Although different scholars are slightly different, but in the four levels of economic, social, institutional, and psychological has achieved a fairly broad consensus.

However, research about urban integration in Chinese sociological scholars generally

ignored spatial integration. In fact, the space integration is not only an important manifestation of urban integration, but also an important factor in causing urban integration disorder (Lu Xian guo, 2011). Spatial isolation caused by the integration of the city is also an important aspect of the study of social integration (Massey, 1985 and 1988). And the residential location of the immigrant population and the public residential area forms a certain isolation in the geographical space, which causes materialized forms of social class differentiation in the urban space, and reflects the degree of alienation between migrants and residents. Studying on residential spatial integration is an important perspective to balance urban integration, which is different from the other aspects. Therefore, this article takes rural migrant population as the research object, focusing on their residential spatial integration.

3. Research and Analysis Methods

3.1 Case Selection

Nanjing is located in the lower reaches of the Yangtze River, near the sea, and the capital of Jiangsu Province whose economic development is relatively high. At present China has formed three migrant population metropolitan regions, including Beijing-Tianjin-Dalian, Guangzhou-Shenzhen-Xiamen and Shanghai-Nanjing-Hangzhou that Nanjing belongs to. According to the Sixth National Census (2010), Nanjing residential population was 8.0047 million in 2010, including 1.7487 million migrants (21.8% of the total residential population), however, this figure was only about 700 thousand ten years ago. The problem of migrant population in Nanjing is typical, according to the related researches, migrant population distribute with large quantities, high increasing rate, transform from the second industry to the third industry and leave from the main city to the outer periphery cores, which is in line with the general trend of the development of China's migrant population. Therefore, this article selects rural migrant population living in Nanjing main urban area (gathered 1.6015 million migrant population, accounted for 91.6% of the whole migrant population of Nanjing) as research object, data originally comes from the statistical data of sub-districts in Nanjing main city and sampling survey data from rural migrants.

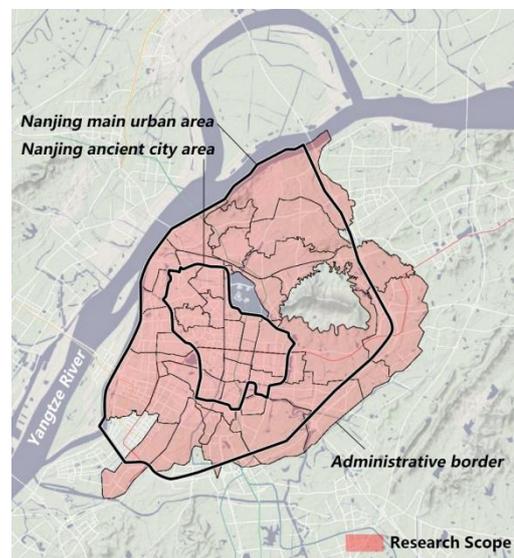


Figure 1: Sketch map of research

3.2 Research Method

The national census data can't cover the social and economic attributes of the migrants, in addition, migrants is a group with strong liquidity, which brings a lot of practical difficulties. The research is based on the sixth national census data, according to the proportion of 3‰ to sample questionnaire among the migrant population who living in 41 sub-districts of Nanjing main city. Respondents are the rural migrant population with typical behavior features whose household-registration not in Nanjing and leaved their registered residences for more than

one month.

Specific research methods:①Visit the management department of the 41 sub-districts in the research scope to locate the gathering areas of migrant population in order to observing their daily living behavior; ②Design the questionnaire and issue in the gathering areas according to the ratio; ③collect and record The valid questionnaires in SPSS to establish a database for analyzing. In this research, 2200 questionnaires were distributed and 1939 valid questionnaires were recovered.

3.3 Analysis Approach

"Residential stability" and " Residential conditions" will be two key indicators through the full text to measure migrants' residential spatial integration degree, and article will be expanded in two aspects—"general trend" and "classification comparison".

Analysis Approaches of article are as following:

①Analysis of general integration degree—Take the sub-district as the statistical unit, illustrate the spatial distribution characteristics of rural migrants' integration through the combination of two indicators("residential stability" and " residential conditions").

②Impact factors distinguished of residential stability—Calculate the moving times of rural migrants to reflect their residential stability; and then analyze social attributes of the migrants and migration times by correlation analysis to distinguish the impact factors to residential stability and analyze the causes.

③Impact factors distinguished of residential conditions—Statistical analysis of the residential conditions of rural migrants; and compare their residential conditions with different social attributes to determine the impact factors to residential conditions and analyze the causes.

4. Analysis of Integration Degree

4.1 Index Quantification

This article uses the migrant population migrating frequency to reflect the “residential stability” index. Residential stability of space unit i (S_i) is calculated as follows:

$$S_i = Avg \left(\frac{Q_a}{T_a} \right)_{(a=1,n)} \quad (1)$$

Where Q_a means the total number of migration of the migrant population (a) in space unit i and T_a represents the length of time when the migrant population (a) lives in Nanjing. The data above is obtained from the questionnaire.

The “residential conditions” index is quantized by average land rent, living space per capita and the perfect degree of infrastructure. Residential conditions of space unit i (C_i) is calculated as follows:

$$C_i = R_i \times Avg(E_a) \times Avg(F_a)_{(a=1,n)} \quad (2)$$

Where R_i , E_a and F_a stand for the average land rent of space unit i , living space per capita of space unit i and the infrastructure ratings of space unit i from three dimensions(kitchen, toilet, water and electricity supply), respectively. The data of R_i is obtained from the internet, while the data of E_a and F_a is available from the questionnaire.

4.2 Analysis Method

Residential spatial integration of the rural migrant population can be measured by the

combination of Residential conditions and residential stability; its main steps are as follows:

(1) Measure of residential stability index & Residential conditions index

Residential stability index (Isi) of space unit i is calculated as follows:

$$I_{S_i} = \frac{1/Sf_i}{Avg(1/Sf_i)_{(i=1,n)}} \quad (3)$$

That is to say, residential stability index (Isi) of one space unit i is equal to the average reciprocal of the total migration number in all space unit i divided by that in one space unit i.

Residential conditions index (Ici) of space unit i is calculated as follows:

$$I_{C_i} = \frac{Cf_i}{Avg(Cf_i)_{(i=1,n)}} \quad (4)$$

Which means that Residential conditions index (Ici) of one space unit i is equal to the average infrastructure ratings of all space unit i divided by that of one space unit i.

(2) Division of residential spatial integration degree

This article uses the standardized index to build a coordinate system. X axis for the residential conditions index, Y axis for the residential stability index. Assume that the two indexes have considerable influence on residential spatial integration degree of migrant population.

According to the analysis above, we can use the intersection point of the residential condition index and the residential stability index as the reference point to draw a straight line with a slope of -1. On this basis, the main city sub-district units of Nanjing can be divided into:

High Degree of Integration Region (Its mathematical expression is $I_{S_i} \geq 1$ and $I_{C_i} \geq 1$);
 Potential Integration Region (Its mathematical expression is $I_{S_i} \geq 1$, $I_{C_i} < 1$ and $I_{S_i} + I_{C_i} \geq 2$ or $I_{S_i} < 1$, $I_{C_i} \geq 1$ and $I_{S_i} + I_{C_i} \geq 2$);
 Low Degree of Integration Region (Its mathematical expression is $I_{S_i} + I_{C_i} < 2$)

4.3 Analysis Results

Using calculation formula 1, 2, 3 and 4, we can get “stability index-Condition index” scatter plot. The residential spatial integration degree of rural migrant population can be got by projecting the scatter plot to the coordinate system above. To visualize the results, we can combine the scatter plot with the density map of migrant population in Nanjing to produce a sketch map of the residential integration degree of rural migrants population, according to which we can grasp the distribution and integration degree of rural migrants in Nanjing.

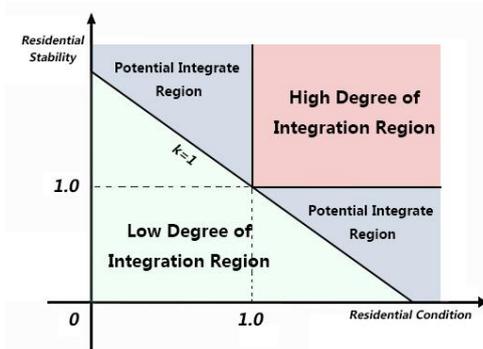


Figure 2: Integration area classification of residential spatial based on stability index and condition

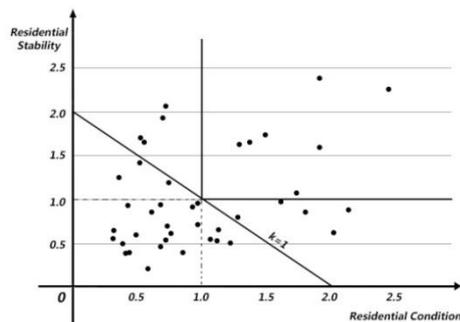


Figure 3: "Stability index-Condition index" scatter plot based on data of administrative regions

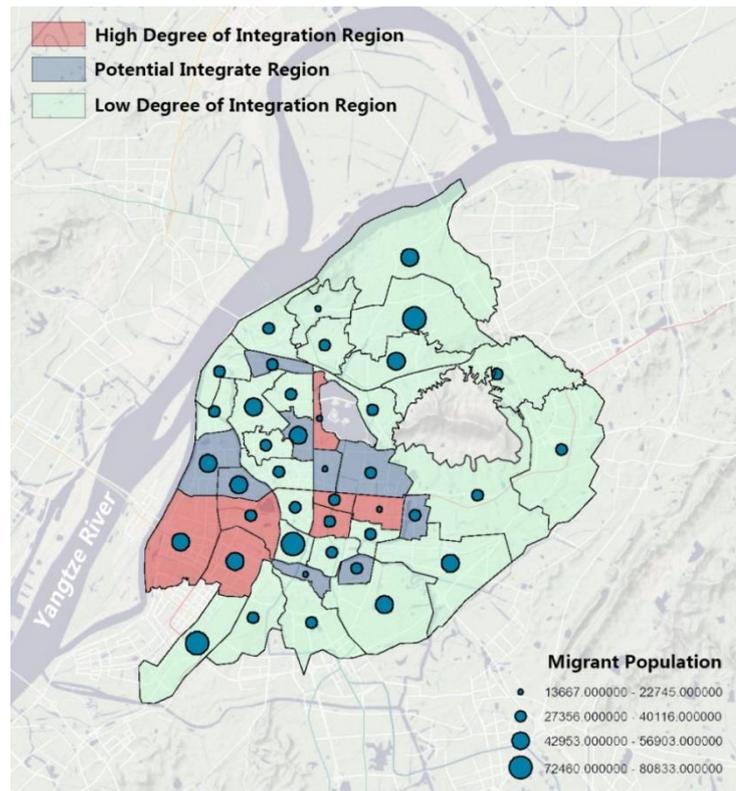


Figure 4: Sketch map of the residential integration of rural floating population in Nanjing City (*Source: The Sixth National Census 2010)

The analysis found that residential spatial integration of the rural migrant population in Nanjing shows an obvious agglomeration and polarization phenomenon centering the old city center area and the southeastern Hexi CBD. The spatial integration of the main city periphery is significantly lower. It can be seen that the residential integration of the rural migrant population in Nanjing is closely related to the economic development of the sub-district. The main reason is that the regions with higher levels of economic development tend to have more convenient traffic conditions, better infrastructure, more employment opportunities and the possibility of integrate into the local life. However, the higher rents in such areas limit the entry of a large part of the rural migrant population, as shown in the following table:

Tab. 1: Number of migrant population in different integration degree regions in Nanjing (*Source: The Sixth National Census 2010)

	High Degree of Integration Region		Potential Integration Region		Low Degree of Integration Region	
	Quantity	Proportion	Quantity	Proportion	Quantity	Proportion
Sub-districts	7	17.07%	9	21.95%	25	60.98%
Population	231739	14.47%	314822	19.66%	1054937	65.97%

The three categories of Nanjing rural migrant population residential spatial integration degree accounted for 17.07%, 21.95% and 60.98% of the total amount of space units respectively. If the migrant population information is included in the statistics, the migrant population living in the three categories accounted for 14.47%, 19.66% and 65.97% of the

total number of migrant population in the main city of Nanjing. It can be seen that the number of migrant population living in a high degree of integration sub-districts is relatively small, while the vast majority of rural floating population live in relatively low integration degree sub-districts.

In summary, Nanjing migrant population integration degree presents an obvious segregation phenomenon. High integration degree sub-districts are concentrated in the two main city center area, separating from the city peripheral low integration areas. While the vast majority of rural floating population live in relatively low integration degree sub-districts of city periphery.

5. Impact Factors Distinguished

5.1 Discrimination of Residential Integration Degree Impact Factors

By reference to the relevant literature and theoretical results, the factors have influence on residential integration degree can be roughly estimated as follows:

(1) Gender Structure

Since ancient times, division of labor between male and female in China has created the “men outside, women inside” model in which women are generally responsible for taking care of the family. This situation makes rural women subject to many conditions when seeking employment outside home, and in a weak position while competing with men of the same level. Therefore, this article intends to take gender structure as one of the impacting factors and use “the proportion of male migrants” index of Nanjing sub-districts to indicate it.

(2) Age Structure

Chinese farmers possess strong local complex which will gradually increase while they grow older. In other words, the migrant population may be more inclined to see the city as a work place to earn money. Their final purpose is to return to the country life. Therefore, this article intends to take age structure as one of the impacting factors and use “the average age of migrant population” index of Nanjing sub-districts to indicate it.

(3) Income Level

Income level reflects the material life conditions and the general consumption level. Generally speaking, people with higher income level have a relatively large potential to adapt to urban life. Therefore, this article intends to take the income level of rural migrant population in Nanjing as one of the impacting factors and use “the average household monthly income of migrant population” index of Nanjing sub-districts to indicate it.

(4) Education Level

The education level of rural migrant population has direct influence on their social scope and employment level. In general, the higher educated people have a stronger will to settle down in the city than the lower educated people. Therefore, this article intends to take the education level of rural migrant population in Nanjing as one of the impacting factors and classifies it into three categories: college and above, middle school and primary school or below.

(5) Household Registration

The free flow of population is blocked by long term household registration system in China, especially for the rural population. The location of one individual's household registration often determines the maximum range of his activities. Therefore, this article

intends to take the household registration condition of rural migrant population in Nanjing as one of the impacting factors, and classifies it into six categories: north China, east China, northeast China, South China, southwest China and Northwest China.

(6) Career Distribution

The employment conditions of rural migrant population have immediate impact on their economic behaviors which are the key to the problem whether they can integrate into the city. Therefore, this article intends to take the career distribution of rural migrant population in Nanjing as one of the impacting factors, and classifies it into five categories: management personnel, technical personnel, service personnel, manual labor personnel and unemployed.

5.2 Analysis of the Overall Sample Status

According to the questionnaire data, the overall characteristics of rural migrants according to the factors above can be understood as follows:

Tab.2: Demographic profile of the migrant population samples(n=1939)

Factors	Sample Quantities(Proportion)
Gender	Male 1087 (56.06%) , Female 852 (43.94%)
Age	Average age:38.49
Income Level	Average household monthly income: ¥4767.39 (\$ 731.33)
Education Level	Never schooled136 (7.48%) , primary school 448 (24.64%) , middle school 671 (36.91%) , high school 362 (19.91%) , university 190 (10.45%) , above university 9 (0.49%)
Household Registration	north China (1.46%) , northeast China (1.12%) , east China (83.89%) , middle China (7.41%) , South China(0.22%) , southwest China(2.36%) , Northwest China(2.41%)
Career Distribution	management personnel (1.41%) , technical personnel (7.52%) , service personnel (71.60%) , manual labor personnel (17.28%) , unemployed (2.19%)

As can be seen in the table, the gender ratio of male and female in rural area is almost equal in Nanjing, and the male population is slightly more than the female. The group is mainly middle-aged, with an average age of 38.49. Their overall income level is low, with an average household monthly income of ¥4767.39 (\$ 731.33). Their education level is poor; the vast majority of them only received primary and junior high school education while the proportion of people with a college degree or above is only 10.94%. The source of the migrant population is single, 83.89% of them come from east China, and people among them with Jiangsu, Anhui Province rural household registration accounted for the vast majority. They are mainly engaged in the service industry in the city (including retail vendors, service personnel, etc.) and manual labor related industries (including the construction industry, etc.), as well as part of the staff (2.19%) is unemployed.

To sum up, the rural migrant population in Nanjing mainly comes from the underdeveloped areas surrounding Nanjing, the overall quality of this people is low, the age is old, the industry the engaged in is relatively low-end.

5.3 Impact Factors Quantitative Validation of Residential Integration

On the basis of qualitative prediction, this section will use the SPSS to focus on gender, age, income, educational level, household registration, occupation, and other factors' impact degree of the rural migrant population.

It can be seen from table 3 that except for "Household Registration" index, the remaining 5 factors included in the model have significant correlation.

From a gender perspective, Gender Structure have a moderate correlation with residential stability ($0.5 < |OR| < 0.8$) and a weak correlation with residential conditions ($|OR| < 0.5$). So gender has a certain degree of influence on the rural migrant population integration. As the proportion of male migrant population increased, the degree of integration showed a downward trend. That is to say, women have higher integration degree than men in the aspect of space integration. We can draw a conclusion that women are not in a weak position among the rural migrant population in Nanjing, which is contrary to our initial hypothesis.

From the age point of view, age have no correlation with residential stability but a moderate correlation with residential conditions ($0.5 < |OR| < 0.8$). So age also have a certain degree of influence on the rural migrant population integration. As the age increases, the degree of integration declines. This result is the same as our first hypothesis

From the income Perspective, income level has a moderate correlation with residential stability ($0.5 < |OR| < 0.8$), but no correlation with residential conditions. Therefore, the income level has a limit impact on the rural migrant population integration. This reflects the rural migrant population in Nanjing does not tend to use their income to improve their residential conditions. In contrast, they need a stable living environment.

In terms of education level, we can see that there is a strong correlation between education level and the rural migrant population integration degree. The proportion of people with primary and lower education level showed a negative correlation with residential stability and residential conditions; the proportion of people with middle school education level showed a positive correlation with residential stability and residential conditions; while the proportion people with University and above education degree showed a positive correlation with residential conditions. This finding indicates that the migrant population with a higher educational degree is easier to integrate into the city life, and whether they have a high school education background is one of the key factors to manage that. That is to say, the rural migrant population with at least middle school education background can be easier to gain a foothold in the city.

In terms of career, it can be seen that the industry that the migrant population engaged in has a strong correlation with residential integration degree. The proportion of people engaged in service industry has a positive correlation with residential stability and residential conditions; while the proportion of people engaged in physical labor industry and unemployed have a negative correlation with residential stability and residential conditions. This shows that engaging in the service industry (including retail traders, service personnel) makes it easier for them to integrate into the city life, while engaging in manual labor related industries (including construction, etc.) makes it difficult for them to integrate into the city life.

Tab.3: Bivariate correlation analysis on residential integration-influential factors of rural migrant population in Nanjing

	Factors	Residential Stability			Residential Condition		
		Pearson Correlation	Sig. (2-tailed)	N	Pearson Correlation	Sig. (2-tailed)	N
Gender	Male proportion	-.578**	0.000	41	-.362*	0.020	41
Age	Average age	-.264	0.095	41	-.555**	0.000	41
Income	Average monthly income	.457**	0.003	41	.151	.346	41
Education	Primary school or below	-.395*	.011	41	-.666**	.000	41
	Middle school	.416**	.007	41	.485**	.001	41
	University or above	.136	.395	41	.479**	.002	41
Household Register	North China	.198	.215	41	.330*	.035	41
	Northeast China	.005	.976	41	.239	.133	41
	East China	.037	.820	41	-.157	.326	41
	Central China	.016	.921	41	-.199	.212	41
	South China	-.172	.283	41	-.021	.897	41
	Southwest China	.042	.794	41	.147	.359	41
	Northwest China	-.041	.801	41	.170	.287	41
	Career	management personnel	.061	.707	41	-.030	.851
	technical personnel	.019	.906	41	.151	.347	41
	service personnel	.359*	.021	41	.595**	.000	41
	manual labor personnel	-.400**	.009	41	-.658**	.000	41
	unemployed	-.207	.195	41	-.457**	.003	41

*.Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Through above analysis, we verified the relevant factors that have impact on the rural migrant population integration degree. From which we found the relatively vulnerable groups: ① old age(age > 45)rural migrant population; ② low income(average household monthly income < ¥ 2000 (\$ 306.17))rural migrant population; ③ rural migrant population with education degree under middle school; ④ rural migrant population engaged in manual labor related industries. In the next section, we will provide advice to help the above people to better integrate into the city in space.

6. Conclusion

This article takes "residential stability" and "living conditions" of rural migrant population as quantitative indicators to characterize the degree of residential spatial integration, and analysis the relevant impact factor. It is found that the status of integration of Nanjing rural migrant population exists obvious differentiation phenomenon, closely related to the level of socio-economic development of all regions. But the vast majority of migrants lives in the low degree of integration areas of the city, so that the status of this marginalized population was

unable to construct identification of the city life, urban culture value, as well as the future plan of urban life. At the same time, the migrants of low integration degree are showing "two low and one high" (low education, low income, elderly) features, and mostly manual workers, so that this part of migrants is in weaker position. Therefore, the city should take needs of more rural migrants into account in policies and systems, social management and public participation, while increasing investment in human capital in this part of the group, to enhance their social competence. Along this line, this article makes the following proposals:

(1) Improve the labor market, and increase employment opportunities

Most rural migrants engage in dirty and tired work and labor intensity is too large. In the current Chinese labor market, this group is at a disadvantage in both labor and capital sides, which makes their legitimate rights are not appropriate safeguards and employment are also facing discrimination in the job market. Therefore, the government and relevant departments should improve the regulatory of labor market and take rural migrants institutionalized into the urban labor market system and city public welfare services, developing resources and power from all sectors of society, to provide safe and effective information such as consulting services, employment and training, life support and other related information.

(2) Strengthen the social security system, and pay more attention to social fairness

With the large-scale rural migrants flowed into cities, a large number of them have to be excluded from the urban social security system because of no urban household registration. With the gradual advance of urbanization in next few years, there will be a large number of rural population to cities and eventually become urban residents, so the establishment of a social security system for migrant workers is an inevitable trend. Vigorously promote social security case of rural migrants to enable them to enjoy the achievements of social development and social security rights and interests, not only to facilitate their integration into the city proper meaning, but also to fully demonstrate the principle of fairness of social security. This case both highlights the humanistic care in urban and rural development and the idea of social harmony, and helps to achieve social equity.

(3) Promote participatory of urban life, and provide opportunities for social participation

With establishment of a management system called "small government, big society", the city government should provide more opportunities and channels of social participation for rural migrants to make participation more effective in city life, especially those who involved in design and modification process of management system related to their interests, in order to give them opportunities to express their views to accelerate the process of integration into the society. All levels of government and society should be adhering to the "people-oriented" concept of governance, keep building a harmonious society strategic layout, and attach great importance to effectively address the problems of space integration of rural migrants.

(4) Increase investment in human capital, and strengthen education and training

Low quality of rural migrants themselves is one of its urban integration obstacles, and to some extent, the level of education determines their occupation and social status in the inflow. From their own point of view, less educated and lack of experience and technique is a major obstacle they meet. If rural migrants can get good education and training skills, it is helpful to enhance their economic status and improve their quality, but results of this investment by government and employers is not ideal. Strengthening investment of rural compulsory education and upgrading the environment for basic education in rural areas can effectively

enhance the human capital of rural migrants; strengthening vocational training, allow them to meet the needs of labor employer better.

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Reference:

- Bian Yanjie (1999) Social network and job search process, Hong Kong: Oxford University Press.
- Entzinger H, Biezeveld R (2003) Benchmarking in Immigrant Integration, Rotterdam: Erasmus University Rotterdam.
- Feng Xiaotian (2004) The Social Adaptation Situation of Rural Migrants of the Three Gorges, *Sociological Studies*, No.5: 19-27.
- Gordon M (1964) Assimilation in American Life, New York: Oxford University Press.
- Lv Ke (2004) On the main obstacles to the existence of migrant workers in the public, *Journal of Chengdu municipal Party School of the Communist Party of China*, No.2.
- Lu Xianguo (2009) Spatial Segregation and Concentrating Survival Way: the Social Distance between Rural Migrant Workers and Citizens, *The Journal of Gansu Administration Institute*, No.4: 61-87.
- Massey D S, Denton N A (1985) Spatial Assimilation as a Socioeconomic Outcome, *American Sociological Review*, Vol. 50 No.1:94-106.
- Massey D S, Denton N A (1988) The Dimensions of Residential Segregation, *Social Forces*, Vol. 67 No.2: 281-315.
- Ren Yuan, Wu Minle (2006) Social Integration of Floating Population in Urban China: a Literature Review. *Population Research*, Vol. 3 No.3: 87-94.
- Tian Kai (1995) The Analysis and Investigation of Urban Adaptability of Migrant Workers. *Social Science Research*, No.5: 90-95.
- Yang Liyuan (2007) Exploration into Eight Major Problems in Process of Social Integration of Migrant Population, *Journal of Ningbo University (Liberal Arts Edition)*, Vol. 20 No.6: 65-70.
- Zhang Jijiao (2004) The "Differential Mode of Association": From Rural to Urban Version--With Examples of the Migrants' Urban Employment, *Ethno-National Studies*, No.6: 50-59.
- Zhang Wenhong, Lei Kaichun (2009) Structural Equation Model of the Social Identifications of the New Urban Immigrant, *Sociological Studies*, No.4: 61-87.
- Zhu Li (2002) On the Urban Adaptability of the Peasant-worker Strata, *Jianghai Academic Journal*, No.6: 82-88.

A Critical Analysis on the Applicability of Previously established Theoretical Growth Models in Post-Apartheid South Africa: The Case of the Durban Metropolitan Area.

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Abstract: This study seeks to inform the apparent mushrooming of new developments towards the north of Durban as a result of the change in development patterns visible in the Durban Metropolitan Area (DMA). These changes have often been seen to be in concurrence with the development of a new set of growth needs, which go beyond physical development as the main tool for city growth. With that, the study seeks to then investigate the applicability of previously used growth models- the Burgess Concentric Zone Theory, The Hoyt Sectoral Theory and Bid Rent Theory- in the further development of Post-Apartheid Durban- observations based on the years 2010 to 2015. This analysis will be made by comparing and contrasting the factors that are currently spearheading new developments (as compared to previous factors) in the Durban Metropolitan Area (DMA) and the extent to which current growth trends are following these previously used growth models. The discussion seeks to explore the notion of African cities reshaping themselves to more relevant development trends that speak to the unique pressures and needs of the city. The variety of policies, regulations and frameworks formulated from region to region are an indication of the need for the creation of environments that are relevant to each region, thus responding to the various needs.

Introduction

The location of the city of Durban was the beginning of an enormous spatial development boom. These developments took shape through the various periods within South Africa's history such as Colonisation, Apartheid, the industrial period and the current patterns of decentralization to the North and West of the city (EThekweni Municipality, n.d). Various development patterns have thus been replicated and evolved to suit the social character of Durban.

In a reading by Alison Todes (2008) an understanding on the development patterns that are visible in Durban (South Africa) is provided, by comparing and contrasting the various factors that have affected development pre and post- 1994. Her reading is based on the need to shift from an Apartheid spatialized city to one that provides access to high density housing units, which are in close proximity to places of work and home, mixed land use systems and encourage social integration. This ideal description of an enabling environment is drawn from the ideas of Jane Jacobs, who advocates on creating socially relevant urban environments. Durban (South Africa) is discussed as one of the cities that seem to emerge and develop along the patterns of existing international spatial developments.

Urban policy is also criticized for creating division, fragmentation and sprawl. McCann (2003) seeks to give insight on urban politics and the degree to which politics shape the urban environment by showcasing the various strategies and elements of the political environment that affects the scales of development. The reading speaks of urban governance as a player in the shaping of development patterns and draws attention to two aspects, the privatization of policy making power and the rise and forms of decision making. This paper will exam the development patterns used to develop the Durban Metropolitan Area (DMA) and the extent to

The discovery of gold in South Africa led to numerous developments in attempt to harness the exporting of the mineral out of the country. One of these as the further development of the harbour, which was initially intended for the shipping in of settlers and labourers who were working on sugar cane fields (EThekwni Municipality, n.d). With the increase in the need to trade gold, the functions of the Port increased dramatically with marine industries mushrooming at the harbour as well as commercial uses including ship building, stevedoring (the loading and offloading of cargo) and chandling (the retail dealing of shop equipment) (EThekwni Municipality, n.d). In 1900 this port node began the development of infrastructure services to harness the growth and liveability of the area as well as transportation in the form of a railway system, transporting goods and people in and out of the city area. By 1932 residential units were visible and in 1935 Durban was given city status (EThekwni Municipality, n.d). Some of the early residential spaces/ units are still visible along the Point development area, which lies opposite the main Port harbour- which is under the jurisdiction of Transnet. The land uses in the area by 1935 included the industrial, economic (commercial) and residential uses.

The spatial plans of the Durban Central Business District (CBD) were further fragmented by Apartheid (EThekwni Municipality, nd), where race and colour were seen as a determinant of the social make up of a specific area. Areas demarcated for Whites were closer to the cities CBD area which had employment opportunities, office space, recreational areas as well as commerce. This was guided by the Group Areas Act (1950) which also saw the evolution of townships- on the urban fringes- as well as the creation of formal housing on the north and south of Durban. Post-apartheid, the spatial form of Durban changed with massive increases in informal settlements and land invasions- along the peripheries- as the population is in sought of opportunities. Housing subsidies began to mushroom around peripheral areas as a



Figure 2: The Land Uses feeding off from the Durban Port (Google Maps, n.d)

means of informal settlement upgrading and began moving closer to the city. Twenty one years into democracy, land use models have shifted away from the conventional Modified Davies' Apartheid City Model as well as other international models- Burgess Concentric Zone Theory, The Hoyt Sectoral Theory and Bid Rent Theory. With this change, there is an apparent outward shift of development towards the North Durban's main CBD area- which has become

degraded- and developments follow various land use patterns that speak on compaction integration (Cilliers, 2010).

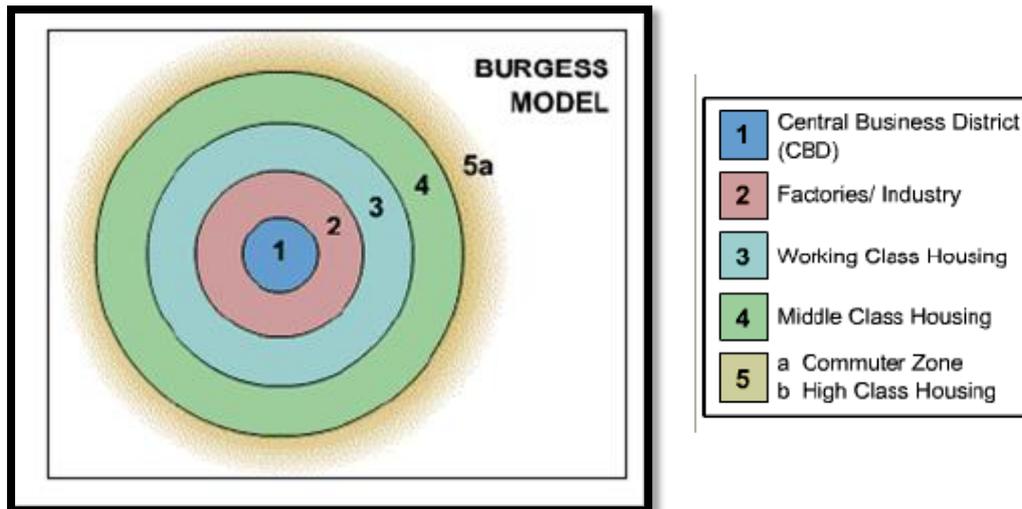
Decentralization out of the Durban Centre Business District (CBD) to the North of Durban has been noted as a result of new developments mushrooming around the development plans of Tongaat Hulett Development and Dube Tradeport. The new developments are coupled with residential growths, commerce, highways and lower land costs which have attracted the population towards this area. This development node includes a regional shopping Centre (Gateway Theatre of Shopping), entertainment complexes, golf estates, further high income residential units and the new King UShaka airport. Previously, this compaction integration development tool as a concept was declined following its critique for creating spatial division- since it creates individual centers in which developments sprout from. However, recently, this concept has been acknowledged for positioning Durban as a possible 'World Class' city.

Background of the three Theoretical Growth Models used in the study.

Shettar (2013) defines theoretical Growth Models- also referred to as Land Use planning models- as guides that have been developed by various scholars in attempt to understand the patterns of development that are visible in various cities of the world. Very often when these models are implemented they have been criticized for failing to understand the unique needs and environments of the cities in which they are being replicated in (Shettar, 2013). In the implementation of these models it is very important to understand that they should only serve as guidelines and not 'stencils' of development. Three theoretical growth models- the Burgess Concentric Zone Theory, The Hoyt Sectoral Theory and Bid Rent Theory- were previously used in the guiding of the growth of the spatial developments of the Durban Metropolitan Area. The principles and limitations of these models will be discussed to guide this paper.

1) The Burgess Concentric Zone Theory

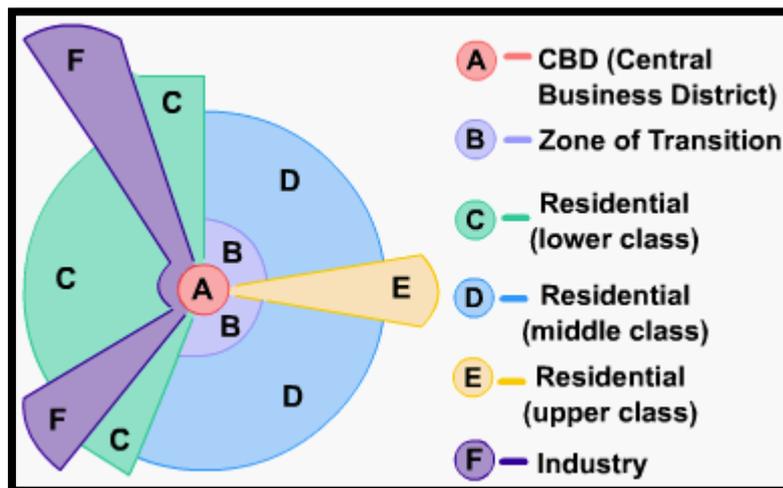
According to Bunyi (2010), the Burgess Concentric Zone Theory is a model that was used to explain the internal structure of the city as a pattern of social groups that are arranged in rings. Originally based in Chicago, the model assumed that Chicago's growth emanates from the center of the city and moves outwards in a series of rings. This outward movement is confirmed to a specific social structure of the city which follows the central CBD area (1); the transition zone of mixed residential and commercial uses (2); Low-class residential homes-inner suburbs (3); better quality middle-class homes- outer suburbs (4) and the commuter's zone (5a) (Burgess, 1925). The suggestion made by this model is that the lower class is most likely found closer to the city centre and the upper class population is found further away from the city centre- which is less dense as you move outwards. Since rent is cheaper closer to the centre of the city- and increases further from the centre- the city is able to accommodate the lower class who are in search for, and is thus denser (Bunyi, 2010).



The Burgess Concentric Zone Theory (Burgess, 1925)

2) The Hoyt Sectoral Theory

The Hoyt Sectoral theory is believed to be very similar to the advocacies of the Apartheid Model of development. This theory suggests that the city grows in the formation of series or wedges in which follow each other according to class and class following a pattern of land uses- along communication (rivers, railways or roads) routes (S-Cool, n.d). It was found in



The Hoyt Sectoral Theory (S-Cool, n.d)

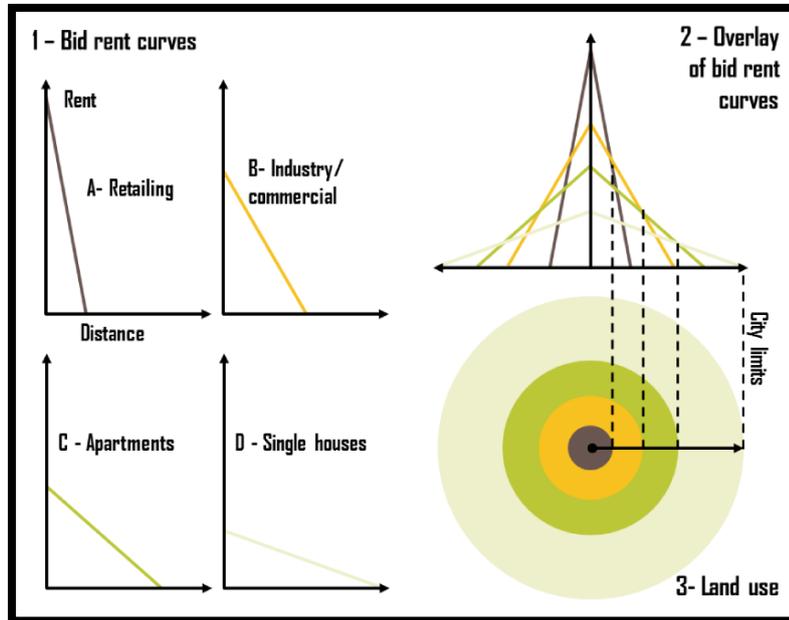
most cases that the industrial zone would be followed by the lower class developments, which was separated from the upper class zone by means of developing a middle class zone in the middle as a physical barrier. Like the Burgess Concentric Zone, this theory suggests that there is an urban core (CBD) in which all development mushrooms around (S-Cool, n.d).

3) The Bid Rent Theory

The Bid Rent Theory speaks on the price phenomena that land closer to the CBD area is more expensive than land that is closer to the urban peripheries (Cilliers, 2010). This is due to issues around accessibility to the CBD which is the core of the city in which transactions and swapping of goods and services is done. Thus there is competition between the land uses to ensure that they are closer to the CBD area, so as to cut costs of transportation when travelling to or from the cities CBD (Cilliers, 2010). The theory also states that there is competition for

land that is in close proximity to transportation routes, thus also ensuring accessibility. Residential areas are usually developed away from the CBD- along transportation routes- areas to ensure that they are away from the noisy and polluted city centre (away from industry) (Cilliers, 2010). Therefore the rationale behind the theory is that land is expensive if:

1. It is located closer to the CBD area;



2. It is located along transportation routes.

The main purpose then becomes 'accessibility' (Cilliers, 2010). This means that urban growth is expected to grow outwards in the direction of the cities peripheral areas (horizontally ribbon growth); or alternatively to grow along transportation routes. In its name the Theory implies that the highest buyer/bidder attains the most favourable land that is closer to the city, however benefits in the long run with transportation being cut down (Cilliers, 2010). The expected pattern of land uses in the Bid Rent Theory follows a city centre in the centre of the middle, followed by retail, then industry/commercial, residential apartments in the third ring and lastly, single houses being the furthest distance from the city centre (on the city limits/ peripheries).

Pre 1994 theoretical growth models such as the Burgess Concentric Zone Theory, The Hoyt Sectoral Theory and Bid Rent Theory were used as a template to guide and fulfil spatial requirements that were seen as necessary in creating a holistic environment. Post 1994 the Durban Metropolitan Area (DMA) has seen various changes in growth patterns that are coupled with a variety of needs -that are the factors necessary- in modern developments. There seems to have been an extensive change from what originally sparked 'holistic developments' pre 1994- which was physical developments- to a more socio-economic approach to development between 2010- 2015 (Post 1994). This paper seeks to discuss and contrast between the 3 growth models (Burgess Concentric Zone Theory, The Hoyt Sectoral Theory and Bid Rent Theory) and the various growth trends that are currently shaping the development of the DMA.

A statistic by Vacchiani-Marcuzzo (2005) on the Urban Population of South Africa between 1911 and 2001, shows an increase of urban areas- with over 5000 people- increasing from 25

to 307. With an increase in the number of urban areas there was a total 95, 7% increase in the total urban population from 1911-2001. However, according to Turok (2012) there are debates around the inaccuracy of population indicators, pre-1994 that assume the unreliability of statistics presented by the colonial and apartheid government. During this time, both governments did not attempt to collect census data on the black population, totally excluding a majority of the South African population from development indicators (Turok, 2012). It can then be assumed that the inaccuracy of development indicators may have given a false assumption on the spatial urban needs of the country- thus utilizing incorrect and insufficient growth patterns for the large population (Davies, 1963). The underlying question is whether the previously established theoretical growth models such as the Burgess Concentric Zone Theory, The Hoyt Sectoral Theory and Bid Rent Theory- still apply to the spatial development needs of post-apartheid (years 2010- 2015) South Africa?

Discussion

Mabin and Smit (1997) recapture the various adjustments of the spatial restructuring of South African cities over the various periods of time. The residual impacts of the Apartheid and Colonial City formations are still visible in the spatial planning of the city. The Colonial period introduced the Township Establishment Plan which replicated British used development plans in the constructing of South African cities. Amongst many, the Burgess Concentric Zone Model, the Hoyt Sectoral Model and the Bid Rent Theory were used to shape the cities Post-1994. All three growth models assume that the city has one urban core in which the business district is and has various zones that vary in class in which society builds around. The introduction of the Apartheid era after the Colonial period, saw the unequal distribution of access to land uses amongst the various races, since the Urban Core areas were only restricted to the White, totally neglecting the majority. Davies (1963) argues that with democracy and the need for spatial reconstruction, came the need for more land uses. The urban core with limited space can no longer fulfill the socio-economic needs of current developments and there has been a resulting shift in development patterns.

Polycentric Development Approach

Cilliers and Schoeman (2008), present a new development model that is key for South African cities which are currently facing the constraints of colonial development models that were enforced onto the cities. Polycentric development models present the possibilities of the development of major economic nodes outside of the Central Business District as opposed to the monocentric design of formerly used theoretical growth models, The Burgess Concentric Zone Model, the Hoyt Sectoral Theory and the Bid Rent Theory. Greed (1996), presents the need for cities to adjust and adapt to various changes over time. These changes are no longer only dependent on physical changes but are dependent on the socio-economic position of the city which is ever-changing and includes increasing population growths, fluctuating markets, new innovations and changing policy.

Sustainable Urban Form

Urban sustainability speaks to the ability of a city to sustain itself socially, environmentally and economically (Cameron, 2000). This can be achieved through the ability to maintain the urban system of a city by balancing the three main components. Sustainable development can be described as the development of the society to benefit human beings by meeting their needs at present without harming that of the future generations. This is done by utilizing natural resources rationally, replenishing and preserving those in existence, (Ceigis et al, 2009).

Sustainable Development has commonly been associated with sustainable urban form and has been a restructuring tool in the rejuvenation of urban areas. In attempt to create these sustainable cities, a set of policy and regulations have been put in place in developing countries like South Africa to harness (Cameron, 2000) and ensure that modern cities materialize into *Sustainable Urban Forms*. Sustainable Urban Form, seeks to move away from the conventional development of cities through the adopting of previously used growth models, which were simply replicated into South African spatial plans (Jenks and Burgess, 2000). Sustainable Urban Forms are attainable through city designs that promote compactness (Jenks and Burgess, 2000), where extra costs on transport, infrastructure, products and people are minimized by the ability to combine land uses into one common area (Econhist, n.d). Sustainable Urban Form thus describes the pattern of compaction that South African cities are slowly transforming into (Adebayo, 2012), slowly moving away from formally used theoretical growth patterns, which separated land uses through various rings or zones thus restricting pedestrian movement and limiting access to recreational zones- which were not considered necessary. Sustainable Urban Forms are thus seen as highly densified since a lot of activities are visible in a single common area (Econhist, n.d). Compactness as a sustainable urban form can be used to achieve urban sustainability and increased standard of life (Econhist, n.d).

Way Forward: Towards A More Enabling Spatial Environment

1) Out-of-town Retailing

Greed (1996) explains the phenomenon of new developments moving out of the city towards the urban periphery as a result of 'Out-of-Town Retailing'. Out-of-Town Retailing is the idea of the migrating and development of new business districts out of the urban core or Central Business District (CBD), followed by the mushrooming of land uses around the new developments (Greed, 1996). The mushrooming is coupled with new employment opportunity that attract residential developments closer to these new commercial arenas. With residential developments the need for an extension of land uses then rises, which respond to the growing socio-economic needs of the changing society. This development concept thus rejects the theoretical growth models –which were previously used- which are not flexible to adapt to changes in population, socio-economic needs and land uses (Davies, 1963). The Durban North area which is situated in the DMA is currently experiencing 'Out-Of-Town Retailing', where visible economic nodes have been developed in relation with Dube Tradeport and Tongaat Hulett Development, who have played a big role in the development of what seems to be the creation of a new Central Business District towards the North (NCBD). An impact assessment was done by Tongaat Hulett Development in 2012 to highlight the needs (supply and demand of the economic market) and desirability (socio-economic needs) of the development of a proposed Compensation Industrial and Business Estate (CIBE) development in the Durban North Area (THD, 2012). With this CIBE development some of the land uses that were proposed to accompany this development included industry, commercial, mixed use zone, residential, an open space system as well as a bulk infrastructure and services zone (THD, 2012: 3). Durban North is an example of the concept presented by Greed (1996) in the sense that it proves the moving out of land uses from the Urban Core as a result of the commercial industry moving towards the North (Green, 1996).

2) Compact Cities

The concept of Compact Cities is used to describe the notion of creating mixed use urban environments that are compact. Here, urban activities and land uses are close to one another to accommodate and create better a better quality of life for those living within the area. The compaction and closeness of land uses enables convenience and easy access to other land uses which encourages walkability, cycling and more economical pooling of infrastructure services. The ultimate purpose of Compact Cities is to create communities that are compact and enabling to the society living within them. According to Jenks and Burgess (2000), Compact Cities are an important tool in attaining urban sustainability since the concept promotes the creation of balanced cities that consider social, economic and environmental elements in development (Jenks and Burgess, 2000). Compact Cities seek to promote environmentally viable neighborhoods that are also pedestrian friendly in the sense that the compaction of land uses in one common space allows and promotes walkability, cycling and transit as a form of accessibility to the various amenities. One particular concept that can be utilized to promote the principles of compact cities in South African cities, is New Urbanism. The ability to reduce the use of motor vehicles in neighborhoods, enables for low car emissions and the creation of more green spaces and throughways, thus rejuvenating urban areas significantly.

3) African Cities

In a study by Cameron (2000) which highlights and attempts to give an indication of the future of South Africa, shows that the shifting of South African cities is purely a result of various economic, social, political, environmental and technological changes that have occurred over time and have impacted the direction in which development is to occur (Cameroon, 2000). African Cities can then be described as the phenomenon that seeks to explain the reformation and restructuring of previously colonized regions in and around the African continent, in a way that is suitable and viable to the society that inhabits it (UN-Habitat, 2014). African cities reflect the nature of Africa's rapid state of development. These cities have mixed designs and neighbourhoods as a result of historical colonialism and traditional areas. Current African cities remain mixed and made up of various influences (Davies, 1963) including the Apartheid model, European and American models which all attempted to 're-imagine African urbanism' (UN-Habitat, 2014). Currently, the impacts of these models, the increasing population numbers and the increase in urban growth, have indicated the inability of these previously used models to adjust to changes and growing spatial needs (Adebayo, 2012). Ultimately, the sense of cities recreating and reshaping their form rejects the theories of previously used growth models which were implemented on a replication basis and not to entirely suit the development needs of African cities. Post- 1994, various studies and debates around the possibilities of 'African Cities' as Sustainable Urban Form are underway by Jess and Burgess (2000) where it has been noted that perhaps developing countries continue to remain developing countries due to their inability to adjust and replicate development models of developed countries (Jess and Burgess, 2000).

Precedent

1 International Experience

Britain: Retail Decentralization

In a study by Greed (1996), a case study on the retail transition period of Britain (Cribbs Causeway- Northern edge of the Greater Bristol urban area) is highlighted in depth, mid-1960s. During this time, the commerce industry began to peak out of the city CBD, thus

creating employment opportunities that resulted in new residential developments out of the city. The increase in population numbers in these out-of-town areas then resulted in what is known as 'spatial transformation' (Thomas, 1993: 1). This period saw a huge decentralization from the traditional urban core or CBD to the 'urban periphery' where there was more development space and sites. The new shift also saw the introduction of various technology platforms that allowed for the increase of capital as result of the fulfillment of more consumer needs. This drew more business interest (and the creation of more business parks) to the new areas. With the transition from transit based spatial development to the introduction of the mobile car there was the development of good road access (in the form of motorways and highways) and parking for consumers and the delivery of stock which became convenient and viable rather than accessing the CBD which is more densified and transit orientated.

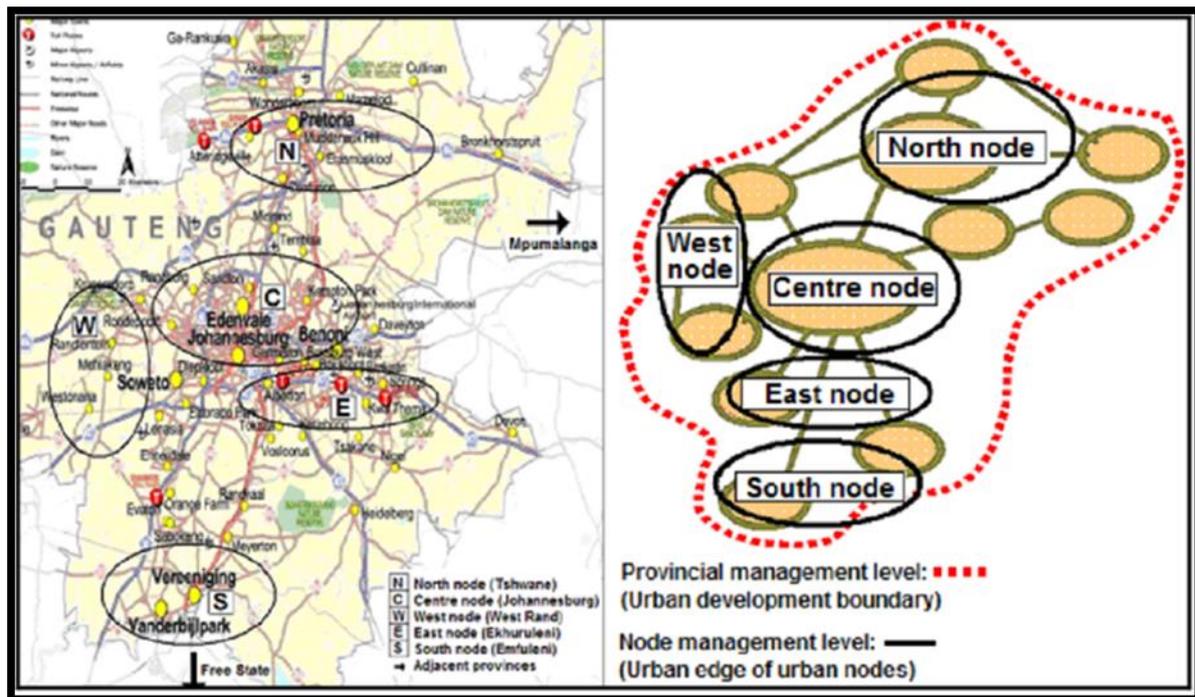
With this, became the creation of Regional Shopping centers.

Greed (1996) further identified that the factors that sparked new development patterns included the limited growth perspectives in the CBD due to space limitations; The introduction of the private car which increased traffic congestion and parking problems in the CBD for motorists- thus sparking resilience to shopping in the CBD; Increase in employment opportunities in these new developments, increased consumer spending power; The introduction of the refrigerator sparked the same mobile consumer to purchase larger quantities of food at less frequent intervals thus encouraging more usage of Regional Shopping Centers which had parking space and trolley systems that made shopping in large quantities easier (Greed, 1996). The responses made by Planning Policy were driven by the indications of an ever outward urban growth and a large population growth was projected. Therefore appropriate measures had to be put in place to accommodate the expected growth over the next two decades. Although there were concerns around the decentralization and resulting devaluation of the city urban core, planning policy was forced to approve out-of-town node developments after failing to prove assertions of unacceptable impact of the new development plans which actually strengthened the overall economy of Britain (Greed, 1996).

2 Local Experience

Gauteng City Region: The Urban Development Boundary Concept

Post 1994, Gauteng (South Africa) saw a need to reshape city formation by moving 'out-of-town', towards urban peripheral developments. An article by Cilliers and Schoeman (2008) revealed the purpose of the Urban Development Boundary Concept which was developed to address issues of the urban settlement formation in the Gauteng City Region by the creation of more Sustainable urban forms. The main planning tool that was used to create this concept was to move from a monocentric type of spatial development to a polycentric development system. New spatial development patterns alongside policy were used to guide the implementation of this new sustainable urban form. According to Cilliers and Schoeman (2008) the polycentric development approach used in Gauteng enabled the distribution of the economic sector amongst various nodes; better economic opportunities and social structures; created urban open spaces between the nodes; minimized traveling and congestion costs to one central node (Cilliers and Schoeman, 2008).



The proposed Polycentric development system for the Gauteng City Region Cilliers and Schoeman, 2008

Some of the defining factors that sparked the creation of this new development pattern included the existence of larger road systems in Gauteng (such as major freeways) that enabled business and transport networks; the need for space as a tool for the development of new economic activities; the need for natural and cultural areas for conservation and quality of living that do exist in the highly densified city CBD; the need for the creation of employment areas closer to home, that are safe and provide social entertainment; the economic, social and environmental needs of the growing Gauteng population saw the creation of the proposed polycentric development pattern for the Gauteng City Region. In the Response to the identified needs the Gauteng City Region Planning policy responded by enhancing Town Planning Schemes to encourage integrated development planning as a development tool; created a development strategy that would be used at all structural levels from the Provincial management Level to the Node Management Level, in the creation and implementation of the proposed polycentric development system.

Conclusion

The growth dynamics of cities post-apartheid have resulted in modern developments seeking to fulfil more socio-economic needs than the previous sole fulfilment of physical needs. Further developments of the Durban Metropolitan Area (DMA) will thus continue to gradually shift towards the North and perhaps the West, following the developments of new prospects in these areas that fulfil both physical and socio-economic needs. The compactness and spatial form of the Durban North Area has created a city within a city, mushrooming around major business districts and parks, responding to the economic globalization. Furthermore, up town residential areas continue to attract more development in and around the area. Case studies around polycentric developments has proven to not be new concept internationally, and as a developing state that is expecting large increases in population numbers, the country seeks to find alternative spatial development patterns to address the growing need for land.

References

Adebayo, A.A. (2012) A Tale of Two African Cities: Hyper Growth, Sprawl and Compact City Development -Towards the Development of a Sustainable Future City, 48th ISOCARP Congress 2012, South Africa.

Behrens, R and Watson, V (1996) Making Urban Places: Principles and Guidelines for Layout Planning, [Online], Available: <http://jutaacademic.co.za/uploads/Free%20Downloads/making-urban-places.pdf> [Accessed on 23 May 2015].

Burgess, EW (1925) The Concentric Model, [Online], Available: <http://ahscain.weebly.com/uploads/5/4/5/4/5454604/unit7-burgessconcentriczone.pdf> September 2015].

Braun, V and Clarke, V (2006) Using Thematic Analysis on Psychology, Vol 3: 77- 101, Qualitative Research in Psychology, England.

Bunyi, J (2010) Concentric Zone Model, [ONLINE], Available at: http://www.lewishistoricalsociety.com/wiki/tiki-read_article.php?articleId=16 [Accessed on 28 March 2016].

Cameron, B (2000) The Future of Cities In South Africa, Document Transformation Technologies, South Africa.

Church, R (2001) The Effective Use of Primary Data, Elsevier Science, USA.

Cilliers, D.P (2010) The Development and Use of A Land-Use Suitability Model In Spatial Planning In South Africa, [Online], Available: http://dSPACE.nwu.ac.za/bitstream/handle/10394/4703/cilliers_dp.pdf;jsessionid=5B9AB9D772D0CCD4E27305AA0EDCBDB5?sequence=1 [18 October 2015].

Davies, R. J. (1963) The Growth of The Durban Metropolitan Area, South African Geographical Journal, South Africa.

Econhist (n.d) The compact city, [ONLINE], Available: <http://econhist.userweb.mwn.de/geography/VO%20Compact%20city.pdf> [Accessed on 4 April 2016].

Greed, C. (1996) Introducing Town Planning, 2nd ed., Addison Wesley Longman, Essex.

Goldstone, C (2009) Durban's Population Boom, [ONLINE], Available at: <http://www.iol.co.za/news/south-africa/durbans-population-boom-460347> [Accessed on 30 March 2016].

Hancock, B and Ockleford, E and Windridge, K (2007) An Introduction To Qualitative Research, NIHR RDS, Yorkshire.

Jabareen, Y. R. (2006) Sustainable Urban Forms Their Typologies, Models, and Concepts, Vol 26, pgs. 38-52, Journal of Planning Education and Research, United States.

Jenks, M and Burgess, R (2000) *Compact Cities: Sustainable Urban Forms for Developing Countries*, Spon Press, London.

Lynch, K (1960) *The City Image and its Elements*, [Online], Available: http://www.laboratoriorapu.it/LPU_sito/download/Materiali_Papers/02b_08.03.26_Lynch-anthology.pdf [6 April 2015].

Mabin, A and Smit, D (1997) *Reconstructing South Africa's cities? The making Of urban planning 1900–2000*, Programme for Planning Research, Witwatersrand (South Africa).

McCann, E (2003) *Framing Space and Time in the City: Urban Policy and Politics of Spatial and Temporal Scale*, Vol 25, No.2, Ohio State University, Ohio.

Patton, M.Q and Cochran, M (2002) *A Guide to Using Qualitative Research Methodology*, [ONLINE], Available at: <file:///C:/Users/MBALE~1/AppData/Local/Temp/qualitative-research-methodology.pdf> [Accessed on 27 April 2016].

Schoeman, C.B. and Cilliers, E.J. (2008) *The Urban Development Boundary as Planning Tool for Sustainable Urban Form*, Vol. 117, pg. 85-94, WIT Press, South Africa.

S-Cool (n.d) *Models from Burgess and Hoyt*, [ONLINE], Available: <http://www.s-cool.co.uk/a-level/geography/urban-profiles/revise-it/models-from-burgess-and-hoyt> [Accessed on 15 April 2016].

Shettar, J (2013) *Patterns of Land Use in Towns and Cities*, [Online], Available: <http://www.slideshare.net/jaganshettar/patterns-of-land-use-in-towns-and-cities> [Accessed on 16 October 2015].

The South African Government (n.d) *eThekweni Municipality: Introduction to the History of Durban*, [Online], Available: http://www.durban.gov.za/Discover_Durban/History_Communities/Durban_History/Pages/Introduction_to_the_History_of_Durban.aspx [Accessed on 16 October 2015].

The South African Government (1950) *Group Areas Act*, [Online], Available: http://www.historicalpapers.wits.ac.za/inventories/inv_pdfo/AD1812/AD1812-Em3-1-2-011-jpeg.pdf [Accessed on 16 October 2015].

The South African Government (n.d) *The Local Government Handbook*, [ONLINE], Available: <http://www.localgovernment.co.za/> [Accessed on 14 April 2016].

Todes, A (2008) *Reintegrating the Apartheid City? Urban Policy and Urban Restructuring in Durban*, Gary Bridge and Sophie Watson, South Africa.

Tongaat Hulett Development (2012) *Compensation Flats: Needs and Desirability and Impact Assessment*, pg. 3-4, Urban-Econ: Development Economists, Durban.

Turok, I (2012) Urbanisation and Development in South Africa: Economic Imperatives, Spatial Distortions and Strategic Responses, Paper 8, International Institute for Environment and Development (United Nations Population Fund), London.

Vacchiani-Marcuzzo, C (2005) Mondialisation et Systeme de Villes (unpublished PhD thesis), University of Paris, Paris.

District Rural Development Planning to guide the transformation and upliftment of the lives of rural communities through linking economic production to the value chains and rural-urban markets.

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Synopsis:

The development of District Rural Development Plans as a tool to guide the implementation of the Comprehensive Rural Development Program, to enhance balanced and sustainable rural development, linked to urban areas, to improve the livelihoods of rural communities, using the establishment of agri-parks as one of the vehicles.

1. Introduction

In the preamble to the Spatial Planning and Land Use Management Act, No. 16 of 2013 (SPLUMA) (p. 1), it acknowledges that:

“many people in South Africa continue to live and work in places defined and influenced by past spatial planning and land use laws and practices which were based on racial inequality; segregation; and unsustainable settlement patterns.”

Prof. W.J. du Plessis (PER, p.46) states “by the time of the advent of the new South Africa about 17, 000 statutory measures had been issued to segregate and control land along racial lines with different land control systems in South Africa.”

1.1 Colonial Legacy

The 1913 Natives Land Act (No. 27 of 1913) resulted not only in a dispossession of land from the indigenous black people but also in the erosion of their culture, livelihoods and Ubuntu, which was the anchor of social cohesion in rural communities. The Act was designed to disposes 80% of the population and to confine them to only 13% of the country’s land. The remainder of the land which included the rich mineral resources and cities were reserved for the white minority.

The grand plan of apartheid was to form independent homelands but they were not economically viable and relied on remittances from workers in urban areas and transportation subsidies. These areas were reincorporated back into South Africa in 1994.

The resultant impact inherited by today’s rural communities is overcrowding of communal land areas which has resulted in land degradation and associated food insecurity. This together with limited infrastructure, poor basic services and high levels of unemployment and illiteracy has detracted from income generating potential in these areas.

There is recognition therefore that the rural space in South Africa reflects colonial patterns of economic development.

1.2 The New South Africa

During the post-1994 period in South Africa under-development of traditional rural areas has been a key concern for government. The large population resident in scattered settlements in deep rural areas do not have access to skills, resources or information which they can use to meaningfully harness the economic opportunities available to them. Various initiatives have been implemented in rural areas, but the challenge has been to make a substantial impact which changes the lives of those living in rural areas. To achieve this goal, there is a need (amongst many other issues) to strengthen rural-urban linkages with the view to ensuring that the necessary information and opportunities are available to residents of neglected rural areas in South Africa.

The Department of Rural Development and Land Reform has been mandated by the President of the Republic of South Africa to champion the Rural Development Programme in the country. To achieve this, the Comprehensive Rural Development Programme (CRDP) has been developed. The programme incorporates the development of the District Rural Development Plans as a tool and the Agri-park concept as a mechanism for achieving the rural transformation particularly in those neglected areas of the country.

In terms of current governmental planning and development policies, rural development in the South African context can be viewed from two main perspectives. Firstly, the land reform programme of government involving the restitution and redistribution programmes and the need to ensure that the new beneficiaries of this land are able to grasp hold of the opportunities being given them and to make an economic success of their agricultural ventures. Secondly, the communal land areas within the country which remain underdeveloped and with the people often living in extreme poverty and reliant on social grants. In order to break the cycle of poverty in these areas there is a need to stimulate the rural economy and to harness both human and natural capital to benefit the lives of the rural communities.

The District Rural Development Planning process, with the development of Agri-parks, is being rolled out in all 44 District Municipalities of South Africa. The District Rural Development Plans (DRDPs) have been developed as a component of the Comprehensive Rural Development Programme to focus the work into specific areas designed to stimulate local economic development, employment creation, skills transfer, enhanced market linkages and ultimately economic growth and development in these rural areas.

2. The National Development Plan (NDP)

The overarching document which has influenced a considerable amount of debate within South Africa is the National Development Plan. In its development, it has drawn upon many of the concepts which have been at the foundation of the new South Africa. The introduction of Chapter 6 of the National Development Plan opens with the words:

“Since 1994, the main challenge for rural development has been the need to combat marginalisation of the poor. This required changes in access to resources (land, water, education and skills), rural infrastructure and other government services.”
(Manuel, et al, Chapter 6, p. 1)

The National Development Plan sets out a vision for South Africa for the year 2030 and the District Rural Development Plans are tasked to begin to unpack this vision within the District

Municipal space. Vision 2030 requires “better integration of the country’s rural areas” (Manuel, et al, Chapter 6, p. 2) The plan is very bold when it states that “achieving this vision will require leadership on land reform, communal tenure security, infrastructure and financial and technical support to farmers, and building the capacity of state institutions and industries to implement these interventions.” (Manuel, et al, Chapter 6, p. 19)

The District Rural Development Plans provide a framework in the context of the NDP for the development of viable and vibrant rural areas at a local level. They are used to identify a range of economic opportunities in agriculture and associated sectors which can be further developed to positively impact on rural development within District Municipalities.

“Successful agricultural production requires suitable land that is well located in relation to major markets and agro-processing chains.” (Manuel, et al, Chapter 8, p. 9) This has been a major theme in the Department of Rural Development and Land Reform’s recent strategy which is aimed at locating land for strategic land reform projects (redistribution). The relationship between redistribution projects and agri-parks needs to be defined in terms of a range of up and downstream linkages including: provision of inputs, commodity production, transportation, processing and marketing.

As an integral part of the urban-rural linkages concept, the idea of Agri-parks stems from the small town development strategy within the NDP which states that:

“A strategy should be developed to enhance the developmental role of small towns in rural economies, with a focus on economic viability, sustaining public services, skills development, the green agenda and connecting infrastructure.” (Manuel, et al, Chapter 8, p. 25)

3. The Urban-Rural Divide

“From a broad perspective, the South African story since 1994 (‘22 years of democracy’) appears to be one of rural decline, urban growth, and a long-term decline in economic prospects.” (Khumalo, et al. 2016, p. 14) The phenomenon of urban growth is a worldwide phenomenon, which can be ascribed to increasing concentration of wealth in urban areas and the cost-effective manner in which, services and amenities can be provided, due to economies of scale. The change in political policy post 1994 effectively removed restrictions placed on movement, employment and residential location of black people imposed by apartheid policies. This had the effect of rapidly increasing population numbers in the urban areas throughout South Africa, particularly those with inherent economic growth potential.

The urban bias is seen as a major contributor to the limited government spending in rural areas. This rural-urban bias has been debated for many decades. One aspect which influences the debate is the way urban areas are defined, especially outside of the larger cities and metropolitan areas. “A change in the threshold definition of an urban place (from say 5,000 to 10,000 people) can change the ways that we see, measure and think about villages, towns and cities.”(Corbridge 2006 p.4)

“Like many other countries, South Africa does not have a government-wide, officially agreed and accepted definition of “rural”. (Khumalo, et al. 2016, p. 22) The Department of Rural Development and Land Reform has undertaken a study of the rural settlements and urban areas in KwaZulu-Natal, captured in GIS and in a report, Development Edges: A Settlement Typology. (Kahn 2015) In this study density of houses was used to categorise the rural

settlements, using 1 unit per hectare, 4 units per hectare and 16 units per hectare in a grouping of a minimum of 10 residential units within 100m, 50m and 25m respectively. The classification of urban areas was in respect of functionality and catered for peri-urban and informal areas which abut formally laid out towns. This information helped to understand the dynamics of the rural fabric within KwaZulu-Natal when compiling the Rural Development Plans.

“Consistent with the Rural Development Framework of 1997, rural areas are defined as having at least the following two characteristics:

- Sparsely populated areas in which people farm or depend on natural resources, including villages and small towns that are dispersed through these areas.
- Areas that include large settlements in the former homelands, which depend on migratory labour and remittances, as well as government social grants for their survival, and typically have traditional land tenure systems.”(Khumalo, et al. 2016, p. 25)

With the high population numbers in the rural areas with low economic growth, “The fact is that South Africa’s current economy is simply not strong enough to sustain the tax burden needed to fund infrastructural programmes that stimulate demand and create employment. This bleak scenario suggests that the system of rural-urban linkages, which has evolved for 22 years, will be fundamentally tested.”(Khumalo, et al. 2016, p. 14)

In order to address this challenge, the DRDLR has to come up with innovative solutions to address economic growth for the rural areas in support of the larger economic system at local provincial and national scales.

4. KwaZulu-Natal’s Scattered Settlement

KwaZulu-Natal has a very different spatial pattern than those found in other provinces of South Africa. More dense settlements dominate most of the country, many of them the result of factors including topography, rainfall, traditional agricultural practises and betterment planning dating back to the 1960s to late 1970s.

In denser settlements infrastructure can be provided on a relatively cost-effective basis. In contrast KwaZulu-Natal is challenged by scattered settlements and rugged topography, to provide cost effective services. The NDP advocates cost effective service delivery through densification in defined areas and curbing of urban sprawl. In less dense areas, the level of services will therefore be in accordance with the cost effectiveness of the provision of the infrastructure.

5. Comprehensive Rural Development Programme

It is intended that the Comprehensive Rural Development and Agri-parks programmes are to bring together all government departments in achieving a common goal. It is further intended, through these two programmes, to strengthen partnerships between government and private sector stakeholders. This is designed to ensure increased access to infrastructure and production on the one hand, while developing existing and creating new markets to strengthen and expand value-chains on the other, and thus to promote rural urban linkages.

In July 2009, the Comprehensive Rural Development Programme (CRDP) was approved by the South African Cabinet. The aim of the CRDP is to mobilise and empower rural communities to take the initiative to take control of their own destiny, with the support of

government. The goal of the CRDP is to bring development to the rural communities by improving access to basic services and through enabling the establishment of local industries and enterprise development. The CRDP broad based agrarian transformation focusses on community mobilisation and organisation as well as strategic investment in economic and social infrastructure by government. It is built on the premise that rural areas have the potential to be developed in a way that generates jobs and economic opportunities, thus providing an alternative to the large urban centres, and contributing to the reduction in rural-urban migration.

Furthermore, although agriculture can play a significant role in both direct and indirect economic development in rural areas through enhancing production, processing and marketing systems, the CRDP proposes diversification of the rural economy, according to conditions prevailing in different areas. This is necessary to achieve economic resilience in rural areas in the face of fluctuating market forces at national and global levels for agricultural produce.

The CRDP consists of three phases (CRDP 2009 p. 20):

1. Meeting basic needs;
2. Enterprise development; and,
3. Establishment of village industries and creation of access to credit facilities.

In the 2009 State of the Nation Address, the President of South Africa stressed the importance of improving the lives of rural people when he said 'for as long as there are rural dwellers unable to make a decent living from the land on which they live... we shall not rest, and we dare not falter, in our drive to eradicate poverty'. (Zuma, 2009 p. 1)

The success of the CRDP relies heavily on the participation of all departments within the three spheres of government and the involvement of relevant stakeholders, not least of all the rural people themselves. Only the full commitment from all role players will ensure that the vision of creating vibrant, equitable and sustainable rural communities is realised.

6. District Rural Development Plans

The District Rural Development Plans have been developed to guide the intensified government investments through reviewing of current developmental realities and potential in these areas and to come up with interventions that will improve the livelihoods of rural communities.

In KwaZulu-Natal, all the District Municipalities have areas which are characterised as rural in nature, with people existing at a low level of subsistence and in poor living conditions.

In terms of the Spatial Planning and Land Use Management Act (No. 16 of 2013), spatial planning and land development in the country should not exclude rural areas and should address their inclusion and integration into the spatial, economic, social and environmental objectives of the relevant sphere (SPLUMA 2013, p.22).

The purpose of developing these Rural Development Plans is to integrate and align different spheres of governmental development initiatives and their planning process, captured in their Spatial Development Frameworks (SDF), Integrated Development Plans (IDP) and sector plans, focusing primarily on rural development. There is a critical need for alignment between sector departments, parastatals and the municipal development agenda in ensuring integrated and sustainable development. These Plans will assist in identifying the

developmental potential of the rural areas of District Municipalities and also ensure that the potential is achieved.

One of the challenges of undertaking development in rural areas is the relatively low densities and distances to markets and thus the cost-effectiveness of the infrastructural investment. Appropriate types of infrastructure and their location can unlock the development potential of rural areas. But as the NDP states, "The question is not whether infrastructure should be provided, but what levels and forms of infrastructure should be provided, where it should be located and how it should be funded." (Manuel, et al, Chapter 8, p. 9)

Four of the five overarching principles for spatial development found in the NDP are also found in the Spatial Planning and Land Use Management Act (SPLUMA) of 2013, which are: spatial justice, spatial sustainability, spatial resilience and spatial efficiency. (NDP Chapter 8, p. 14) The one difference is spatial quality in the NDP and good administration in SPLUMA. (SPLUMA, p. 18)

7. Functional Regions

The approach undertaken to develop the District Rural Development Plans started with a broad synopsis of the economy of the district which then brought a focus on the functional areas within the district. These functional economic regions within the Districts were analysed to identify economic potential within all sectors, but more specifically to identify agricultural and agro-processing activities which could have an economic advantage for the functional region. From there, the spatial alignment and the concepts developed for the agricultural activities, tourism, economic development and any other locality specific activity present in the region.

There is no universally agreed upon approach to define Functional Economic Management Areas (FEMA), but there is a wide range of alternative ways to define functional boundaries (Hlongwa 2015, p.18). These consist of (1) Transportation and Transport networks; (2) Labour; (3) Markets; (4) Supply chains in industry and commerce; and (5) Administrative areas. These are defined by the markets or catchment areas which best reflect the drivers of the local economy.

"A functional region is characterized by its agglomeration of activities and by its intra-regional transport infrastructure and established economic interaction networks, facilitating a large mobility of people, products and inputs within its borders. A functional region is an integrated economic system defined by the interaction which takes place in its networks, e.g. commuting, communication, decision-making and distribution of goods and services." (Karlsson, et al, 2009 cited in Karlsson and Olsson 2015 p. 4).

For a functional region to excel, it does help to have a competitive advantage or a locational advantage to pursue the agricultural activity.

8. Value Chain

The agricultural commodities prioritised for the Agri-parks varies per region, but beef, maize and vegetable production are the common thread throughout KwaZulu-Natal's ten districts.

In unpacking the value chain of the vegetable production, the streamlined version is that the vegetables are grown on farms, transported to wholesale facilities where storage, cool

rooms, processing and packaging take place and then the product is forwarded to a retail facility or exported. On closer inspection, within the vegetable value chain there are four broad types of farmer: the specialist farmer using high technical methods of production, including hydroponics; the large scale commercial farmer; the smallholder farmer and the market gardener. The specialist and certain of the large scale farmers are the main provider to the high end market, retailing via selected upmarket supermarket chains, niche markets, and supplying export markets. The commercial farmers are producing in volume and supply the middle and lower end supermarket chains. Both large and smallholder farmers supply fresh produce to the municipal markets. This is then used to supply the street trader markets in urban areas.

But even this view of the value chain is simplistic, as the take-off agreements of the supermarkets may leave the commercial farmer with surplus produce which is then funnelled via the municipal markets to small retailers and street traders; smallholder farmers have agreements directly with smaller retail outlets. The informal trade is large in South Africa and many purchase their produce from the municipal markets to sell on the streets. Farmers are quite resourceful and sell directly to bakkie buyers who sell on the streets, farmers' markets are established where farmers sell directly to the public, both in cities and at pension pay points in rural areas.

The cattle, goat, sheep and chicken industries have their own value chains with both formal and informal abattoirs of varying sizes catering for the market as well as an informal trade. An interesting phenomenon is that though the market for live goats and therefore goat meat is very large in South Africa, there are no official statistics concerning the trade. There are no formal shops or supermarkets selling goat meat. This informal trade is a vibrant industry with its own marketing strategies.

With the need for milling and large storage facilities, maize is the more formal of these prioritised commodities, but even with it, there is an informal trade where bakkie buyers purchase a small truck load and then sell directly or to other street traders as fresh or boiled white maize on the cob.

9. Strategic objectives of Agri-parks

The agri-park model has been conceptualised by the Minister of Rural Development and Land Reform, Mr Gugile Nkwinti, MP, and further refined by various members of his team. "The concept for Agri-Parks draws from existing models [in South Africa] and abroad, including educational/experimental farms, collective farming, farmer-incubator projects, agri-clusters, eco-villages, and urban-edge allotments and market gardens." (DRDLR 2015, p.3)

The Agri-park model is the main vehicle currently being used to advance the Comprehensive Rural Development Programme in South Africa. "Of prime importance will be linkages between the parks and surrounding agricultural land for production." (DRDLR 2015, p.4)

The four key strategic objectives of Agri-parks are:

1. The Establishment of Agri-parks in all of South Africa's 44 District Municipalities that will kick-start the Rural Economic Transformation for these rural regions;
2. To further develop the skills of and provide support to smallholder farmers through the provision of capacity building, mentorship, farm infrastructure, extension services, production inputs and mechanization inputs;

3. To enable producer ownership of the majority of Agri-Parks' equity (70%), with the state and commercial interests holding minority shares (30%); and,
4. To bring under-utilized land (especially in Communal Areas, other state land and land reform farms) into full production over the next three years, and expand irrigated agriculture.

10. The Agri-park concept in South Africa

The primary focus of the agri-parks will be on agricultural production, the processing of the produce and the support mechanism to achieve this goal. An Agri-park has a number of core facets to its makeup which include:

1. **The Farmer Production Support Unit (FPSU):** The FPSU is a rural outreach unit connected with the Agri-hub. The FPSU does primary collection, some storage, some processing for the local market, and extension services including mechanisation.
2. **Agri-Hub Unit (AH):** The AH is a production, equipment hire, processing, packaging, logistics and training (demonstration) unit.
3. **The Rural Urban Market Centre Unit (RUMC):** The RUMC has three main purposes:
 - i. Linking and contracting rural, urban and international markets through contracts.
 - ii. Acts as a holding-facility, releasing produce to urban markets based on seasonal trends.
 - iii. Provides market intelligence and information feedback, to the AH and FPSU, using latest Information and communication technologies.

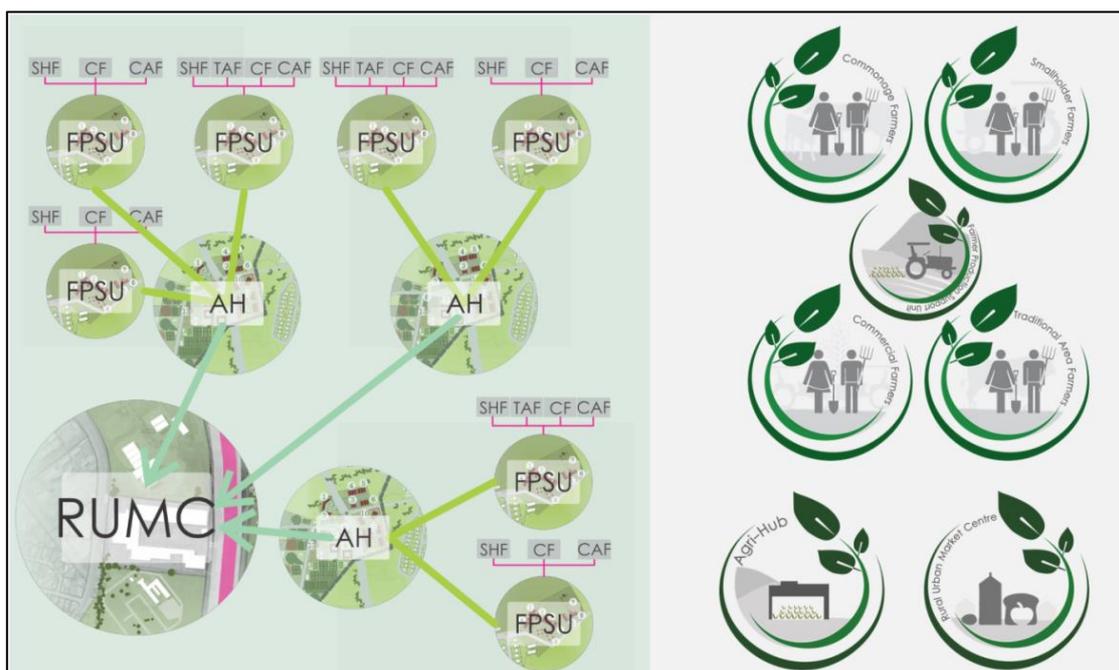


Figure 1. Static Representation of the Agri-park Model (DRDLR 2015)

The above Agri-park concept and components are further aimed at supporting the following stakeholders:

(1) Small Holder Farmers (SHF), (2) Commonage Area Farmers (CAF), and (3) Traditional Area Farmers (TAF) many of whom will be co-operatives, will be encouraged to use the Agri-park process and therefore benefit from the support given, value-adding processes, packaging and the economies of scale. "It is within this process that SHF will be supported over the next ten years." (DRDLR 2015, p.19)

(4) Commercial Farmers (CF) will be able to access and use the Agri-park facilities and network, but, due to their existing farming experience and product volumes, they may choose not to use all the levels and services, and enter at the appropriate point for their farming enterprise or even go directly to the market.

The Agri-park concept includes impacting, participating and owning a part of the commodity value chain of the various commodities being promoted within the agri-park. This means the Agri-park will be involved in the inputs, production, harvesting, transporting, storage, processing, marketing and finally retailing of commodities. It further provides a network of contacts between producers, markets and processors, but also provides the physical infrastructure required for the transforming industries.

11. UThungulu and uMgungundlovu District Rural Development Plans and Agri-park Business Plans

In trying to harness the economic potential within the uMgungundlovu and uThungulu District Municipalities, the aim of rural development was approached with a strong focus on agricultural land, as the largest commodity in any district, and by spatially aligning the Agri-park Model with the functional regions identified in the two districts as a key driver for agrarian transformation. The benefits further include downstream services linked to the agricultural sector. In addition to agricultural development, the following Objectives and Operational Strategies were identified within the two districts as issues, that if addressed, will facilitate a steadily growth in the wealth of the rural populace. These strategies aim to diversify the economy and move away from the 'agriculture only' reliant economy.

Table 1: Objectives and Operational Strategies

uThungulu DM
<p><u>Objective 1: Improving productivity & competitiveness of the agriculture sector</u></p> <ul style="list-style-type: none"> • OS 1: Supporting small-scale farmers; OS2: Harnessing existing commodity value-chains; OS3: Optimising the potential of Agri-Parks. <p><u>Objective 2: Promote tourism through existing development corridors</u></p> <ul style="list-style-type: none"> • OS1: Harnessing economic development corridors; OS2: Harnessing the cultural heritage development corridors; OS3: Development of distinct Special Economic Zones. <p><u>Objective 3: Investment in rural industrialisation.</u></p> <ul style="list-style-type: none"> • OS1: Promoting urban-rural linkages & functionality; OS2: promoting the revitalisation of rural areas; OS3: Completion of rural development projects. <p><u>Objective 4: Conserving the natural environment</u></p> <ul style="list-style-type: none"> • OS1: Formulation of the uThungulu Biodiversity Conservation Plan. <p><u>Objective 5: Promoting integrated human settlements</u></p> <ul style="list-style-type: none"> • OS1: Reduction of service delivery backlogs; OS2: Promoting integrated rural spatial planning.
uMgungundlovu DM
<p>Objective 1: Unlocking rural economy through agriculture and tourism;</p> <p>Objective 2: Linking rural areas to opportunities through services; and,</p> <p>Objective 3: Linking rural population to opportunities.</p>

These Objectives and Strategies are to be implemented within the Functional Regions and Intervention Areas as depicted on the below images.

Identifying the areas of implementation is a fairly simple exercise in relation to the implementation of the initiatives.

implementation. The following aspects have therefore been identified as crucial aspects to be addressed before effective implementation and the expected outcomes can be reached.

- Appropriate Infrastructure required in achieving targets.
- Focus on catalytic projects. Investment must have a strategic focus.
- Balanced approach: Physical Development & Social Development.
- With agricultural land as the most common commodity in the districts, the “agricultural production should be prioritised to boost job creation and local economic development, which will gradually develop a sustainable competitive industry.” (Manuel, et al, Chapter 8, p. 9)
- Alignment of efforts on departmental projects. Support same communities to obtain largest return on investment; and,
- Availability of land to drive agrarian (inclusive of ownership transformation) is a challenge and Stateland / State Resources being used as a catalyst to drive socio-economic transformation.
- Irrigation schemes are very important, and with current trends in climate change, alternative and more intensive farming practices such as hydroponics, with less wasteful practices should be advanced.
- As much as guidelines can be provided on setting up institutional arrangements to facilitate implementation, the lack of capacity (time, finance, skilled personnel) hampers effective Weak economic activities in rural areas necessitate the need to link to existing economic activities for offset markets. “Indeed, with farm families relying increasingly on off-farm employment and social grants, the economic success of rural communities will depend on the development of new economic engines.” (Khumalo, et al. 2016, p. 24)
- Long term implementation is a challenge, as setting up of partnerships, signing of contracts etc., needs specialised skilled input from professionals who can facilitate these processes for a longer time whilst skills transfer takes place.

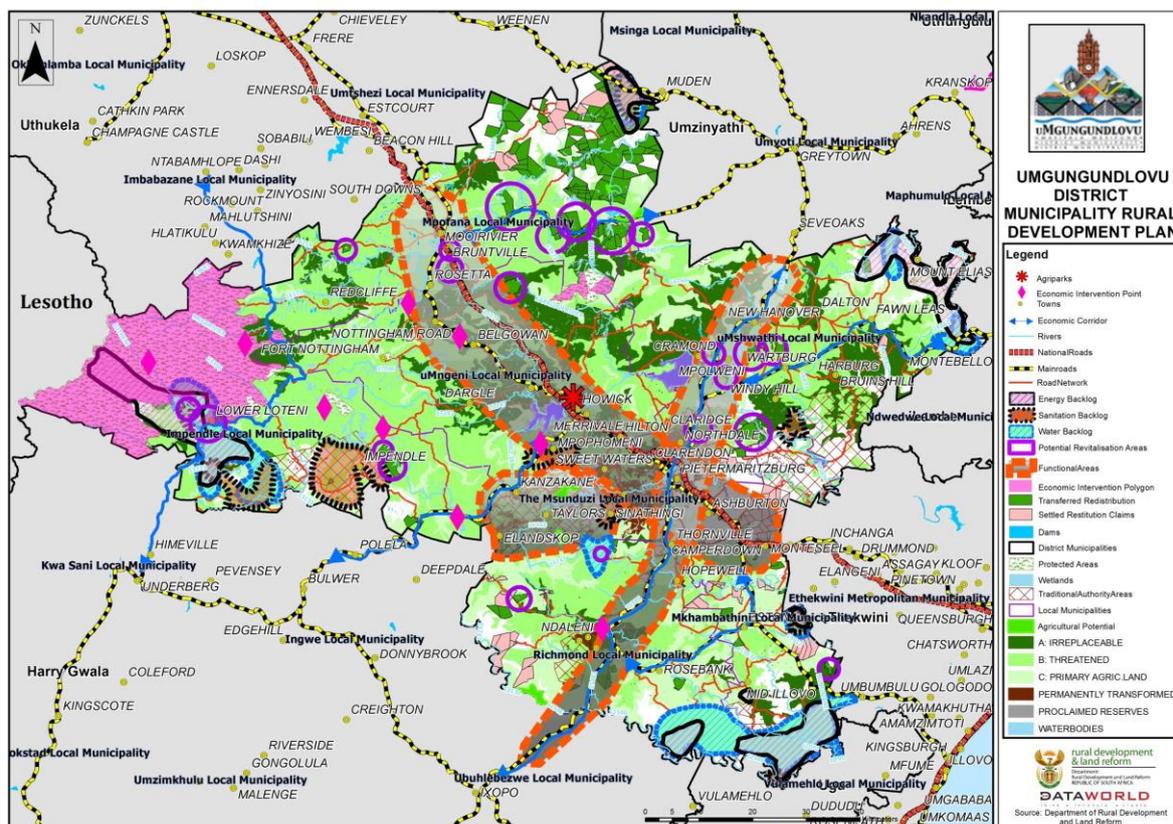


Figure 2. Umgungundlovu Rural Development Plan (Hooyberg-Smuts 2015)

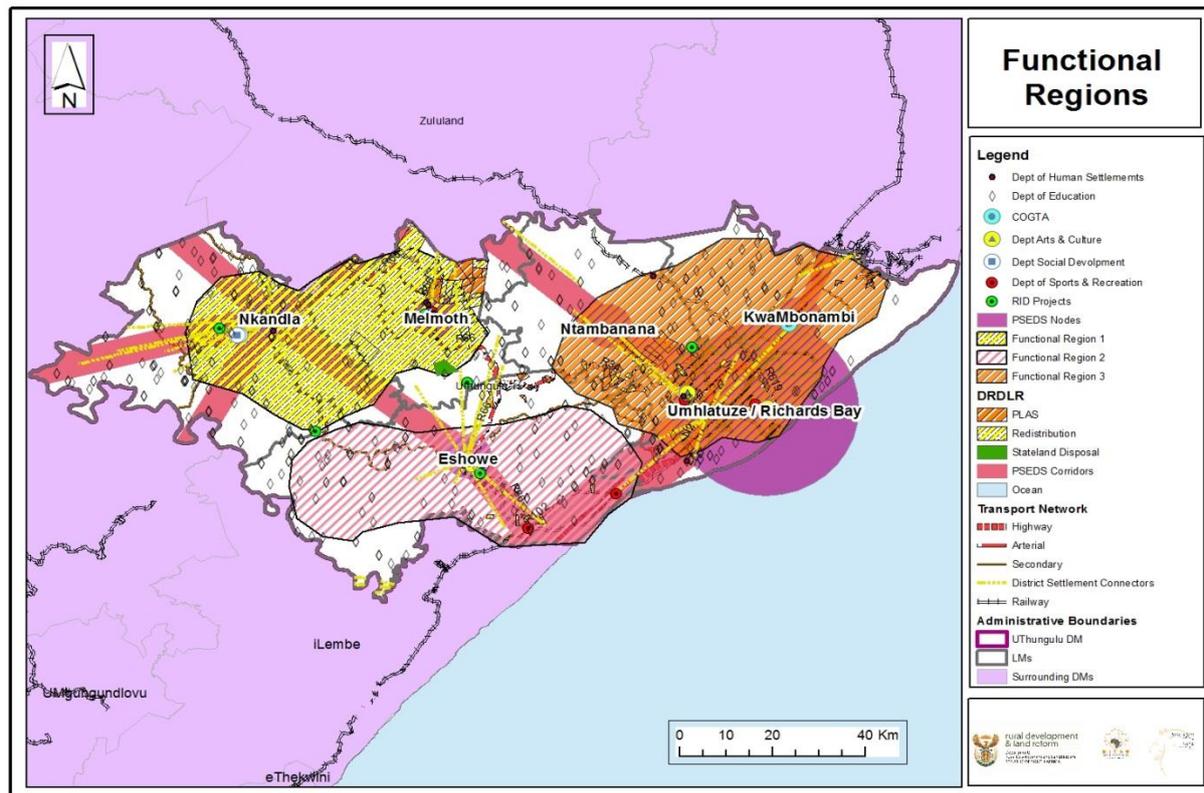


Figure 3. uThungulu Rural Development Plan (Makoni 2015)

12. Conclusion

This review of the concepts inherent in agri-parks and the lessons learnt from application in two (2) districts in KwaZulu-Natal provides an indication of the steps necessary to achieve effective implementation in rural economic upliftment. Following the review of the South African economy, clearly defined deliverables are needed to measure progress with implementation to achieve sustained economic growth. The steps are outlined below:

- Government to create an enabling environment within which the small holder farmers can mobilise resources to meaningfully participate in the commercial agricultural sector.
- The identification of primary commodities and their associated value chains is a first step towards identification of the required agricultural infrastructure & skills transfer requirements to be invested in.
- Stimulate growth at small scale farmer level by providing:
 - Market advice;
 - Access to cost effective inputs from agri-park complexes into land preparation, specialist crop extension support, seeds, fertilizers and herbicides;
 - Irrigation schemes;
 - Access to transportation, processing, packaging and marketing.
- The identification of functional regions provides a strategic guide on where investment should be targeted.
- The establishment of Farmer Production Support Units linked to Agri-Hub Units contributes to the enhancement of rural communities and the realisation of their own economic potential, as it assists with linkages to the Rural Urban Market Centre Units.

- The development of the DRDPs and the incorporation of them into each of the District Municipality's Integrated Development Plans (IDPs) helped place Agri-parks on the table, and brings together all government departments to work in unison towards a common goal.

The goal is to maximise the use of existing state land with agricultural potential in the provinces, where possible, and to maximise the use of existing agro-processing, bulk and logistics infrastructure in the country, to support the growth and the revitalisation of rural towns.

References:

- Corbridge, S. (2006) Urban Bias: The Continuing Debate, Housing and Land Rights Network, <http://www.hlrn.org/img/documents/Corbridge%20Continuing%20Debate.pdf>
- CRDP (2009) Comprehensive Rural Development Programme Framework, DRDLR (unpublished).
- DRDLR (2015) Progress Report on Agri-Parks: Presentation to the Joint Portfolio Committee on Rural Development and Land Reform and Agriculture Forestry and Fisheries, 24 June 2015, Department of Rural Development and Land Reform (unpublished).
- du Plessis, W.J. (2011) African Indigenous Land Rights in a Private Ownership Paradigm, PER, Volume 14, No. 7
- Hlongwa, M., (2015) Development of Rural Development Plans Five KwaZulu-Natal District Municipalities, Presentation of Phases 2 and 3, DataWorld, unpublished.
- Hooyberg-Smuts, I. (2015) Development of a Rural Development Plan for uMgungundlovu District Municipality, KwaZulu-Natal Province, DataWorld, unpublished.
- Kahn, M. (2015) Development Edges: A Settlement Typology, Updated Approach and Data Report, RDLR-0075 (September 2015), Branch SPLUM (KwaZulu-Natal), Department of Rural Development and Land Reform.
- Karlsson, C. and Olsson, M. (2015) Functional Economic Regions, Accessibility and Regional Development, CESIS Electronic Working Paper Series, Paper No. 415, The Royal Institute of Technology, Centre of Excellence for Science and Innovation Studies (CESIS).
- Khumalo, B., Fihla, K., Kumar, K., Lubisi, S., Mayende, G., Muthwa, S., Plaatjies, D., and Steytler, N., (2016) Submission for the 2017/18 Division of Revenue, For an Equitable Sharing of National Revenue, Financial and Fiscal Commission, Midrand, 27 May 2016.
- Manuel, T. & 26 National Planning Commissioners (2011) Chapter 6, An Integrated and Inclusive Rural Economy, National Development Plan (NDP), South African Government.
- Manuel, T. & 26 National Planning Commissioners (2011) Chapter 8, Transforming Human Settlements, National Development Plan (NDP), South African Government.
- Makoni, E. (2015) Development of Rural Development Plan for uThungulu District Municipality, Dita, unpublished.
- SPLUMA (5 August 2013) Spatial Planning and Land Use Management Act, No. 16 of 2013, Government Gazette Vol. 578, No. 36730, Cape Town.
- Zuma, J.G. (2009) State of the Nation Address, South African Parliament, 3 June 2009. <http://www.thepresidency.gov.za/pebble.asp?relid=310>

Research Topic: “Investigating opportunities to enhance Local economic Development using a Community-based planning approach: The case of KwaNzimakhwe”

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Abstract: LED began as a development strategy from the high-income countries of the North and was adopted in the south for economic development of well economically performing cities to partake on international markets, thus centralising economic centres. LED planning thus began shifting since 1994 as a strategy for place-reshaping (Grant and Dollery, 2010) and 're-engineering of local government' (Thornhill, 2008). LED has since then been embedded in legislative and policy contexts (1996 Constitution and the 1998 White Paper on Local Government) to become an obligatory mandate for South African local authorities (Rogerson, 2010). More currently in the midst of debates between the role of Local Economic Development has been the introduction of pro-poor development within and surrounding cities of South Africa which challenges both roles of LED set out by the Department of Local Governance (2006). The pro-poor focus is looking to strengthen the asset base of poor communities (by providing access to municipal services), support of emerging small enterprises, employment creation and setting regulatory frameworks at both local and national levels. At more localised and smaller towns there is a need to maintain their competitiveness but disparities are distinct and there is a growing concern to address such which creates a friction between the expected roles.

The Hibiscus coast municipality is trying to account for its communities especially rural areas that suffer from urban development bias where development is concentrated in the urban coastal areas as opposed to rural hinterlands that experience much less development in comparison. The Hibiscus coast municipality has recognised LED initiatives that would promote the economy that include small, medium and micro-sized enterprises (SMMEs), entrepreneurship in the agricultural sector and eco-tourism but these are met with challenges where only a few rural communities stand to benefit. A pro-poor development approach may be needed to focus in addressing rural socioeconomic issues and in enhancing economic development for rural areas.

A community-based approach is adopted for this research that seeks to include, mobilise, engage and empower community members to be responsible for enhancing economic development that has the potential to address existing socioeconomic issues and with a specific focus on the resources available in the community. The study was chosen as it is a rural area, there is currently no economic development proposed in that area and it is in close proximity to the KZN and Eastern Cape border and may have positive rippled effects to poor communities in the surrounding areas.

1. Project background

According to the draft IDP (March 2015/2016) there are high unemployment levels in the rural settlements, especially the youth, continually increasing each year. Economic growth is required to achieve poverty alleviation as well as a need to provide basic services for poorer

There is a dependence on the main economic hubs on the coastal belt, Margate and Port Shepstone, for employment and services. As the two towns are the main hubs poorer communities such as in KwaNzimakhwe also depend on them for such opportunities and this means increased competition.

The municipality needs ways to address the economic needs surrounding rural areas as well as trying to bridge the gap of development disparities between rural and urban centres.

In trying to address these challenges as part of their objectives the municipality has introduced Local Economic Development as a tool. It has focused on increasing and maintaining economic growth in the municipality whilst trying to promote a pro-poor approach to address the development gap. The municipality has worked with business stakeholders from different sectors for the promotion of LED initiatives over the years especially from the major sectors that Provincial Growth Development Strategy (PGDS) recognised as providing more employment opportunities. PGDS has recognised the commercial agricultural and tourism sector as the major employer in most municipalities in Kwa-Zulu Natal as it contributes significantly to the economy as well as is the largest employer of the municipality, although these sectors are still monopolised by a few thus making it hard to break it into these sectors as well as provide services and produce to market's standards (IDP, 2015/2016).

Therefore, the aim of the research is to investigate the opportunities for KwaNzimakhwe residents using a community-based planning approach to enhance Local economic development approach.

2. Literature supporting research aims

The global context sets precedence to what is happening in South Africa and thus it is important to take a look and discuss some the historical debates that affected development as a whole and led to Local Economic Development.

International debate has been focused on whether conventional local economic development strategies are working and generating pro-poor local economic development or just continue perpetuating uneven development. Uneven development being the accumulation of capital at a certain pole and exacerbation of underdevelopment on the other pole (Bond, 2003). At the peak of modernisation and neo-liberalisation "developmentalism" was the order of day and it emulated the prior experiences of the global North throughout the world, never mind the huge degrees of differences between the north and the south. The period that took place in the 1980s and 1990s is referred to as the period of the "Washington Consensus" as this was the height of neoliberalism. Neoliberalism and its 'free-trade' approach was a platform by the Washington Consensus (World Bank, World Trade Organisation and International Market Fund) that allowed free reign to multinational corporations in other parts of the world through minimum taxes and flexible export tariffs and exploited resources in poorer nations with the promise of bringing in investment, development and growth in receiving countries.

One notable criticism and proposal of alternative methods towards development came in the introduction of sustainable development which became popular when economist Joseph Stiglitz (2001) highlighted the limitations of neoliberalism and its orthodox development practices and the need to transcend to moral commitments of sustainability. This influenced

the World Bank, IMF to turn towards more Poverty Reduction Strategy Programmes. This shift was needed for the disparities created in third worlds after competing in neoliberal trading at its height. There was a need to review the social, economic, political, religious and environmental stresses in local affected communities in the face of neo-liberalism.

Thus Local Economic Development (LED) emerged as a response to liberalisation and privatisation responsible for unequal distribution internationally and localised to each country and its communities. However, underlying LED and its associated initiatives was still the entrepreneurial guise, a product of the broader globalist and neo-liberalist agenda of the global north that favoured only the main economic poles within countries and maintained links with them. Orthodox LED initiatives, introduced at an international level, focused on place marketing which maximised the attractiveness of an area to attract investment, urban boosterism, development facilitation, public-private partnerships, participatory initiatives.

Another point to consider is the lack of a standard definition, concept and methods to follow in the implementation of LED which could lend to its easy manipulation by institutions. What is shared is guiding principles that aim for redistribution of growth, bottom-up-development, meeting basic needs, empowerment, sustainable development etc.

Other critiques of the conventional development included the increasing rejection by communities in developing countries that saw development strategies as a way of treating them as projects and not promoting engagement by the communities. Also development hadn't been embracing what their traditions and customs had to offer to the rest of the world refusing to integrate it as part of development but chose to replace that essential part of community. Other critiques include post modernistic approaches and paradigms that argue that there is no one way to development but alternative ways through innovative and traditional approaches (as long as they are complementary) could enhance development. LED strategies were then adopted at national levels and were context specific seeking to address the effects of past development that marginalised a majority of people within each country. Development planning including the implementation of LED initiatives shouldn't be about imposition onto communities rather it should be about engaging with the community and taking their discussions and suggestions seriously and as input to further LED initiatives (Simon, 2003).

Former president Thabo Mbeki was one of the developing country leaders who embraced what could be the fruits of modernisation with his involvement in the New Economic Partnership for Africa's Development (NEPAD) (Simon, 2003) and the South African Growth, Employment and Redistribution (GEAR) policy of 1996 in the hopes of economic growth in the impoverished African continent and South Africa after a conflicting history. South Africa and other African countries were open to international investments to promote development and growth to help ameliorate underdevelopment. This was in the form of attracting foreign direct investment but there was more money leaving Sub-Saharan Africa than was being invested so, in essence, this perpetuated exploitation of already indebted nations that required assistance to remedy the past and catch up. FDIs also had not invested adequately in developing countries in terms of technology transfer (transferring of skills to other users) so that there would be opportunities to promote innovative businesses that belonged to developing nations; this inadequacy ensured continued dependence on FDIs and increased the vulnerabilities of South Africa.

At this point there was a need to recognise new approaches to LED looking to mobilise internal resources, capacities and skills (RSA, 2001). The new dialogue that was sustainable development was beginning to be addressed by African leaders who began to embrace sustainable local development such as former President Thabo Mbeki who recognised the crippling effects on relying on outside economies to build their economies on the communities instead of self-reliance on growth (Mbeki, 2000a).

South African debates now focused on pro-poor vs place-marketing at local levels.

LED legislation and frameworks placed the greatest pressures on the role of local municipalities since it was embedded in legislative and policy contexts (1996 Constitution and the 1998 White Paper on Local Government) (Rogerson, 2010). Besides unclear guidelines on how they were to implement strategies or how to proceed they were expected to promote urban entrepreneurialism as there was a decrease in participation on international markets so there was a rush to attract investment and LED strategies were centred on maximising investment opportunities.

Place marketing is still seen in some municipalities as they continue to rely on large corporate-dominated development such as IDZs, EPZs and SDIs but this seems to neglect sustainable development (Bond, 2003). In fact, one example of this can still be seen in the Eastern Cape with the Coega Development Zone. Other criticisms are that SDIs are environmentally destructive, capital intensive, inadequate in providing for the empowerment of the marginalised (Jordan et al., 2001). LED development tools such as SDIs, EPZs and IDZs haven't proven as developmental as initially advertised or promised (Bond, 2003). The shift towards community development came with the more sustainable development and the well-being of communities was placed at the centre trickling down to those that least benefit.

Certainly with the highlighted limitations and implications of development local communities have shifted towards a more pro-poor focus and a need to rely on themselves with the available skills and resources. The pro-poor focus challenged conventional LED programming that was more focused on macro-growth or market-led initiatives. This pro-poor focus aims at strengthening the asset base of disadvantaged poor communities (Rogerson, 2000).

What does this all mean for the context of South Africa with regards to LED initiatives?

What justifies market-led approaches is that no community, town or city looking to enhance local economies exists in isolation; they are affected by global competitiveness, changing international divisions of labour, resource exploitations, financial and technical resources available (Simon, 2003). There is also this continued dependence of Third world communities on first world assistance through NGOs and funders as disparities are still ripe. It is hard to break away from them when the illusion of the fruits of modernisation are still aspirations for those who do not have much (Simon, 2003).

The effects of globalisation and later postmodernism and post traditional approaches to development can be used flexibly to harness local skills and resources. There needs to be no exclusion of outside impacts because as pointed out earlier no community exists alone but there is a need to promote development using internal resources.

Community-based planning is a chosen tool to assist in achieving the objectives of the research topic. It is a context-specific approach to community development and development

planning that promotes community involvement. Community-based development planning is not a new concept or approach but has just been in fact ignored by more technocratic, top-down approaches that has shaped much of planning history (Kent, 1981). It allows for a level of dialogue that Kent (1981) sees as a natural method for development planning and engagement that includes people coming up with their own analysis of the situations they find themselves in as well as coming up with methods to confront situations. Therefore, Kent (1981) views community-based planning as a basis in consciousness raising.

Self-reliance in development is important in reducing vulnerabilities and indigenous situations should be valued more than alien values or views of such contextual situations. Thus planners should be opening dialogue to engage with the communities and allowing them to engage in community level plans and use this invaluable input as a basis for urban, regional and national social and physical planning policies.

3. Lessons learned from Case Studies

At a more international level of development planning there has been a shift towards decentralisation where there are a number of community-based resource management programs and participatory approaches. Development agencies are now focusing on livelihood strategies, participation methods and programs run at local level. The move towards a participatory approach rests on assumptions such as local actors are capable of collective action and that the process of collective action between local actors can activate more democratic decision making. The case studies are focused on an attempt to decrease poverty in the communities mentioned below. Critiques on participatory, collaborative and communicative methods are that there are no long term effective results in the improving of conditions (Cleaver, 1999).

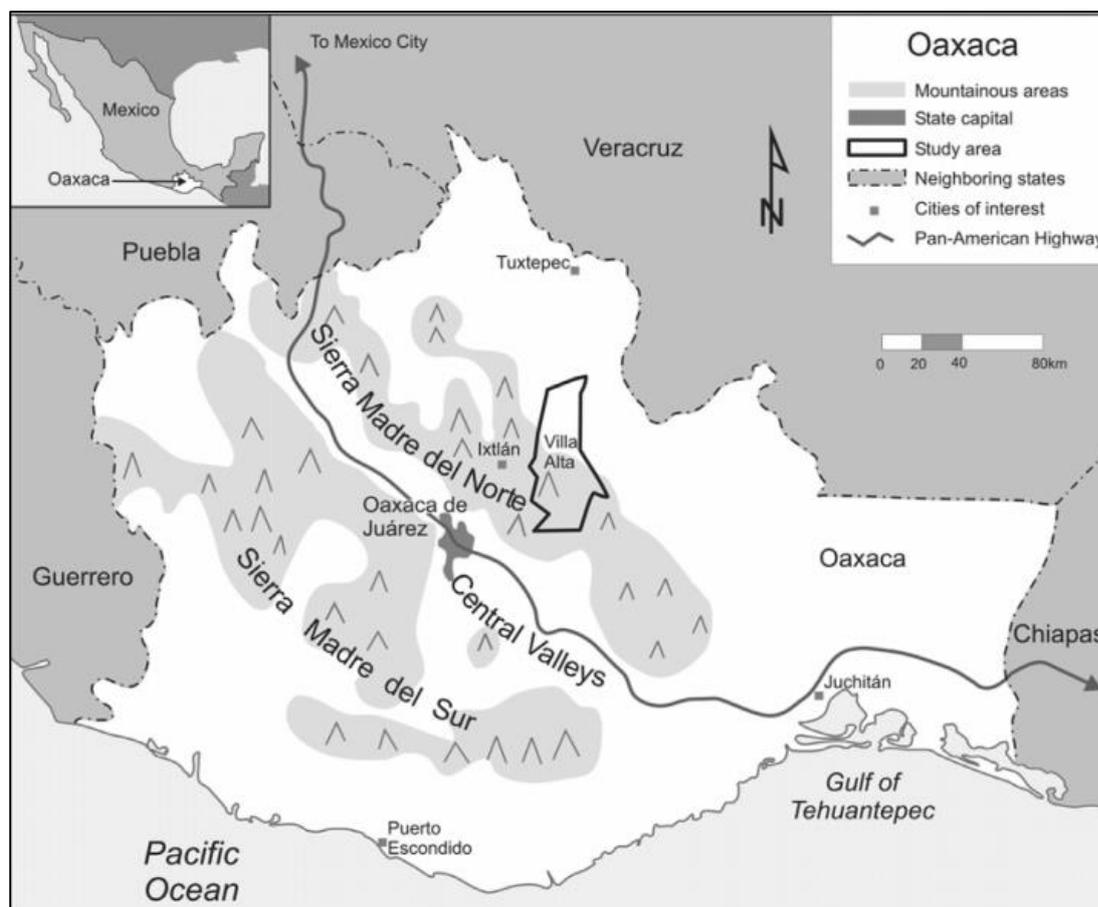


Figure 3: Map illustrating Villa Alta in Oaxaca, Mexico source: Mason Beard, 2008

The international case studies looked at are small communities in Villa Alta, Mexico that take part in community-based planning initiatives in an effort to alleviate poverty. There are three communities that were looked at and adopt a form of community-based planning initiative that includes migration remittance- this is the donation of money by community residents who have migrated elsewhere and are giving back to their community of origin by donating funds to assist in alleviating poverty. This case study also looks at key variables that assist in the level of success of collective action and of community-based planning initiatives.

The three communities include Bsia where community-based planning was proven successful in poverty alleviation based on the key characteristics that fulfil collective action such as a small group size, homogeneity, strong communication and trust between members. But political leanings and other external factors in programmes interfered with the independence of the community and manipulated the initiative and their development needs, although there were positive results. The second community, Yaba, had less characteristics in ensuring success in collective action and in addition had a large diverse group but they were more accessible to political favours and support therefore their community-based plans were mainly supported by the state. Lastly the third community, Rebesle, exercised the strongest characteristics to achieve collective action as well as achieve the level of self-reliance that Kent (1981) mentioned by rejecting poverty targeting programmes subsidized by the state or backing of a political party for gains but opted to exercise social networks and collaboratively work with other neighbouring communities to influence a broader social transformation.

Lessons that can be learned from the above results of case studies is that external influences are still at large in attempting to manipulate communities and their needs for their gains, reliance on external factors places communities in vulnerable positions where the community is adversely affected where the external force is facing problems, also the collaboration between communities is an important and possibly positive factor that hasn't been paid much attention to. No community is in isolation and the interaction between communities is important. The characteristics of collective action are another important consideration that can assist in determining chances of success in collaborative efforts.

4. Research Methodology

This study will be adopting a qualitative approach as it is best suited to acquire data and proposes an alternative approach in concluding the hypothesis in addition to other kinds of data. Numerous methods are selected at each stage from preparing the data to actual data collection and data analysis. Methods to be discussed include sampling method, data collection and data analysis and interpretation of data.

This method will consist of means to select the people to be interviewed based on their presumed roles. Each group will be sampled differently based on their presumed roles.

Probability Sampling:	<ul style="list-style-type: none"> • First of all, probability sampling will be selected to establish the working group category in the community i.e. 18 and older.
	<ul style="list-style-type: none"> • Secondly, cluster sampling or multi-stage sampling of the community for focus groups that will take place for a few days. These multi-stage sampled groups will be as homogenous as possible where older men, older women, younger men and younger women groups will be interviewed separately.
Non-probability purposive sampling	<ul style="list-style-type: none"> • selected to be used for key informants such as municipal officials, LED agency, ward councilors, traditional leaders, community leaders based on their expertise and positions in the community.

Table 1: Table illustrating sampling methods employed

The total population of KwaNzimakhwe is 6218 (StatsSA, 2011) and at the most 1% of the population can be interviewed for focus groups. This means there will be four focus groups consisting of 12-13 people to make it manageable and brings us to a total of 62.

Additionally, the participants approached will be at the discretion of the researcher with the help from a research assistant or a community leader but as long as they are able to fill the minimum set quota.

Once on the field conducting interviews qualitative data collection methods will be used as this is the best method for this study. Once again the type of method selected is based on the presumed roles of all participants. The methods include:

Structured open-ended interviews	<ul style="list-style-type: none"> with focus groups which will seek to investigate the development they would like proposed in the study area based on the skill set they can contribute and their experience of the area in terms of development. Another reason is that they may not be able to answer certain academic questions and so confusion or intimidation will be minimal. There may be numerous answers, open interpretations, discussions from different people and this approach may assist in controlling the structure of the conversation.
Structured open-ended one-on-one interviews	<ul style="list-style-type: none"> with key informants and these interviews will be in-depth. Key informants include municipal officials, LED agencies, ward councilors, traditional leaders, community leaders and they will be asked questions based on what their knowledge background is. A discussion will most certainly be allowed as they could shed invaluable information on the questions and the study in general.
Audio recording	<ul style="list-style-type: none"> This isn't standard as it is subject to participant's preferences and ethical considerations. This method would prove key in the proper recording of information in addition to note taking. This is a favorable method for the inexperienced researcher who isn't skilled in key notes taking and dividing the attention equally between recording of information and the participants. Recording audio will be done for all interviews

Table 2: Table illustrating data collection methods employed

All the interviews will be done face-to-face and, in the case of key informants at their desired location but with community members they may be done at a mutual location, preferably on site to avoid travel costs.

Interview questions are not static and may be subject to change on the basis of information proving as key questions for subsequent interviews. In other words, responses from key informant interviews may shed light on a piece of information that may be used; these responses then may inform some questions to be asked in the focus groups.

This includes GIS data shapefiles to be requested from the GIS department of Hibiscus Coast Municipality to be utilized for achieving objective four and five through mapping.

Land Suitability analysis	GIS and ArchiCAD to be utilized to investigate the surrounding land uses, the extent of available land and compatibility to find the most suitable location for the recommendation of a development
Propose development	GIS and ArchiCAD to demarcate and draw up a concept plan of the location of the development

Table 3: Table illustrating secondary data collection methods

This section will discuss data analysis; It will include three steps to achieving a coherent analysis that can be related to the rest of the study: description, classification and connection.

<p>Description: description of the situational context (settings of where the interview is conducted)</p>	<ul style="list-style-type: none"> • Direct reporting through transcription of interviews after each interview session for coherent notes, the use of quotes • Includes the annotation process by making side notes of information whilst transcribing that needs to be interrogated more, thoughts on the data recorded as well as starting to categorize on the side (especially the main themes that stick out). These notes may feed into the analysis/discussion process of data and main findings.
<p>Classification:</p>	<ul style="list-style-type: none"> • categorization of data into major categories/themes then analyzing and interrogating data and putting it under different categories. The method of splitting and splicing will be used for further interrogation • Coding of the different categories. • Coding won't be applied strictly just as a method to sort out the classification process whilst transcribing.
<p>Connection</p>	<ul style="list-style-type: none"> • the linking, comparing, causes and effects between data and relating it to concepts, theories and past case studies and generally the rest of the study. • This process will also check if data makes sense and contributes otherwise it will be deemed as useless.

Table 4: Table illustrating data analysis techniques

5. Premeditated assumptions on results

Fieldwork will be conducted in July 2016 should there be a timely ethical approval by end of June 2016. Based on early discussions with some of the residents of the study area there are evident frustrations of a lack of development in the area as well as lack of interventions proposed by the municipality. There are however small discussions in the group of the kind of resources they possess in the community they can use for sustainable livelihoods and addressing the unemployment levels. There is a current open dialogue between community members that just requires the appropriate kind of engagement from not only the government but the corporate sector. There are also different perspectives of the kinds of economic development and community-based planning initiatives the community may engage in that range from the community members, the chiefs involved, the ward councillor and some municipal officials. At this point, however, there has not been much information shed on KwaNzimakhwe by municipal officials due to a lack of projects there as well as not completely finding the officials directly involved in the community.

Based on the above case studies and the lessons highlighted, they provide some difficulties and limitations of community-based planning that may be encountered. Based on premeditated assumptions, there is the possibility of political interferences and manipulations in the community as well as conflicts between ruling chiefs and municipal officials or with the communities which could explain the lack of development in the area (past and future). Another form of conflict may be between community members where there is a lack of

homogeneous economic interests and the group is large where selfish ambitions may be more defined that could affect initiatives. There could be a deliberate neglect of the study as it may not be identified as having a great potential for economic turnover for the area and the municipality. There is also the challenge of tertiary educational levels and shortage of skills in entrepreneurship (that is an identified initiative nationally to assist with unemployment and poverty alleviation) that could hinder promoting small businesses within KwaNzimakhwe. The above case studies also introduced characteristics of collective action that can assist in the determining of the response to community-based approach.

6. General Applicability

Local economic development and community-based planning are applications belonging to a broader context of development as discussed in the literature review section evolving with different paradigm shifts over the decades. Community-based planning to enhance local economic development (or any focus on socioeconomic issue) is not a new process or approach but one that has been introduced in the above case study as well as a number of cases, even to urban villages proposed by Gandhi in India, especially those that have experienced past marginalisation from development initiatives. The two approaches or applications are applicable especially to previously marginalised communities that are numerous in developing countries as opposed to developed countries (although these communities are not excluded). There is also a constant revision of the process of both concepts in their application to suit certain contexts and address obstacles they constantly encounter therefore they are ever evolving as well as diffused on the basis of their success. The focus is developing countries in local small communities that are focused in staying economically relevant but have urban development bias where there is little focus on developing rural areas as they aren't competing economically. This can also be attributed to the lack of capacity of the government in optimising economy and little desired involvement of the corporate sector. Specifically, with South Africa, local economic development is mandated as a tool to redress the effects of apartheid and with the effects not having been effectively redressed as yet there have been initiatives introduced (including community-based planning).

7. References

Bloch, R., 2000: *Subnational economic development in present-day South Africa*, Urban Forum, Vol. 11, pgs 227-271.

Bond, P. 2001. *Debates in local economic development policy and practice: Reversing uneven development and reactivating the state in a post-Washington' epoch*. Unpublished paper presented at the Local Economic Development Workshop for Eastern and Southern Africa, Harare, 29 October.

Bond, P., 2002. *Debates in Local Economic Development Policy and Practice: Reversing Uneven Development and Reactivating Municipal Services for a Post-Washington Economic Epoch*, Municipal Services Project, Research Series Occasional Paper, University of the Witwatersrand, Johannesburg

Bond, P. 2003. *Debates in Local Economic Development Policy and Practice*. Urban Forum, Vol.14, No. 2-3, pg 147

Cleaver, F. 1999. *Paradoxes of participation: questioning participatory approaches to development*. Journal of International Development, Vol.11, No. 4, pgs 597-612.

MLONYENI, Inga, 'Investigating opportunities to enhance Local Economic Development using a Community-based planning approach: The case of KwaNzimakhwe', 52nd ISOCARP Congress 2016

DPLG (Department of Provincial and Local Government), 2006. *Stimulating and Developing Sustainable Local Economies: National Framework for Local Economic Development LED in South Africa*. DPLG, Pretoria.

Hibiscus Coast Municipality. *Integrated Development Plan 2013/2014*.

Hibiscus Coast Municipality. *Draft Integrated Development Plan 2015/2016*.

Kent, G. 1981. *Community-based planning: A better approach to development*

Kent, G. 1981. *Community-based development planning*. World Planning Review, Vol.3, No.3,pg 313

Kitchin,R, Tate. N.J. 2000. *Conducting Research in Human Geography: Theory, Methodology and Practice*. Prentice Hall

Mahlawe, O. 2008. *Key Issues in Local Economic Development in South Africa and a potential role for SALGA*. SALGA LED Position Paper

Mason, D.R, Beard, V. A, 2008. *Community-based Planning and Poverty Alleviation in Oaxaca, Mexico*. Journal of Planning Education and Research,Vol. 27, pgs 245-260

Rogerson, C. M., 1999: *Local economic development and urban poverty: the experience of post-apartheid South Africa*. Habitat International, 23, 511-534.

Rogerson, C. M., 2000a: *Local economic development in an era of globalisation: the case of South African cities*. Tijdschrift voor Economische en Sociale Geografie, 91, 397-411.

Rogerson, M. 2003. *Towards Pro-poor Local Economic Development: Case for Sectoral Targeting in SA*. Urban Forum, Vol.14, No.1

Rogerson, CM, 2010. *In search of public-private sector partnerships for local economic development in South Africa*. Urban Forum 20, in press

Simon, D. 2003. *Contextualising South African Local Economic Development within Current Development Debates: The international setting*. Urban Forum, Vol.14, No.2-3

Thornhill, C, 2008. *Re-engineering local government: Lessons from the South*. Paper presented at the CAPAM (Commonwealth Association for Public Administration and Management) Biennial Conference 'Continuing the shared journey: Achieving Public Service Excellence', 18-22 October, Barbados.

Trah. G. 2009. *Local Economic Development in South Africa: Addressing the challenges*. <http://led.co.za/> Accessed 25 May 2016

Using Catchment Areas Analysis and GIS based Spatial Analysis for Prioritising Spatial Investment in Non-Metro South Africa

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Abstract: *In the search for greater equity, spatial justice and efficiency of service delivery, the concepts of central place, agglomeration, and accessibility together with GIS principles of catchment analysis were applied to develop service catchments for social facility provision. A geo-spatially targeted hierarchy of places was also identified to prioritise investment of regional middle order facilities in “Service Malls” located in the most optimal towns to best serve non-metropolitan areas in South Africa. This paper outlines the background, principles and process applied. Delivery of social services in rural South Africa remains a major challenge twenty years after the demise of apartheid. Challenges include the poor planning and allocation of facilities; processes which are vulnerable to politically based decision-making.*

The identification and profiling of service catchments seeks to support more structured and equitable allocation of resources. The identification of prioritised town points to enable targeted social facility investment for allocation of the middle-order social facilities in non-metro areas aims will achieve more spatially balanced, sustainable and efficient allocation of services which meets the needs of both users and service providers and serves the largest number of people from the least number of service points within the principles of equity, government policy and fairness can be achieved.

The catchments and prioritisation form part of a larger research project focused on the consolidation and differentiation of provision standards to guide social facility development and investment in mainly rural areas. A pivotal aspect of the project was the development of a spatial framework for differentiating service catchment types in South Africa. To this end, the entire country was demarcated into service catchment areas based on the principles of accessibility and each service catchment was analysed and profiled in terms of a range of variables.

A key finding was that if a spatially targeted investment strategy was used for locating middle-order services at a maximum travel distance of 30km (or 50km in sparsely populated areas), it can halve the number of potential service points required while still providing services, within acceptable travel distances, to over 90% of all citizens. This could have a major impact on the rationalisation of services and the more efficient allocation of resources to provide the greatest investment returns and impact, potentially allowing for a greater emphasis on quality and operational efficiency in social services provision.

1 Introduction

In a search for greater efficiency of service delivery, the concepts of central place, agglomeration, settlement hierarchy and facility planning theory, accessibility and principles of GIS based catchment and optimisation analysis were collectively applied to develop a geo-spatially targeted set of service points that eliminate spatial overlap of service areas for middle-order services. This paper outlines the development of this geo-spatially targeted

nodal hierarchy that can be used to prioritise investment of regional middle-order services or “Service Malls” in the most optimal towns to best serve non-metro South Africa.

This paper discusses the recent research undertaken in support of this goal. The analysis outputs used to illustrate the work was part of a project to develop differentiated provision standards for social facilities for a range of rural planning contexts linked to the profiling of service catchments for all citizens of South Africa. In the sections that follow key issues are outlined, and the theoretical framework for defining the service catchments explained. The paper briefly touches on the development of service catchments before the eventual identification of the geo-spatially prioritised set of proposed investment nodes. It describes the processes used to develop the prioritised approach to middle-order social facility services nodes. The latter should comprise key facilities for transacting life such as facilities for 24-hour health services, citizen registration, police services and social service application.

The paper briefly touches on the range of economic and planning frameworks that underpin the research approach.

2 Principles and Literature

2.1 Provision of social services in South Africa

The South African constitution provides for each citizen to have access to basic services and in this respect it has become a legislated requirement that local authorities in South Africa prepare Integrated Development Plans to promote consolidated and informed development as well as deliver services. Constitutionally, South African citizens have entrenched rights to access to healthcare and social security amongst other factors (Section 27 of the Bill of Rights). This is in line the Integrated Urban Development Framework (IUDF 2016), Sustainable Development Goals (SDG) and the National Development Plan 2030 (NPC 2012) which requires that by 2030 South Africa should have made meaningful and measurable progress to reviving rural areas and creating more functional, integrated, balanced and vibrant urban settlements. If essential services are not made accessible to all communities, even the most remote, these community members will be unable to make such vital life transactions such as obtaining legal status as South Africans or residents (registering births and deaths, obtaining identification documents, accessing health services, regional level justice facilities (courts) and grant application offices, etc.) in order to conduct full, productive lives, and improve their standard of living, and obtain social support when required and will not be able to benefit from the vision of the new democracy. Currently, the delivery of social services is unequal and remains a major challenge twenty years after the demise of apartheid, especially in rural South Africa. Challenges include poor planning and the allocation of facilities which is vulnerable to politically based decision-making. Owing to the complexity of the development landscape it is not suitable, neither is it sustainable, to provide the same level of services to all areas of the country. Given that departments and municipalities have limited resources to provide services to citizens, the ultimate goal is to within the parameters of sustainability, ensure that all citizens at least have minimum access to key citizen services from the least number of service points (also considering settlement patterns) while still meeting population thresholds, distance requirements and avoiding the development of “White Elephants”.

There are currently limited universal legislated access norms and standards to guide the development of government provided social and other facilities in rural South Africa. The

experience with applying facility standards has highlighted the important role played by the context of local areas and has confirmed that it is not sustainable to provide to all areas equally.

It is widely accepted that not all services can be provided at all places. Some service types have higher population thresholds and a wider service reach with longer acceptable access distances and these provide different levels of service, e.g. regional versus local services. Services of different levels need to be distributed in different ways and provided at different levels of settlement minimum population numbers for them to be feasible, equitably distributed and optimally utilised. It would thus be inefficient to provide the same level of service in all areas of a country irrespective of the context such as density and type of development.

Past projects for the Department of Public Service and Administration, City of Cape Town and City of eThekweni amongst others (Green *et al.*, 2012b; Green *et al.*, 2010a; Green *et al.*, 2010b) have proved that accessibility analysis is an extremely useful tool to sustainably locate facilities in a way that incorporates principles of access distance, service threshold and centrality. However, this process would prove very time consuming and costly if it were to be undertaken on a national level. The demand on skilled resources required would also make this impractical, thus in 2013 the CSIR (Ngidi *et al.* 2013) embarked on a process aimed at applying principles of accessibility planning for social facility location on a national level which was less data intensive. The approach used was to develop a spatial logic for the efficient and equitable allocation of a range of different social facilities that incorporated the principles applied in the GIS based accessibility planning but without the necessity to have access to the current facility supply data. This led to the development and profiling of service catchment areas around existing nodes of various levels with the aim of establishing a hierarchy of service points for South Africa as the basis for the planning of different levels of facility demand.

2.2 *The role of Central Places in rural development*

Walter Christaller introduced the concept of Central Place Theory in 1933 to try and explain the spatial arrangement of the number and size of settlements. Although Christaller's assumptions regarding an isotropic surface and evenly distributed population are mostly invalid for South African conditions, where densely populated settlements often manifest outside key towns. His concept of a central settlement providing services to those living around it, however, remain universally valid irrespective of different density types. The theory consists of two basic principles: that of threshold (minimum population required to provide goods or services at a place); and, the range or maximum distance people will travel for services (Christaller, 1933). The latter is often referred to as the sphere of influence.

Accessibility analysis for facility location planning has incorporated and is dependent on these two economic mechanisms, namely range or access distance and threshold both being part of the Central Place Theory. The first of these two major components refers to the ability to reach a facility using available and affordable transportation and, the second, to the ability to be able to utilise a service which has adequate capacity. The ability to reach a service is generally governed by a willingness on behalf of the potential user to pay for the trip in terms of time and/or money. In reality, this mainly translates into a maximum distance people are prepared to travel, after which the cost of travel exceeds the usefulness of the service to be

received and the trip is foregone. The introduction of the concept of range/ distance to the provision of social facilities introduces a spatial dimension in planning the location, distribution and spatial organisation of services and this spatial perspective supported by GIS analysis has proved a robust approach for locating and planning social facilities.

Threshold is the minimum market (population or income) needed to bring about the selling or provision of a particular good or service. In the provision of communal free services, the minimal value will not be measured in respect of income or profit but will relate more to the efficiency of providing the service to at least a minimum (viable) number of clients;

Range (access distance) is the maximum distance consumers are prepared or able to travel to acquire goods/ services since at some point the cost or inconvenience will outweigh the need for the good/service.

2.3 Approach & Methodology

2.3.1 Principles of hierarchies in service delivery

As indicated, different services have different operational requirements and population thresholds that make a service viable from a service provider perspective while users will be prepared to travel different distances to address different service needs. The latter is mostly impacted on by the frequency at which the service is required as well as the value of the service to the users. To enable such analysis a clear understanding of the typical access and threshold values for different services are required. These principles form the basis of facility provision standards which need to be incorporated as input parameters into models designed to support accessible planning of facilities. For some of these, legislated guidelines are provided; some have evolved through practise or trial and error.

When one considers facility planning thresholds and access distances, it is clear that different facility types can also be grouped based on their having similar threshold and/or access distances and that these can be broadly divided into three categories of services: low-order basic services; high-order services; and, those in between, that form the 'middle-order' facilities. Lower-order facilities that are individually used by a fairly small number of people and are accessed frequently, such as schools, should be located as close as possible to communities of fairly low densities or small populations, while middle-order facilities, such as 24-hour clinics and Home Affairs offices, that serve a higher threshold of people but on a much more infrequent basis are located at further spaced intervals in more established places. Higher order facilities, such as universities and large hospitals can be spaced even further apart and require much more people and higher population densities to be sustainable.

This hierarchical nature of social service delivery can ideally be linked to a hierarchy of centres for clustering social facility provision to serve a wider area of different reach depending on the service level. The establishment of a hierarchy was thus considered a logical spatial structure for equitably allocating facilities of various types to different levels of a hierarchy.

2.3.2 Planning for the location of communal services and economic geography

It is not possible to rely on the market to regulate the distribution of social facilities especially in sparsely populated poverty ridden areas with limited demand and thus the welfare

approach is appropriate for the provision of social services in South Africa. Smith (Amer 2007) presents the key concept of the welfare approach as being “who gets what, where and how” which provides the fundamentals of facility planning for most services irrespective of income. The “what” refers to the service provided and the “where” to the concept of spatial variation, whilst the “how” refers to the broader social and political functioning. A fundamental issue in respect to facility location is the population that it is to serve as well as a good understanding of “where” this population lives, how they are distributed and what their profile is. To this end, a key component of the project was to develop a clear understanding/description of the different service catchments including their settlement morphology which is a subject of a separate paper (Sogoni and Ngidi (unpublished 2016).

Demand targeting and estimation in the provision of social facilities is critical for correctly calculating the size of the service while cultural, economic and social factors in facility use are also important considerations. A key output of the research undertaken was to demarcate and profile ‘wall to wall’ service catchments and to calculate the demand within each service catchment or within a specific distance of the central node of each catchment to gain a better understanding of “where” services are needed and can best be located.

In understanding the “where” of facility location, one can look to economic location theory. The theory assumes that both suppliers and users will tend to minimise their costs and that the service/ outlet will locate “where” the provision of goods and services, including transport, is optimised. Thus travel or access distance or related cost/ time variable is critical in facility location planning. People live at different densities and at different distances from facilities and their reasons for selecting a facility may include a range of factors. However, by introducing the concept of facility thresholds and applying similar threshold (or population ratios) relative to facility size and similar distance limits within similar contexts it is possible to work towards broader equity across a region for the “what” – i.e. the service being provided. This is true even if some citizens choose to make alternative choices based on various social, economic and cultural factors or perceptions as well as available public transport options. Modelling or planning facility location based on the assumption of the informed and rational citizens making a rational choice to visit the closest facility may not always be universally realistic; however, when applied at a strategic level such an approach can provide informed decision making with potentially greater equity in meeting service delivery backlogs.

By looking at the “who”, planning for a specific target group based on the threshold, and by examining “where” demand is located relative to facility location, and by setting a maximum access distance, time or cost limit, a certain level of equity and balance in service provision can be achieved.

2.3.3 Spatial equality and social well-being/ quality of life

In the provision of services citizens should, as far as is possible, not be discriminated against because of where they live. Irrespective of where people choose to live (within reason), the right to access certain basic services needs to be recognised and some effort made to provide access (even if infrequently/periodically) within the restrictions of the available funding. The issue remains that the more sparsely populated an area is, the more difficult and costly it proves to provide communal services and in some cases mobile, periodic or electronic based services are the only options, while in others it may even be necessary to withhold services and allow residents to provide as best they can for themselves.

Discrimination based on colour, creed or race is not acceptable and neither should discrimination be practiced on the basis of place of residence (Amer, 2007). Smith (1995) also highlights the need to achieve social justice within the spatial and geographical arena.

3 Objectives/ Research Questions

It is not possible to rely on the free market to successfully regulate the distribution and provision of social facilities in a developing country and, furthermore, it is recognised that there are insufficient funds to provide all the required facilities in every settlement in the country, and so choices need to be made as to which locations to service. It can also be rationally argued that within the context of budget constraints, services should be provided where they can have an impact on the largest number of people at the same or lower cost (Green *et al.*, 2008).

The identification of those places of greatest need or of greatest accessibility to residents should be prioritized for investment. Thus, the identification of a prioritised hierarchy of places that can be used as a means of spatially targeting the largest number of people from the least number of service points is important.

4 Approach & Methodology

4.1 Analysis approach

In this project two levels of analysis were followed. The first was to demarcate, profile and rank all catchments based on their demand threshold and centrality and to define a minimum basket of services for each level of catchment for a full spectrum of services under the assumption that all needs can be met. The second approach was to target investment requirements on the optimal provision of service access to a basket of middle-order services (which have an access reach of approximately 30km) and identify where they would best be located and preferably linked to a hierarchy. The goal was to seek the lowest number of optimal locations to service at least 80% of the population with a middle-order package of critical services. The latter approach is intended to support the development of sustainable service delivery networks in an environment full of pressures relating to insufficient resources to deal with the extent of the development challenges and competing political and administrative priorities.

4.2 Creating the catchment hierarchy

To support the differentiated and appropriate provision of facilities for different contexts, the service catchment approach (Green *et al.* 2012a) was used to allocate and define the entire country into appropriate service catchments. After which the hierarchical concept was used as the building block for allocation of facility provision packages at different levels and linked to different levels of catchment.

Making use of advanced GIS spatial allocation models it is possible to, from a strategic perspective, undertake a national/regional analysis of demand (population distribution) and potential supply points (town points) linked via the transport network. Such models are most useful for balancing and planning facility capacity within a region or area to achieve spatial equity and social justice. These tools were applied to demarcate service catchments for social facility provision for all areas outside the metropolitan areas. Using GIS tools together with accessibility/central place principles, service catchments for South Africa were developed around the 1328 nodal places of different sizes and settlement morphology that

had previously been identified for South Africa (stepSA, 2016). For the purposes of the process, the country was divided into 1km² grid cells and these units were used to allocate all areas, and by implication its population, to one of the classified settlements. A detail dwelling frame data set was used for this purpose after which the population was assigned to each grid cell and aggregated to the defined catchments.

The classification and profiling of an extensive range of settlement and development contexts as they occur outside of the metros is critically important in understanding both how much, where and how facilities should be distributed within catchments. The profiling identified a vast range of diverse settlement contexts which proved difficult to classify into a usable number of types. However, the profile of each catchment provides sufficient detail to better inform the facility location within each catchment. The latter is extremely complex in nature given the diversity of contexts currently in South Africa and will require local adaptations in each instance. The profiles of the catchments cover a range of factors including population size, density, area, administrative role, economic production measured through Gross Value Addition (GVA), settlement morphology and topography, nodal level and information on travel distances to other settlement levels. The settlement morphology within each catchment is considered to be a key informant to the final number, size and distribution of services within each catchment.

To ensure the sustainability of services and their effective provision, the location of services at key points of accessibility and centrality is critical. The first approach was to develop a hierarchy of catchments based on the profile information. In the 10-level hierarchy that was defined, there are certain links and relationship to the CSIR/SACN typology of settlements for most of the higher order places, while the catchments of lower order places were mostly ranked according to population size. The reason for this is that population demand is the single major factor together with distance effecting the efficiency and viability of services.

The alignment of the several different facility thresholds (the number of people or the size of a community to be provided with a facility) and the appropriate access distance to reach a facility was used as input to the development of the catchment hierarchy and some of the key/common threshold values for selected services (i.e. 1 000 person threshold for schools, a 5 000 person threshold for a fixed 5-day a week clinic and a 20 000 person threshold for a Home Affairs office) informed the number of catchment levels and the ranges of each that were defined. Understanding the frequency of service use and typical acceptable travel distance for different services, and making use of the key parameters of service threshold and access distance of selected facilities, it is possible to group different facility types into three basic groups, namely local, middle and higher services. In this way the hierarchy can be suitably linked to typical facility types with similar thresholds and access distances. Where relevant the node level of some towns was elevated in the sparsely populated and most remote areas of the country.

The first four levels/orders are considered to be developed middle to higher order settlements, or be significant places within more remote/sparse regions. The classification of Levels 1 to 3 and most selected level 4 nodes is based on the SACN/CSIR Typology (stepSA, 2016). In the case of Order 4 settlements, several factors including their playing an important role in their wider area were considered in their selection even if they had a low population (i.e. they were in areas where there was no other suitable service town or other place that was contextually significant in the area). The aim was to ensure that in most areas

of the country there was at least one level 4 (or above) catchment node within a reasonable distance at which to locate middle-order facilities. (The definition of reasonable is again context specific given that in the more arid western regions of the Northern Cape 80km may be reasonable while the distance is seen as excessive in the more densely populated eastern side of the country.)

5 Research Analysis & Findings

5.1 Research analysis

An analysis of the number of people in each catchment level confirmed the concentration of people in the higher order catchments, with over 50% living within the influence sphere of a metro, city or regional service centre. There was also a clear predominance of non-metro catchments with one or two concentrated settlements displaying a clear nodal structure.

Since the key focus of the project was on differentiated services to support the application of standards in rural areas, service packages linked to the typical threshold values (and service reach) were developed for each level with allowance for extra services in more remote areas. The creation of a hierarchy of catchments thus forms an important regulating system for the equitable and efficient distribution of services. For effective application of the standards packages, an understanding of the internal settlement morphology of the catchment is vital. The morphology and its implication on service distribution networks, is addressed in a paper by Sogoni and Ngidi (2016) as well as through the development of application guides.

The provision standards focused on aspects of access and threshold in relation to a range of functional service areas rather than facility design and structural elements. Service provision packages were drawn up based on the crucial concept of providing a minimum of key services to transact basic life requirements. If these essential services are not accessible, community members will be unable to make such vital life transactions as birth registrations, and obtaining access to grant, education and health services. These key services thus form the basis of any service package offered to a community. Depending on the size of communities, their location and distribution, the service packages will provide different levels of specialisation.

To further evaluate service access provision and support planning of higher order service such as 24hour clinics and citizen registration services, a travel distance analysis was undertaken to test the centrality of each of towns at the centre of the catchments as well as the level of settlement concentration within each catchment. The analysis focussed on the 30km distance range. The reason for this was that, based on the most commonly provided middle order services, it is clear there is a convergence of distances between several services as indicated below:

- 15 to 24km – police stations, FET colleges and community halls in a rural context;
- 25 to 30km – Home Affairs offices, Department of Labour offices, multi-purpose centres/Thusongs, SASSA offices, hospitals or community health centres depending on density.

Many of the above social facilities form the core of the so-called “Social Services Mall” concept where middle-order services, that are considered to be critical for all citizens, are

clustered together in close proximity or even under one roof in a Thusong centre or multi-purpose centre. The service offering at such facilities can be incrementally increased based on the elasticity of demand thus no maximum threshold of people to be served was applied. The 30km distance was selected as an appropriate structuring mechanism for most parts of the country for distribution of middle-order service malls. In sparse areas in the western part of the country (less than 10 person/km²), this distance was extended to 50km to support the viability and cost efficiency requirements in low density contexts. The analysis statistics show that at the 30 (or 50km in sparse areas) distance these service could be accessible to 91% of the population if services are placed in all (535 places) catchment nodes of Levels 1 to 7 (having 20 000 or more people per catchment). To achieve a 95% coverage requires extending middle-order service to places with between 10 000 and 20 000 people (level 8), and depends on having up to 805 services points. This highlights the issue that to provide the same package of services to all catchments of the same levels can be costly and potentially not affordable. It will also require significant management and logistics input to support such a large network of services.

Examination of the catchment and travel distance analysis results revealed the problem of likely service redundancy due to the overlapping and competing nature of catchments, resulting in low thresholds of some places thus potentially limiting the positive agglomeration effects through too much competition within the travel range. This promoted the approach of applying spatial optimisation analysis techniques to select points with non-overlapping service catchments with a specific range and minimum threshold levels. The purpose was to potentially achieve more cost efficiency in service distribution but still maintain equity in the location of typical middle-order services. Thus using the goal of service efficiency in conjunction with accessibility as the departure point, an optimisation analysis of all node centroids in South Africa was done to identify optimum locations for social facility 'service malls'. The goal was to identify the least number of service points from which to service the maximum number of citizens.

As indicated earlier, the access range of this group of social services is generally between 20 and 30km for most areas with a 50km range being acceptable for very sparse western parts. Thus the analysis input distance parameter was set to a maximum of 30km in most areas and 50km in the sparse areas in west and north west of the country (this distance is based on the road network rather than simply a straight line distance). The use of GIS and the concept of a maximum travel distance addresses the issue of spatial quantification and fairness and enables analysis across space and not is not limited by service ratios within administrative or other spatial units. This allows for measurement across boundaries, more closely reflecting the travel choices of citizens who are generally not aware of the demarcation lines between areas such as, education or health districts.

The optimisation was applied to all areas of South Africa outside the boundaries of the metropolitan areas. A key assumption was that based on the regional importance or size of the Level 1 to 4s, analysis should by default include all these nodes. The starting point of the analysis was thus to demarcate a 30km catchment around each of these nodal towns based on the network distance. Following this an optimisation analysis algorithm was applied to all areas more than 30km from the Level 1 to 4's to identify the remaining most optimal locations to act as middle-order service provision centres from the nodes of the Level 5 to 10

catchments. Due to computational limitations the analysis was done using the mesoframe of a 50km² spatial unit of South Africa.

The catchment optimisation model sequentially and iteratively identified the mesozones which were the most optimal and densely populated within the distance parameter. Once all suitable mesozones were identified, the optimised mesozones were aligned to the nearest towns serving as catchment centroids. This process was completed though a manual check and a final selection was made of the significant town closest to the selected mesozone. The manual check resolved any inconsistencies and verified the final selection of points. In most cases where there was more than one town close to the optimal mesozone it was sufficient to select the node of the highest order as a default. On completion, a final catchment analysis was done of the selected points to generate the service coverage statistics from all points with more than 5 000 people within 30/50km distance.

5.2 Findings

The outcome was excellent. A service coverage of 91% of the total population within the 30 to 50km range was possible from only 377 central points. When only considering the non-metro population, 84,7% of people can be served from 368 points. This is a major reduction from the 805 places required to reach 96% of the population if using the catchment level approach as opposed to applying a spatial targeted approach. The prioritised town locations and the respective travel distance catchments are shown in figure 1.

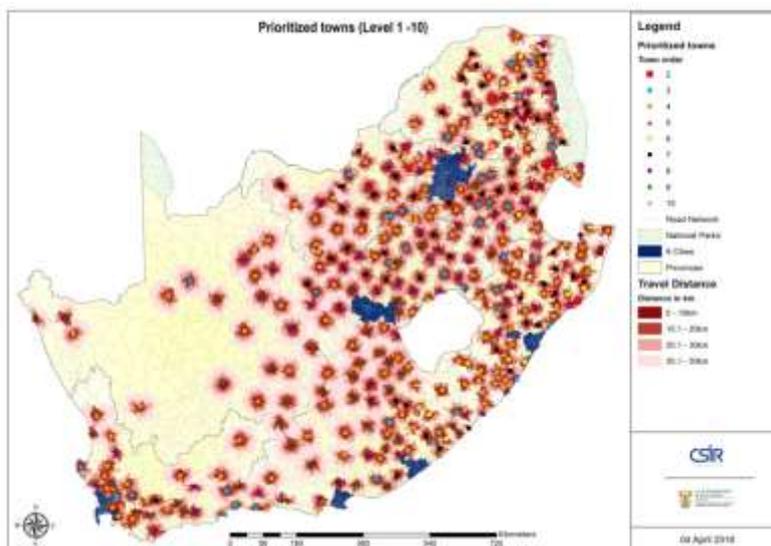


Figure 1: Prioritised towns and orders and surrounding travel distance bands. (Source: Authors, 2016)

Figure 2 below shows the number of prioritised towns in relation to all the towns.

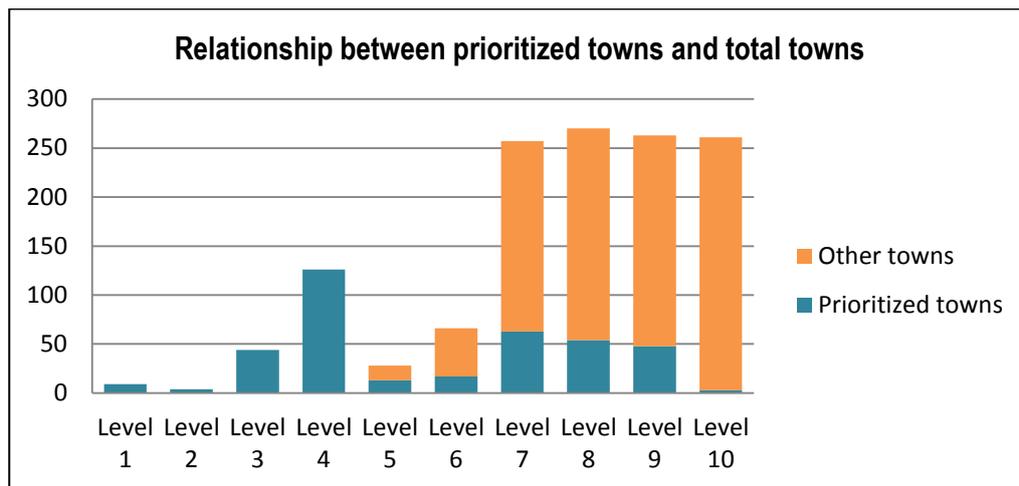


Figure 2: Relationship between prioritised towns and total towns. (Source: Authors, 2016)

The implication of this is highlighted by table 1 below which shows that, by spatially targeting prioritised towns that optimally reach areas of 30km or less with no overlap, it is possible to achieve high service coverage whilst minimising the number of service points and yet still attain a high percentage of population served.

Town Category	Towns by Orders (Cumulative Values)										Total
	9 Cities	Order 2	Order 3	Order 4	Order 5	Order 6	Order 7	Order 8	Order 9	Order 10	
<i>All towns (No prioritisation)</i>											
Number of towns	9	13	57	184	212	278	535	805	1067	1328	1328
% population reached in 30/50km	40.39%	42.25%	55.42%	74.13%	80.60%	83.60%	91.30%	95.90%	98.30%	99.20%	99.20%
<i>Prioritized towns – including the 9 cities</i>											
Number of towns	9	13	57	184	197	214	276	330	377	380	380
% population reached in 30-50km	40.39%	42.25%	55.42%	74.13%	77.53%	80.24%	86.15%	89.34%	90.90%	91.03%	91.03%
<i>Prioritized towns – excluding the 9 cities</i>											
Number of towns	-	4	48	175	188	205	267	321	368	371	371
% population reached in 30-50km	0%	3.12%	25.21%	56.60%	62.29%	66.86%	76.76%	82.12%	84.74%	84.95%	84.95%

Table 1: Number of towns and population per order.

6 Research Contribution

The analysis has implications on service provision throughout the country. The prioritized locations specifically identified for middle order service location means that service providers can achieve high service reach levels using fewer locations rather than trying to roll out services in every corner of the country. These prioritized towns can potential service 90% of the country's population with respect to middle order services within 30/50km from 377 selected towns. With this information, service providers will have a clear understanding of which locations can yield the optimal service reach levels in the most efficient manner. This data can also be used to support a range of other investment decisions, both public and private, in a more cohesive manner.

If the spatially targeted investment strategy is used to locate middle-order services as described above it can reduce the number of potential points to be serviced by over 50% while still being within acceptable travel distance of over 90% of citizens including those in rural areas. This could have a major impact on the rationalisation of services and more efficient allocation of resources to areas of greatest impact, potentially allowing for a greater emphasis on quality and operational efficiency. This is especially relevant given the expected increased demand and reduction in the South African fiscus within the medium term.

7 Research Limitations

The successful implementation of the research outputs will depend largely on government's investment policies and the availability of resources.

For instance, it is stressed that as far as possible facilities should be clustered and that the selection of nodes where there is already existing development or infrastructure should be a key consideration in locating facilities. Resource restraints, particularly around budgets and staffing, mean that particularly in the case of the more specialised and larger facilities, that a roll-out of service provision may be required such that the most needy and largest populations are served first and choices are made between two similar locations. In this regard, the use of the prioritised town hierarchy which has been developed will be critical.

The lack of well-maintained datasets on current facilities means that additional local planning is required to avoid the duplication of services. The analysis was not able to consider the availability of public transport and routes as this information is not readily available and in a usable format.

8 Discussion & Concluding Remarks

A multi-pronged approach has been taken. Firstly, to demarcate the country into services catchment regions and to profile these with parameters relevant to social service delivery and define a social facility service package for reach catchment. Please see www.socialfacilityprovisiontoolkit.co.za. This data can also be supportive of a range of other planning activities. Secondly, a non-overlapping hierarchy of central places/nodes where middle to higher order services can be sustainably provided at central and accessible places was developed. This structure can then provide the basis for incrementally extending services to as many people as possible over the longer term.

Most places still require all local facilities such as schools, pension pay points and small health facilities while middle-order services that are essential for citizens to transact fully in

society should firstly be directed to the prioritised nodes before they are provided to any other places with sufficient demand.

It is in the provision of clustered middle-order services that the opportunity exists to direct investment optimally outside the metros. This targeted approach can best serve non-metro citizens by using the prioritised town points in order to serve the maximum number of citizens in the surrounding communities from the least number of points.

References

- Amer, S. 2007. *Towards spatial justice in urban health services planning*. University of Utrecht: Enschede, The Netherlands.
- Christaller, W. 1933. Static Relations. In Christaller, W. *Central Places of Southern Germany*, pp.27-81. Baskin C.W. (trl) Englewood Cliffs, N.J.: Prentice-Hall.
- Green, C.A., Breetzke, K. & Argue, T. 2008. *Standards for improved governance and performance measurement in the eradication of backlogs and delivery of public facilities*. Winelands 11th International Conference on Public & Development Management. April 17-18 2008. Stellenbosch.
- Green, C.A. and Argue, T.C. 2012. *CSIR Guidelines for the Provisions of Social Facilities in South African Settlements*. August 2012: ISBN 978-0-7988-5603-4. Pretoria: CSIR.
- Smith, D.M. 1995. Geography, social justice and the new South Africa. *South African Geographical Journal* 77(1):1-5.
- Green, C.A., Mc Kelly, D., & Mans, G.G. 2010a. *eThekwini accessibility mapping and optimisation of community social services 2010. Section 18 (Vol. 3) – Node Hierarchy Catchment Analysis. Phase 3 optimising*. Report No. CSIR/BE/PSS/ER/2010/0046/B. Pretoria: CSIR.
- Green, C.A., Mans, G.G. & Spocter, M. 2010b. *Evaluation of community social facilities and recreational space in City of Cape Town: current and future provision for 2016 and optimal location of new facilities*. Report No. CSIR/BE/PSS/ER/2010/0041/B. Pretoria: CSIR.
- Green, C., Mans, G., Le Roux, A., Zietsman, L. and Ngidi, M. 2012a. *Providing government services in an equitable and uncontested manner through geographic accessibility processes*. Paper at Planning Africa 2012 eThekwini, September 17-19 2012.
- Green, C.A., Mans, G., Le Roux, A., Schmitz, P., Mokgalaka, M., McKelly, D., Ngidi, M., Badenhorst, W., Zietsman, H.L. 2012b. *Geographic accessibility study of social facility and government service points for the metropolitan cities of Johannesburg and eThekwini 2011/12*. Report No. CSIR/BE/SPS/ER/2012/0061/B. ISBN 978-0-7988-5608-9. Pretoria: CSIR.
- COGTA(Department of Cooperative Governance and Traditional Affairs) 2016. *Integrated Urban Development Framework, A new deal for South African cities and towns*.
- NPC (National Planning Commission) 2012. *National Development Plan 2030: Our future-make it work*. Pretoria: NPC the Presidency, p260.
- stepSA. 2016. *Functional City, Town and Settlement Typology* [online]. Available from: http://stepsa.org/settlement_typology.html [Accessed 14 April 2016].
- Sogoni, Z. and Ngidi, M. 2016. *The Morphological / Settlement Pattern Classification of South African Settlements, Based on a Settlement Catchment Approach, to Inform Facility Allocation or Service Delivery*. Unpublished conference paper presented at Planning Africa 2016, 3-6 July 2016, Johannesburg.

The spatial context of sustainable rural livelihood development

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When considering planning proposals and considerations for supporting sustainable rural livelihoods, arguments can be made for both centralised and decentralised planning scales (Conyers & Hills, 1984:223). In South Africa, different spheres of government (national, provincial and municipal) have different responsibilities with respect to rural planning and development, although rural development strategies are predominately developed by national and provincial government (centralised planning). Despite the efforts of the different government spheres, though, the implementation of these strategies, as elsewhere in Africa, is still not having the desired effect in rural areas (Dalal-Clayton, et al., 2003:197). In this regard, research regarding the impact of planning at village level (micro-level) can provide valuable insights for realising sustainable rural livelihoods.

In addition to the appropriate planning and implementation scale, the spatial dimension of rural livelihood within the South African context also requires a specific understanding of the extreme differentiation of areas within 'rural South Africa'. Not all spatial systems are similar in nature and being cognisant of the micro and macro relations, as well as the spatial context of a rural community, provide a fundamental awareness of what constitutes rural livelihoods. This is the approach advocated in the Draft Integrated Urban Development Framework (2014:61), which emphasises the need for a managed response that recognises the extreme variation between spatial areas.

Spatial scaling of rural livelihood planning

Assessing the appropriate scale for the development and implementation of sustainable rural development strategies in South Africa requires a consideration of both central and decentralised planning. While centralised rural development planning has for a long time held sway, there has also been a growing realisation that decentralisation is pivotal to rural development (Dalal-Clayton, *et al.*, 2003:193). The primary concerns in this regard are the level at which decisions about the planning and implementation of development programmes are made, and coordination between different levels (Conyers & Hills, 1984:224).

Almost all development planning is 'local' (decentralised) in the sense of the needs of people, interventions to address them and accountability to local populations, but it is only from the 1970s onwards that, instead of centralised development planning, a more comprehensible scale of planning, or 'micro-development', began to be seriously considered as a viable planning approach. Brooks (2004:63) accounts for this as a realisation that people rather identified with the immediate neighbourhood where they lived than the administrative unit (planning level) in which it was situated. For instance, some of the problems that people perceived as making the most difference to their daily quality of life, such as neighbourhood safety, occur at the localised level. This has led to the emerging prominence of micro-development as a planning scale.

Micro-development in a rural context essentially focuses on the smallest territory that has meaning for the local people; which is effective and efficient; and for which they can define their own 'life space' in terms of their values and realities (Taylor, 1992:236). Many studies show the complexity and diversity of rural livelihoods and the strong influence that local contexts have on the scale and nature thereof (Satterthwaite & Tacoli, 2002:66-67). This bears out the validity of a micro-development approach, specifically in a rural African context. Jouve *et.al.* (1996:19), for example, have concluded that village communities are the most effective scale of planning, stating that in many developing countries (especially sub-Saharan Africa), individuals are usually closely integrated in family and lineage units, where their technical and social behaviour is relatively homogeneous and codified within a village

community. Between different village communities however, the variety of micro and macro relations and contexts result in dissimilar spatial systems, even within the same region.

Inherent to the utilisation of micro-development as a sustainable rural livelihood strategy, is the issue of coordination with other planning instruments, as well as decision-making powers (Conyers & Hills, 1984:225). Rural development projects are rarely successfully implemented in developing countries, as responsible authorities often lack enough authority and/or resources (Dalal-Clayton, et al., 2003:197). This state of affairs is amply illustrated by the inability of most local governments to implement their IDPs, especially at territorial and social scales, such as the village agrosystem.

To truly realising sustainable rural livelihoods, communities often need the involvement of central government and possible third parties such as NGOs (Taylor, 1992:246). Local government is uniquely placed to analyse and understand the dynamics within local communities, and ensure that considerations which these communities may not necessarily entertain, be included (such as the participation of excluded and marginalised members of the community). As a prime example, the White Paper on Local Government (1998:25) states that there are many obstacles to the equal and effective participation of women, such as social values and norms, as well as practical issues such as the lack of transport, household responsibilities, personal safety, etc. Municipalities can adopt inclusive strategies aimed at removing these obstacles to, and actively encouraging, women's participation. Supporting stronger local governance (village and municipal) is fundamental in the pursuit of sustainable rural livelihoods, and should focus on the following objectives (adapted from Davids *et al.*, 2009:109):

1. Realisation of needs-oriented and endogenous nature of society's value and social reality.
2. Bottom-up decision making by communities, community control and management of resources.
3. Structural transformation of social relationships, economic activities and power relationships.
4. Responsive, creative and innovative institutions and institution building.
5. Self-reliant, participatory partnerships between planners and beneficiaries in communities.
6. Capacity building and empowerment of communities.
7. Support for and advocacy of people's roles in development by government, NGOs and CBOs

Complexity of rural space

'Rural' space has historically been juxtaposed with 'urban' space, frequently using population density and economic activity as the predominant criteria to differentiate between the areas (Fazal, 2012:2). As such, 'rural' areas have traditionally been viewed as areas outside the city/urban boundary or periphery with a spatially dispersed population, where the main economic activity tends to be agriculture. This approach towards spatial differentiation informed studies of the interaction between urban and rural areas in developing countries, focussing on settlement hierarchies that usually had an urban bias (Rostow, 1960; Boudeville, 1966; Friedmann, 1966).

It soon became clear, however, that these models did not represent the complex reality of human settlement and the rural-urban interface in developing countries, specifically the effect of migration dynamics. Rural populations in developing countries consider migration as an important way to increase or diversify income and/or to ensure access to assets and it can either be circular, seasonal, long term or permanent (Gilbert & Gugler, 1992:79). This two-way connection may include urban-rural linkages (sending remittances from urban to rural areas, supporting new migrants to urban areas), but also rural-urban (sending food from rural to urban areas, rural asset management) (Satterthwaite & Tacoli, 2002:55).

The continues intensification of rural-urban linkages has also led to the blurring of boundaries between what constitutes 'rural' and 'urban', as well as the diffusion of economic and spatial boundaries (Ndabeni, 2013:13). Some development studies began to consider the transitory zone of mixed rural and urban economic, social, cultural and natural resource uses at the periphery of cities in developing nations, even developing typologies to describe these 'peri-urban' areas. Iaquineta and Drescher (2000), for example, categorised peri-urban areas into five 'ideal' types (village, diffuse, chain, in-place and absorbed) according to the evolutionary impact of migration, presented in the following table.

Village peri-urban: Rural villages with an urban consciousness. It is distant from the city both geographically and in travel time, but acquires an urban consciousness from out-migrants who contribute remittances and non-income resources, impart "urban" ideas and modes of behaviour and participate in (often strategic) community-decision making.

Diffuse peri-urban: Areas proximate to the city with high-level ethnic heterogeneity because of multiple-origin in-migration, with greater density of various beliefs about customary institutions leading to increased likelihood of conflict and the possibility of the development of new institutions for resolving conflict.

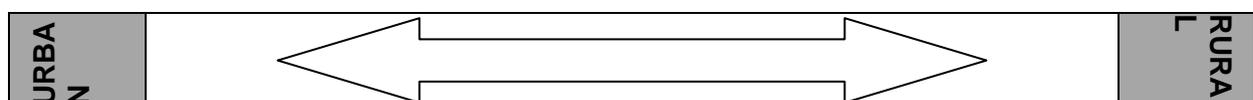
Chain peri-urban: Areas that is geographically close to the city and undergoes growth via a process of chain migration; also areas usually identified as "squatter settlements" on urban fringe.

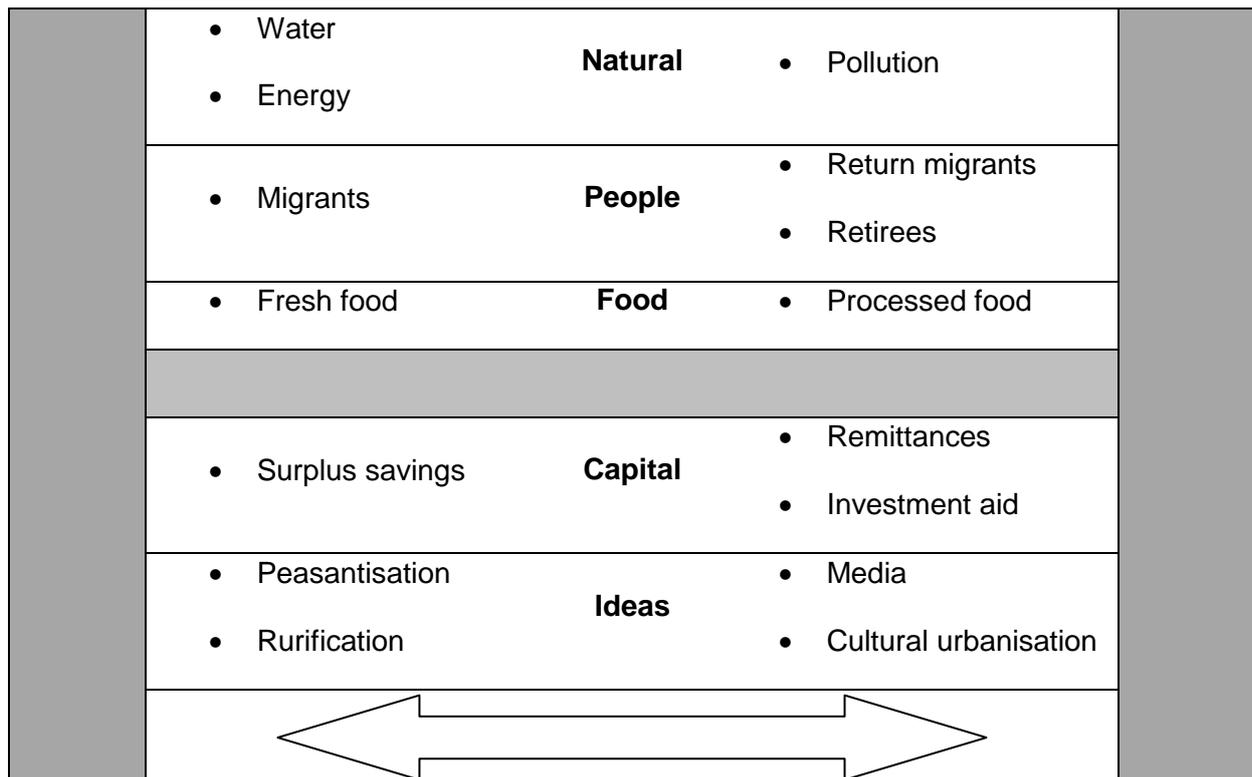
In-place peri-urban: Geographically close to the city and in the process of being absorbed by it; the result from in-place (in situ) urbanisation, natural increase and some migration.

Absorbed peri-urban: Areas proximate to or within the city that have been absorbed for a considerable period of time and deriving either form in-place or chain peri-urban areas.

Summary of peri-urban typology (Source: Iaquineta & Drescher, 2000).

The complexity of the rural-urban interface (and, in turn 'rural' areas) is not only determined by the multiplicity of migratory patterns as indicated by Iaquineta & Drescher (2000), it is also influenced by flows of natural resources, ideas, information and wealth exchanges (Ndabeni, 2013:1). While the flows of people, foods and goods (raw or processed) are tangible, that of ideas, information and wealth exchanges are less so (Lynch, 2005:3). Further complicating the rural-urban interface is the influence on these linkages by the socio-political, economic and structural relationships maintained between individuals and groups in the different areas (Lesetedi, 2003:37). A stylized representation of these linkages, flows and networks connecting rural and urban areas, with an exchange of benefits and disadvantages on both sides, is presented in the following figure.





Urban-rural linkages (Source: Lynch, 2005:6)

In the South African context these urban-rural linkages are also prominent when considering rural areas; for instance, some of the differentiation criteria that the NDP (2012:264) indicates for rural areas are the contraction or expansion of their populations due to migratory patterns, location with respect to development nodes and corridors, and the degree of poverty. Another significant criterion is that of the Department of Human Settlements (2009:1-4) namely tenure, stating that the housing needs differ in areas with communal tenure and traditional settlement patterns to those in rural towns with informal and formal settlements. Using the criteria of the (dominant) economic activity, it can vary from commercial farming areas to subsistence farming areas (with communal tenure) and often include small towns and settlements which are largely dependent on agriculture.

The multi-faceted concept of 'rural' South Africa is further complicated by the effect that apartheid policies have had on human settlement patterns (Ndabeni, 2013:13). This specific aspect is emphasised by the distinction that the National Development Plan (2012:264) makes in Chapter 8 between human settlements in the 'rural' areas of South Africa: it distinguishes between settlements in commercial farming areas and those in former homelands. Those in commercial areas are categorised into small market towns, agrivillages, informal settlements, farm villages and scattered homesteads and those in former homelands into displaced townships, peri-urban informal settlements, villages and scattered homesteads.

The recognition that human settlements in the rural areas of South Africa are to a greater or lesser extent interwoven with urban areas, through multi-level linkages, has directed the NDP (2012:279) to adopt the approach of UN habitat towards 'rural' and 'urban' settlements. Instead of separate categories, urban and rural are seen as a continuum of settlements, linked by various influences and processes. It is important to understand, however, that the nature of relationships and linkages is not uniform and as such the urban-rural continuum is not a smooth linear transition (Lynch, 2005:90-91). When considering rural livelihood proposals and planning considerations, it is of the utmost importance to ascertain the spatial dimension of a specific rural community for which the strategy is designed (i.e. its 'position' in

the urban-rural continuum). In this regard, the rural-urban continuum (as conceptualised by Satterthwaite (2000) and illustrated in the table below) is a useful tool to assist in determining the specific aspects of the spatial dimension of a specific rural community.

RURAL	RURAL-URBAN CONTINUUM	URBAN
<p>Livelihoods drawn from crop cultivation, livestock, forestry or fishing (i.e. key for livelihood is access to natural capital)</p> <p>Access to land for housing and building materials generally not a problem</p> <p>More distant from government as regulator and provider of services</p> <p>Access to infrastructure and services limited (largely because of distance, low density and capacity to pay?)</p> <p>Less opportunities for earning cash: more for self-provisioning; greater reliance on favourable weather conditions</p> <p>Access to natural capital as the key asset and basis for livelihood</p> <p>Urban characteristics in rural locations (e.g. prosperous tourist areas, mining areas, areas with high-value crops and many local multiplier links, rural areas with diverse non-agricultural production, etc.)</p>		<p>Livelihoods drawn from labour markets within non-agricultural production or making/selling goods or services</p> <p>Access to land for housing very difficult; housing and land markets highly commercialised</p> <p>More vulnerable to 'bad' governance</p> <p>Access to infrastructure and services difficult for low-income groups because of high prices, illegal nature of their homes (for many) and poor governance</p> <p>Greater reliance on cash for access to food, water, sanitation, employment, garbage disposal,</p> <p>Greater reliance on house as an economic resource (space for production, access to income-earning opportunities; asset and income-earner for owners – including <i>de facto</i> owners)</p> <p>Rural characteristics in urban location (urban agriculture, 'village' enclaves, access to land for housing through non-monetary traditional forms, etc.)</p>

The rural-urban continuum (Source: Satterthwaite, 2000).

In essence, planning approaches that intends to provide viable options for sustainable rural livelihoods, need to be cognisant of the fact that many rural and urban residents rely on a combination of both rural- and urban based assets or income sources as part of their survival strategies. This implies that specifically in terms of poverty, a distinction between urban and rural contexts are limited, because of the characteristics of production patterns, rural-urban links and the diversity of conditions in both rural and urban areas (Satterthwaite & Tacoli, 2002:59-60). Rural livelihood strategies contain both urban and rural elements, comprising any combination of activities such as cultivation, herding, hunting, gathering, reciprocal or wage labour, trading and hawking, artisanal work (i.e. weaving and carving) processing, providing services in transport, fetching and carrying, begging and theft (Chambers & Conway, 1992:8). Furthermore, migration for rural populations is an important way to increase or diversify income and/or to ensure access to assets.

It is also of vital consequence in South Africa to understand the gender dimension of rural livelihoods. Some of the relevant issues are that women comprise a large percentage of the rural poor (NDP, 2012:42), women migrants in urban areas usually send home a higher percentage of their income than their male counterparts and women in rural areas have less control over the spending of remittances (Ndabeni, 2013:25). In addition, female-headed households are particularly disadvantaged as they spend relatively more on basic social services such as food and water, shelter, energy, health and education, and transport and communications services (Department of Human Settlements, 2009: 3). This argues for a specific focus on women when developing sustainable rural livelihood strategies, with an inclusive understanding of the complexity of 'rural' space and its interconnectedness with urban space.

Micro-development in Africa

In an African context, there are numerous studies corroborating the success of a micro-development approach towards sustainable rural livelihood development (Dalal-Clayton, *et al.*, 2003; Jouve, *et al.*, 1996). However, Ndaro (1992:195) argues that local initiatives will remain marginal to the development process unless they are integrated with the planning efforts of government. In this regard, it is encouraging that in South Africa, micro-development is being promoted by national policies such as the National Development Plan (2012) and draft Urban Spatial Development Framework (2014). These policy documents make provision for village development, supporting the stance that effective sustainable rural livelihood development needs to take place at village level. The necessity for active involvement of local people in managing the resources they depend upon, and in planning their own development, cannot be denied (Dalal-Clayton, *et al.*, 2003:193), but they need institutional support from various levels of government if they are to succeed.

Some of the arguments in support of local level initiatives in Africa (micro-development) are provided by Taylor (1992:223), an advocate of local self-reliance in a rural context, such as:

- In the current state of crisis in Africa, local level initiatives are necessary for survival.
- African governments are unable to provide adequate development services and local people cannot depend on the state to provide them with sufficient means to improve their quality of life.
- There are unutilised or underutilised resources available at local scale, including financial resources, which could be mobilised for development purposes.
- The enormous diversity in rural Africa in economic, ecological, sociological and political terms is such that development can be effectively addressed only at the local level.
- Economically sound 'sustainable development', as emphasised by the Brundtland Report, has unique meaning at the local level.
- Central planning has inherent weaknesses and the need for decentralisation and devolution is paramount not only in Africa, but many other countries, both socialist and capitalist.

Indigenously based knowledge has a major contribution to make to the development process and this local knowledge is effectively found at the local scale.

Considering that women in South Africa constitute a large percentage of the rural poor (NDP, 2012:42), it is obvious that micro-development strategies for sustainable rural livelihood development should specifically provide for their needs and priorities. Issues such as

unequal access to ownership of land and the other social and power relationships which are included in the concept are particularly important (Taylor, 1992:236). Access to safe drinking water, electricity and quality early childhood education, for example, would greatly ease the burden of women having to generate survivalist strategies in rural areas (NDP, 2012:218). This needs knowledge of the diversity of rural areas and agricultural practices in order to avoid the exclusion of households, and assist in contextualising and focusing interventions (Laurent, *et al.*, 1999:190).

Illustrating the effectiveness of micro-development approaches towards sustainable rural livelihood development in an African context, with a specific focus on women, is the Boma Project in Kenya (BOMA Project, 2009). The Boma Project in Kenya (a NGO) aims to alleviate poverty and build resiliency through their Rural Entrepreneur Access Project (REAP). It is a two-year poverty graduation programme that provides a cash grant (seed capital to launch a business), sustained training in business skills and savings, and hands-on local mentoring by village mentors to business groups of three women. REAP helps women to build a pathway out of extreme poverty by addressing three elements that contribute to the cycle of aid dependency in the arid lands of Africa: low incomes, inconsistent cash flows and inadequate financial services for the rural poor. Profits from each REAP business provide a diversified income, while Boma savings associations help women to manage cash flow (for daily needs), plan for future expenses (such as school fees and medical care), and respond to shocks (such as drought or family emergencies).

Another example is that of the Millennium Villages initiative in Africa (Millennium Promise, 2006). Millennium Promise believes that villages can transform themselves and meet the Millennium Development Goals if they are empowered to implement inexpensive, community-led interventions. In addition to actively engaging communities to lead the implementation of these interventions, there is also the provision of low-cost, practical and integrated investment. It is tailored to meet the needs of each community in health, food production, education, access to clean water, and essential infrastructure. These investments are provided to the villages under the scientific and technical guidance of the Millennium Promise Scientific Council, the UN Millennium Project and The Earth Institute at Columbia University. Millennium Promise also understands that the development of Millennium Villages (micro-development) cannot take place in isolation but need the support of government, partner organisations and, of course, the village members themselves.

Conclusion

It is clear from the preceding discussion that there is tremendous potential for village-based rural livelihood development to result in sustainable development and poverty reduction. Village-based rural livelihood development, as a manifestation of micro-development, would reflect many aspects of sustainability on a small scale. It may also address the current needs of many rural people and realise some of the objectives of the National Development Plan (2012). It could even lead to a pattern of interconnected "villages" or mixed-use, self-reliant and human-scale centres (Silberstein & Maser, 2000:37).

However, the importance of local initiatives should not be romanticised. Taylor (1992:225) states that local initiatives cannot replace effective public provision but can only flourish in association with it. The promotion and consolidation of localised decision making (micro-development) can provide an implementable compromise between top-down policies and bottom-up social networks (Magnaghi, 2005:200-201). It is imperative to acknowledge, in this regard, that a workable and flexible balance between localism and the place of communities in the wider system be sought. In addition, micro-development is in nature too detailed to be easily included in broader policy, although it could inform the direction thereof (Dalal-Clayton, *et al.*, 2003:127). Still, the NDP (2012:204) states that the complexity of 'rural' South Africa

requires different and specific strategies in accordance with different settlement types, in order to develop rural sustainability.

Furthermore, the development of sustainable rural livelihood villages cannot be considered in isolation since their ecological footprint and financial viability are often very dependent on the larger urban environment. Landman (2003) even states that these villages will not be sustainable if not supported by the majority of the urban residents. It raises the question of whether such initiatives can be truly strategic and lead to sustainable development action, especially if those involved do not have the social, economic and physical resources to take advantage of this opportunity to attain sustainable rural livelihoods.

References

BOMA Project, 2009. *The BOMA Project - Prosperity with dignity*. [Online] Available at: <http://bomaproject.org/>.

Boudeville, J. R., 1966. *Problems of regional economic planning*. 3rd ed. Edinburgh: Edinburgh University Press.

Brooks, L., 2004. All politics are local. *New Economy*, June, 11(2), pp. 63-64.

Conyers, D. & Hills, P., 1984. *An introduction to development planning in the Third World*. Bath: Wiley.

Dalal-Clayton, B., Dent, D. & Dubois, O., 2003. *Rural planning in developing countries: supporting natural resource management and sustainable livelihoods*. London: Earthscan.

Dauids, I., Theron, F. & Maphunye, K. J., 2009. *Participatory development in South Africa: a development management perspective*. Pretoria: Van Schaik Publishers.

Fazal, S., 2012. *Land use dynamics in a developing economy: regional perspectives from India*. Dordrecht: Springer.

Friedmann, J., 1966. *Regional development policy: a case study of Venezuela*. Cambridge, Mass.: MIT Press.

Gilbert, A. & Gugler, J., 1992. *Cities, poverty and development: urbanisation in the third world*. 2nd ed. Oxford: Oxford University Press.

Jouve, P., Tallec, M. & Budelman, A., 1996. *Study of agrarian system in West Africa based on analysis of the diversity and dynamics of village farming systems*. Montpellier, Koninklijk Instituut voor de Tropen (KIT), pp. 19-32.

Landman, K., 2003. *Sustainable 'urban village' concept: mandate, matrix or myth?*. Pretoria, Paper presented at the Conference on Technology and Management for Sustainable Building, CSIR Conference Centre, p. 13.

Laurent, C. et al., 1999. Household typology for relating social diversity and technical change: the example of rural households in the Khambashe area of the Eastern Cape province of South Africa. *Agrekon*. *Agrekon*, Volume 38, pp. 190-206.

Magnaghi, A., 2005. *The urban village: a charter for democracy and local self-sustainable development*. London: Zed Books.

Ndabeni, L. L., 2013. *An analysis of rural-urban linkages and their implications for policies that sustain development in a space continuum*. [Online] Available at:

<http://www.cogta.gov.za/index.php/iudf/1081-rural-urban-linkages-and-their-implications-for-policies-that-1-1>.

Ndaro, J. M. M., 1992. Local coping strategies in Dodoma district, Tanzania. In: D. R. F. Taylor & F. Mackenzie, eds. *Development from within: survival in rural Africa*. London: Routledge, pp. 170-196.

Rostow, W. W., 1960. *The stages of economic growth: a non-communist manifesto*. Cambridge: Cambridge University Press.

Satterthwaite, D. & Tacoli, C., 2002. Seeking an understanding of poverty that recognizes rural-urban differences and rural-urban linkages. In: C. Rakodi & T. Lloyd-Jones, eds. *Urban Livelihoods: A People-Centred Approach to Reducing Poverty*. London: Earthscan, pp. 52-70.

Silberstein, J. & Maser, C., 2000. *Land use planning for sustainable development*. Boca Raton: Lewis.

South Africa. Department of Co-operative Governance, 2014. *Draft Integrated Urban Development Framework*. Pretoria: s.n.

South Africa. The Presidency: National Planning Commission, 2012. *National Development Plan (NDP) 2030*. Pretoria: s.n.

South Africa, 1998. White Paper on Local Government. *Government Gazette*, 13 Maart, 393(18739), pp. 1-120.

Taylor, D. R. F., 1992. Development from within and survival in rural Africa: a synthesis of theory and practice. In: D. R. F. Taylor & F. Mackenzie, eds. *Development from within: survival in rural Africa*. London: Routledge, pp. 214-258.

The spatial integration of the SADC through development corridors

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Abstract

Regional policies based on regional integration emphasising economic cooperation and spatial linkages through development corridors, have the potential to stimulate intra-regional trade and economic growth in the SADC. Qualitative and quantitative research methods are applied, with case studies of both the EU and SADC investigated to determine the application of regional economic integration in conjunction with development corridors as an instrument of spatial integration to bolster regional economic growth through increased intra-regional trade. Results indicate that as regional economic integration increases, so too does intra-regional trade, stimulating the regional economies of the EU and SADC. Results also indicate that development corridors are essential in facilitating the movement of traded goods between member states of both regional blocs. It is clear that development corridors facilitate the movement of less traded goods per kilometre of corridor infrastructure than their EU counterparts. However, despite the potential of this regional policy directive, renewed emphasis needs to be placed on economic cooperation and policy harmonisation through the strengthening of policy implementation mechanisms of the supranational institutions of the SADC as well as creating financial instruments for increased infrastructure investment in an effort to improve linkages in fragmented development corridors

1. Introduction

The Southern African Development Community (SADC) is a regional bloc that consists of fifteen Southern African member countries aiming to further interaction and collaboration among themselves (SADC 2012a). Vast, untapped economic potential exists within the SADC which can be extracted by means of increased trade between the various member countries (Ono 2011; SADC 2012a). However, trade between the regions within the regional bloc (intra-regional trade), is stymied by certain barriers, which, through various mechanisms, some of which are tariff-based, limit potential increases in intra-regional trade in the SADC (Lakshmanan 2001). These trade barriers can potentially be eliminated by regional integration emphasising regional economic integration and spatial integration through development corridors. The former will stimulate intra-regional trade and the latter will facilitate increased trade movements, both of which are important in stimulating regional economic growth (De Boe et al. 1999). Despite the potential of a regional policy directive emphasising regional integration, renewed emphasis needs to be placed on policy harmonisation, economic cooperation, improving fragmented spatial linkages and strengthening the policy implementation mechanisms of the SADC's supranational institutions (Mapuva & Muyengwa-Mapuva 2014; Carbone 2003). The objective of regional policy is to alter the spatial distribution of scarce resources within or between regions according to regional and national objectives (Armstrong & Taylor 2000).

2. Objectives, scope and limitations

The main objective of this study is to investigate regional integration within the SADC through regional economic integration and spatial integration by means of development corridors in order to stimulate intra-regional trade and subsequently grow the SADC's regional economy. Case studies of the implementation of regional integration in the SADC and the European Union (EU) is investigated to evaluate its ability to stimulate intra-regional trade and economic growth. Based on the findings, a core objective is identifying elements within the

EU's regional integration model for potential implementation into the SADC's integration model. This study is sub-continental in scale, with case studies investigating regional integration between the various member countries, i.e. regions, of two regional blocs (EU and SADC).

Important limitations to the study include the contrast in economic scale between the particular regional blocs investigated in the respective case studies. Economic output and the resultant volume of intra-regional trade between the EU's developed regions (the most successful example of regional integration on a sub-continental scale), dwarfs that of the SADC, a young, sub-continental regional integration project between developing regions in Southern Africa (Bilal 2007; Mapuva & Muyengwa-Mapuva 2014). The number of years the respective stages of economic integration are implemented within the EU and the SADC presents an additional limitation to this study. In spite of the glaring contrasts, a central aim of this study is to investigate the potential of regional economic integration in stimulating intra-regional trade. In addition, the role of sub-continental development corridors as instruments of spatial integration in the facilitation of increased intra-regional trade is evaluated. In accordance with the core objectives of this study, a literature review of regional integration and its associated elements are undertaken in the following sections.

3. Intra-regional trade and regional economic growth

Economic growth within a region is determined by its ability to produce goods and services for consumption by people within the region and those in other regions (Glasson 1974). The multiplier effect is the base of regional economic growth, stipulating that as more goods and services are produced within a region, more people are employed, increasing their ability to consume goods and services, subsequently increasing demand and industrial output within the region, stimulating economic growth (Glasson 1974; Ono 2011). The economic base theory stipulates that a region's economic production is based on goods and services produced within the region intended for local consumption (non-basic activities), as well as goods and services produced within the region, but consumed in external regions, leading to an influx of additional income from external consumers (basic activities). Pfouts and Curtis (1958) and Kilkenny and Partridge (2009) highlight the importance of basic activities in achieving regional economic growth, explaining that as the demand for locally-produced goods increase in foreign regions, economic output is stimulated, leading to growth in non-basic activities and fulfilling the role of catalyst for regional economic growth (the multiplier effect).

According to Glasson (1974), exogenous regional economic growth theories such as the export base theory and the Hecksher-Ohlin model emphasise the role of exogenous factors in regional economic growth. Dawkins (2003) states that the export base theory indicates that demand from other regions for locally-produced goods and services is the most important factor in regional economic growth, indicating linkages with the economic base theory and the intra-regional trade multiplier. When there is a demand for locally-produced goods and services, exports increase. As a result, foreign income flows into the region of origin, which lays the foundation for increased investment and industrial expansion, as well as growth of the financial and services sectors of the economy (Dawkins 2003). A region's ability to export is determined by its advantage over another region in the production of a certain product (Leichenko 2000). A region with an abundance of natural resources can easily export a large amount of commodities, as opposed to regions with fewer natural resources. The availability of advanced technology will also affect the ability of a region to produce enough goods to export a surplus to other regions (Leichenko 2000). The Hecksher-Ohlin model shares similarities with the export base theory, as it explains that the product of specialisation that a region exports will be a product in which it has a comparative advantage in terms of abundance of input needed in the production of the good (Dawkins 2003). Thus,

the export base theory, the Hecksher-Ohlin model and the basic economic base theory, make it clear that trade with other regions stimulate regional economic growth.

4. Intra-regional trade barriers

Several trade barriers stymie trade flows between the SADC's member states and stand in the way of intra-regional trade and subsequent economic growth. These barriers include tariff-based barriers, such as import taxes and levies, and other barriers, such as insufficient interconnecting infrastructure to facilitate increased trade flows, both of which may hamper intra-regional trade growth (Dorrucci et al. 2005; De Boe et al. 1999; Lakshmanan 2001). Regional policy directives based on regional integration can successfully stimulate intra-regional trade by breaking down tariff-based and other trade barriers, bringing about regional economic growth. Regional economic integration potentially eliminates tariff-based trade barriers, increasing trade between regional partners and stimulating the regional economy while spatial integration (through development corridors) facilitates the efficient movement of trade flows between regions (Lakshmanan 2001). To effectively evaluate regional policy emphasising regional integration, the effect of regional economic integration and the role of spatial integration through development corridors on intra-regional trade is evaluated within the context of a literature review of theoretical elements relevant to the study.

According to Mattli (1999) and Sapir (1992), regional economic integration is the process during which several regional economies are integrated by means of the systematic elimination of tariff-based trade barriers, i.e. import taxes, levies and other restrictions placed on exports from one region to another. The elimination of these tariffs and the resultant liberalisation of trade between regions is instrumental in stimulating trade between regions and growing their regional economies (Sapir 1992). Tariffs are eliminated through the various stages of regional economic integration (see Figure 1).

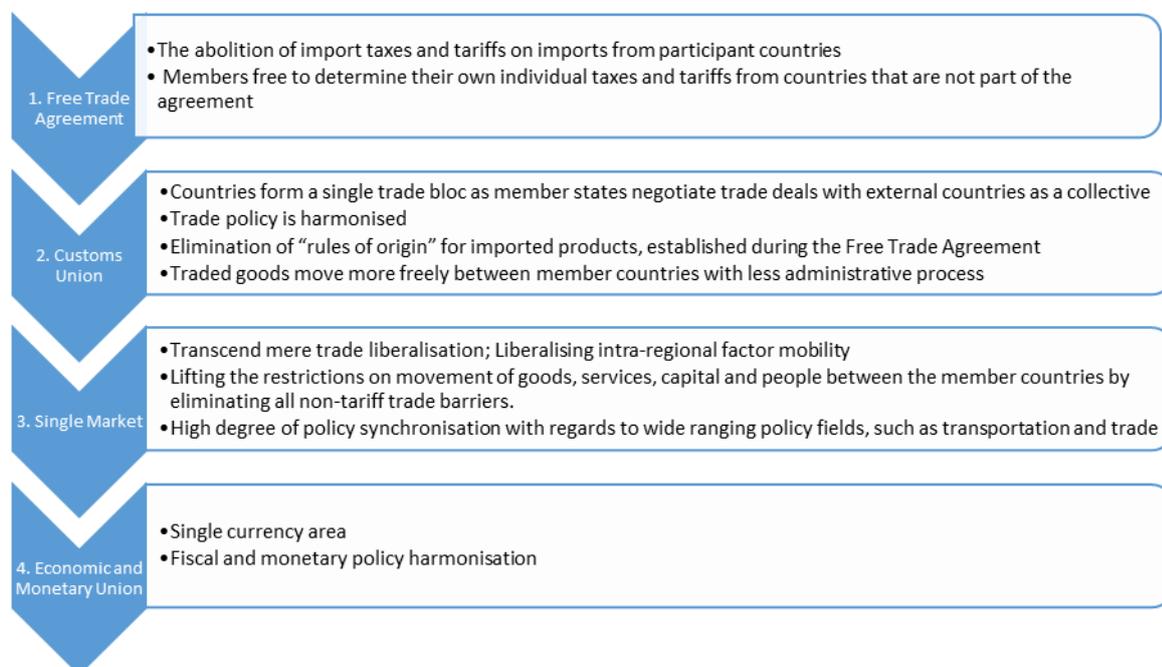


Figure 1: Stages of regional economic integration.

Source: Adapted from Peters-Berries 2010 Mattli 1 and Holden 2003 .

These stages of regional economic integration are implemented between regions to break down tariff-based trade barriers, boosting intra-regional trade and stimulating regional

economies. The benefits of regional economic integration in the elimination of tariff-based trade barriers are clear.

Lakshmanan (2001) states that eliminating tariff-based barriers alone is not sufficient to stimulate intra-regional trade and that other barriers must also be eliminated for increased intra-regional trade and economic growth. This will be achieved through the implementation of spatial integration by means of development corridors (De Boe et al. 1999). The spatial integration arm of regional integration through development corridors is critical in eliminating trade barriers unrelated to tariffs, which remain in place in spite of increased regional economic integration. It is suggested that, while regional economic integration stimulates intra-regional trade by eliminating tariff-based barriers, spatial integration through development corridors is needed to efficiently facilitate the resultant increase in trade flow levels between regional partners (De Boe et al. 1999; Lakshmanan 2001). Spatial integration emphasises the increased efficiency of movement and mobility between regions through physical infrastructure with the aim of maximising the degree of accessibility between regions and terminating physical movement barriers from one region to another (Anderson 2001a). Physical barriers may present as traffic bottlenecks, infrastructural gaps and insufficient maintenance of existing infrastructure (Lakshmanan 2001).

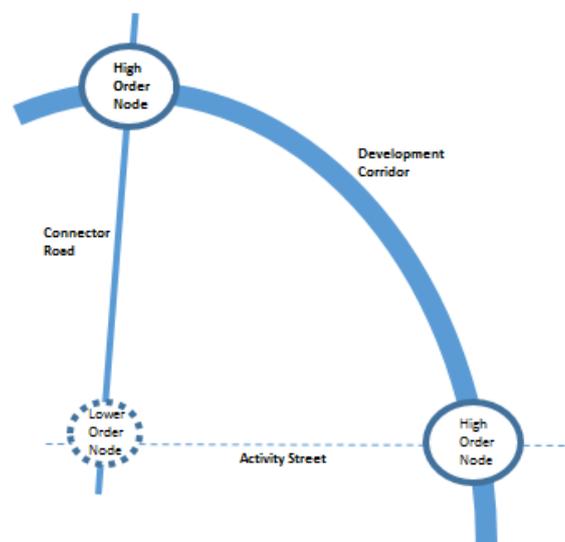


Figure 2: Development Corridor connecting nodes of activity
 Source: Adapted from Tomko et al. 2008 and Jiang 200 .

The most efficient form of connecting infrastructure between regions is the development corridor that connects nodes of higher order and function through efficient channels of communication, or transportation networks, causing a linear arrangement of nodes and corridors (Whebell 1969; Anderson 2001b). As illustrated in Figure 2, different forms of connecting infrastructure exists between nodes of varying function and order. A development corridor, however, solely connects two nodes of higher order, while connector roads and activity streets connect higher order and lower order nodes (Hughes 1972; Council of Europe 1992). In this system of connecting infrastructure where each centre emanates various axes that connect them with other centres, the prominence of the corridor is reflected by the order of the centres connected by its infrastructure (Council of Europe 1992). These development corridors must facilitate the movement of consumers and goods through vehicular traffic routes, railways and waterways, as well as the movement of technology through communication lines (De Boe et al. 1999). This linkage of nodes through linear channels leads to an increase in the interchange of products and consumer services from one region

to another (Whebell 1969). In order to improve development corridors, substantial investment in infrastructure development is needed to bring about a highly efficient transport corridor that will facilitate the effective conveyance of products and consumer services between two interconnected regions of varying sizes (Council of Europe 1992).

It must, however, be noted that the efficiency of movement on these development corridors is not solely dependent on the physical development corridors' infrastructure, but so-called non-physical infrastructure as indicated in Table 1 (SADC 2012b). This includes interoperability (uniformity in design standards and technical regulations through the harmonisation of legal, regulatory, administrative frameworks), as well as ensuring market access to lower the costs of transport for service providers through improved competition and to attract new investment to improve the linkages between existing development corridors (Lakshmanan 2001; Anderson 2001a). Ensuring interoperability and market access is of critical importance for the physical development corridor infrastructure to fulfil its function of facilitating the movement of traded goods between regions (Lakshmanan 2001). Both the development corridor and the regulation that accompanies its infrastructure in the various regions is critical in ensuring regional spatial integration, increasing mobility between regions and facilitating increased intra-regional trade. Literature links spatial integration (eliminating non-tariff trade barriers and boosting interconnectivity between regions by means of development corridors) and regional economic integration (breaking down tariff-based trade barriers). Regional economic integration stimulates intra-regional trade and regional economic growth while development corridors facilitate the movement of increased trade between regions.

5. Empirical investigation

Quantitative and qualitative research methods are used in this study. Qualitative research methods include case studies of regional integration in both the EU and the SADC. Within these case studies, the implementation of regional integration through regional economic integration, as well as spatial integration through development corridors is investigated. Regional economic integration is evaluated in terms of its ability to stimulate intra-regional trade and economic growth in the SADC and the EU, an evaluation which is undertaken by means of data analysis. Spatial integration through development corridors is also evaluated in terms of the importance of development corridors in facilitating increased intra-regional trade flows as a result of increased regional economic integration in the SADC and the EU. This spatial integration evaluation is also undertaken by means of data analysis. The aim of the empirical investigation is to determine the potential of a regional policy directive emphasising regional integration as a means of stimulating regional economic growth.

This section investigates the manifestation of regional economic integration within the EU and the SADC, respectively. A summary of the findings of these economic integration analyses are illustrated in Table 2.

Table 2: Regional economic integration, intra-regional trade and economic growth

European Union			Southern African Development Community			
Annual intra-regional trade growth (%)	Annual DP growth (%)	Correlation (r)	Stage of regional economic integration	Annual intra-regional trade growth (%)	Annual DP growth (%)	Correlation (r)
96,28	42.85	0.984	a. Partial Free Trade Agreement	70.62	45.44	0.930
				enlargement		
				42.68	25.97	0.877

257,17	45.72	0.996	1. Free Trade Agreement	26.14	38.16	0.913
113.7	30.8	0.956	2. Customs Union	n a	n a	n a
nlargement						
212.98	18.25	0.979				
nlargement						
3.98	8.11	0.525				
nlargement						
98.51	18.96	0.987	3. Single Market	n a	n a	n a
nlargement						
5.53	7.55	0.924				
42.59	7.74	0.802	4. Economic and Monetary Union	n a	n a	n a
nlargement						
21.74	5.47	0.999				
nlargement						
-0.59	-0.56	0.946				

Source: Adapted from Eurostat 2011, IMF 2011 and SADC 2011a

Table 2 illustrates the increase in intra-regional trade, as well as the rate of economic growth experienced within each of the stages of regional economic integration as implemented within the EU and the SADC, respectively. There is a clear correlation (r) between the growth in intra-regional trade and regional economic growth. The aim is to establish the extent of economic growth as intra-regional trade increases.

During the Partial Free Trade Agreement (a), the correlation between growth in trade and the regional economy is 0.984. During the Free Trade Agreement (1) it is 0.996. During the various enlargements of the Customs Union (2), the maximum correlation is 0.987 with the minimum being 0.525. Perfect correlation exists between trade growth and economic growth before the enlargement of the Single Market (3). During the Economic and Monetary Union (4), the maximum correlation is 0.999, while the minimum is 0.802. There is thus a positive correlation between growth in intra-regional trade and regional economic growth: as intra-regional growth increases, so too does regional economic growth. While this finding does not determine causality between the determinants, a substantial correlation between the two is confirmed.

The EU experienced growth in intra-regional trade with the escalation of economic integration, although trade growth slows with the establishment of the Single Market. Although the correlation between intra-regional trade and economic growth is established, the exact annual growth rate within each stage of economic integration is obscured as a result of enlargements of both the EU and the SADC. This results in immediate rises in community-wide trade and economic growth as a consequence of ascensions of additional member countries and their respective economic output. Subsequently, intra-regional trade and economic growth is divided into periods of enlargements and stages of economic integration. This limits the study to determining the correlation between trade and economic growth, rather than determining the extent of said growth in trade and economic output. In

addition, enlargement of the EU has been accompanied by the ascension of smaller and less developed member countries (especially countries in Eastern Europe from the former Soviet Union) with little trade connectivity with existing EU member countries. This limits growth in intra-EU trade and the regional economy within the data analysis.

The role of development corridors as an instrument of spatial integration in the facilitation of increased intra-regional trade is evaluated in the following section. Table 3 illustrates the importance of development corridors in the transportation of exported goods between member countries of the EU and the SADC, respectively. This is done by illustrating the volume of goods transported on non-development corridor infrastructure (measured in 1000 tonnes per kilometre) in the EU and the SADC (including all road, rail and inland waterways transport infrastructure) compared to the volume of goods transported on development corridor infrastructure. As a result of data availability limitations, the development corridors analysed in the EU includes the North Sea-Mediterranean Corridor (NSM in Table 3); the Orient-East Med Corridor (OEM); and the Rhine-Alpine Corridor (RALP). In the SADC, the Maputo Development Corridor (MC in Table 3), excluding goods transported through Swaziland (due to data constraints), is analysed.

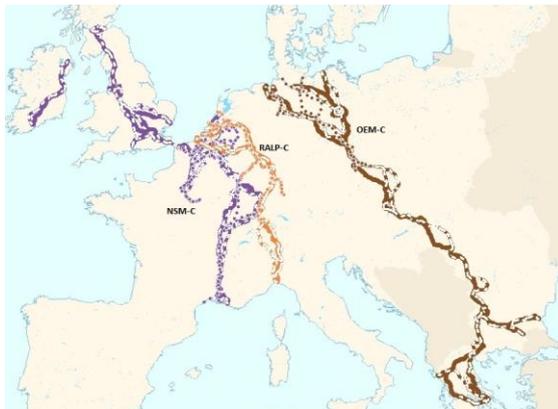


Figure 3: Selected EU development corridors. Source: European Commission 2011 .



Figure 4: The Maputo Corridor. Source: Sojitz Corporation 2011 .

Table 3: Corridor Tonnes Km freight transport

Area	Total goods (1000 tonnes)	Corridor infrastructure (km)	1000 tonnes/km	Area	Total goods (1000 tonnes)	Corridor infrastructure (km)	1000 tonnes/km
EU	18090119	3966435,89	4,56	SADC	1017900	860151	1,183
NSM	1029000	13919,00	73,93	MC (Excl. Sz)	4407	1183,1	3,725
OEM	698000	13160,00	53,04				
RALP	372000	6546,00	56,83				

Source: Adapted from Eurostat 2011 , European Commission 2014 , De Bod and Havenga 2010 and USAID 2008 .

The EU's development corridor infrastructure carries substantially more volumes of freight per kilometre than non-corridor infrastructure, illustrating the importance of development corridors in facilitating the movement of traded goods between member countries of the EU (Eurostat 2015; European Commission 2014; De Bod and Havenga 2010; UNAID 2008). In the SADC, the infrastructure of the Maputo Corridor carries three times as much freight than non-corridor infrastructure in the SADC, illustrating the importance of the development corridor in the transportation of traded goods between regions of the SADC. Spatial integration through development corridors in the facilitation of increased trade flows (as a result of greater regional economic integration) is thus of vital importance. In addition, a noticeable difference exists between the quantity of freight transported on development corridor infrastructure of the EU and on that of the SADC. This finding eludes to the fact that the development corridors in the SADC do not possess the physical or non-physical infrastructure, as implemented in the EU, needed for the efficient trade facilitation on the physical infrastructure of the development corridors. This may contribute to fragmented development corridors with a lack of interoperability and market access along the lines of the physical infrastructure of development corridors in the SADC, resulting in inefficient trade facilitation. Spatial integration through development corridors can be improved upon to better facilitate intra-regional trade in the SADC and bring about improved regional economic growth.

6. Conclusions

In evaluating regional integration in the EU (and the SADC), it is clear that a regional policy directive based on regional integration emphasising economic and spatial integration can potentially stimulate intra-regional trade. This can be done by breaking down tariff and non-tariff trade barriers, bringing about regional economic growth. Regional economic integration eliminates tariff trade barriers, increasing trade between regional partners and stimulating the regional economy. Spatial integration through development corridors facilitates the efficient movement of increased trade flows between regions (Lakshmanan, 2001).

Taking the aforementioned into account, the following recommendations can be made in terms of regional policy in the SADC. Firstly, regional policies that alter the allocation of scarce resources between the member countries of the SADC need to be implemented. These policies must emphasise regional integration (based on trade liberalisation through regional economic integration, as well as development corridors facilitating trade). Secondly, with regards to regional economic integration, it is recommended that the SADC focusses its institutional resources on achieving the third phase of regional economic integration, namely the Customs Union. Considering the limited capacity of the SADC, both institutionally and financially, resources should be channelled into the establishment of the Customs Union in the SADC. Thirdly, a regional policy fund must be created to finance the targeted infrastructure projects being promoted by the SADC's regional policy. If a regional policy fund is created in the SADC, regional policy objectives in the form of infrastructure projects to improve the trade facilitation abilities of the development corridors can be completed, improving the ability of development corridors to fulfil their function of facilitators of trade. The newly-formed New Development Bank of BRICS (of which South Africa is a member) may contribute to infrastructure development within Southern Africa. Although this development bank may be a valuable financial instrument, South Africa's substantial capital input into this venture (rather than institutions of the SADC) raises questions about the commitment of the SADC's dominant economy to support the regional integration objectives of the SADC, achieved under the bloc's own auspices and strong institutions through the development of mechanisms ensuring policy implementation in its various member states. Without the support of its strongest members, regional integration in the SADC will not succeed.

Fourthly, improvements to the non-physical aspects of the development corridors are imperative. It is recommended that interoperability (through universal design standards and

safety regulations) is optimised along the connecting infrastructure of the development corridors to ensure trade facilitation is equally efficient in all the regions of the SADC. Improved market access to external investors in the transport sectors of member countries is also recommended. Lastly, improving the capacity and functioning of the supranational institutions should be a priority for the SADC. Throughout the EU-model, the role of these institutions as policy implementation mechanisms and regional economic integration facilitators becomes clear in its involvement in policy harmonisation and ensuring a coherent and coordinated approach to regional integration. These institutions coordinate funding, organise projects and exercise targeted interventions to improve the functioning of the development corridors to fulfil its role as instrument of regional integration through trade facilitation. These institutions require additional funding to ensure that they have the needed capacity to fulfil their duties. Member countries must ensure that the institutions have the needed jurisdiction for policy formulation and implementation.

References:

Anderson, W.P (2001a) Transport integration in the European Union (In Subramanian, U, ed. Integration of transport and trade facilitation: selected regional case studies, Washington: The World Bank).

Anderson, W.P (2001b) Southern African Development Community: the Maputo corridor (In Subramanian, U, ed. Integration of transport and trade facilitation: selected regional case studies, Washington: The World Bank).

Armstrong, H and Taylor, J (2000) Regional economics and policy, 3rd Ed, United States of America: Blackwell Publishers Inc.

Bilal, S (2007) Is the EU a model of regional integration? Risks and challenges, <http://ecdpm.org/wp-content/uploads/2013/11/EU-Model-Regional-Integration-Risks-Challenges-2007-.pdf>. Date of access: 12 June 2016.

Carbone, M (2003) Regional integration and development: the challenges facing the SADC, http://ec.europa.eu/development/body/publications/courier/courier197/en/en_003.pdf. Date of access: 12 June 2016.

Council of Europe (1992) European regional planning strategy - volume 69, Germany: Council of Europe Publishing and Documentation Service.

Dawkins, C.J (2003) "Regional development theory: conceptual foundations, classic works, and recent developments", Journal of planning literature, Vol. 18 No. 2.

De Boe, P, Grasland, C and Healy, A (1999) Study programme on European spatial planning - Strand 1.4: spatial integration, http://www.mcrit.com/SPESP/SPESP_REPORT/spatial_integration.pdf. Date of access: 15 April 2015.

Dorrucci, E, Firpo, S, Fratzscher, M and Mongelli, F.P (2005) "The path of European institutional and economic integration: What lessons for Latin America?", Journal of economic integration, Vol. 20 No. 2.

European Commission (2015) Mobility and transport: TENtec interactive map viewer, <http://ec.europa.eu/transport/infrastructure/tentec/tentec-portal/map/maps.html>. Date of access: 8 June 2016.

- Eurostat (2015) Eurostat: your key to European statistics, <http://ec.europa.eu/eurostat/data/database>. Date of access: 6 June 2016.
- Glasson, J (1974) An introduction to regional planning: concepts, theory and practice, London: Hutchinson Educational.
- Holden, M (2003) Stages of Economic Integration: from Autarky to Economic Union, <http://publications.gc.ca/Collection-R/LoPBdP/inbrief/prb0249-e.htm>. Date of access: 12 June 2016.
- IMF (2015) IMF data, <http://www.imf.org/en/Data>. Date of access: 6 June 2016.
- Jiang, B (2009) "Street hierarchies: a minority of streets account for a majority of traffic flow", International journal of geographical information science, Vol. 23 No. 8.
- Kilkenny, M and Partridge, M.D (2009) "Export sectors and rural development", American journal of agricultural economics, Vol. 91 No. 4.
- Lakshmanan, T.R (2001) Transport and trade facilitation: an overview (In Subramanian, U, ed. Integration of transport and trade facilitation: selected regional case studies, Washington: The World Bank).
- Leichenko, R.M (2000) "Exports, employment, and production: a causal assessment of US states and regions", Economic geography, Vol. 76 No. 4.
- Mapuva, J and Muyengwa-Mapuva, L (2014) "The SADC regional bloc: what challenges and prospects for regional integration?" Law, democracy and development, Vol. 18.
- Mattli, W (1999) The logic of regional integration: Europe and beyond, United Kingdom: Cambridge University Press.
- Ono, Y (2011) "The Keynesian multiplier effect reconsidered", Journal of money, credit and banking, Vol. 43 No. 4.
- Pfouts, R.W and Curtis, E.T (1958) "Limitations of the economic base analysis", Social forces, Vol. 36 No. 4.
- Peters-Berries, C (2010) Regional integration in southern Africa – a guidebook, Germany: Internationale Weiterbildung und Entwicklung.
- SADC (2011a) SADC statistics yearbook 2011, <http://www.sadc.int/information-services/sadc-statistics/sadc-statiyearbook/>. Date of access: 12 July 2015.
- SADC (2012a) History and treaty, <http://www.sadc.int/about-sadc/overview/history-and-treaty/>. Date of access: 29 October 2015.
- SADC (2012b) Regional infrastructure development master plan: transport sector plan, http://www.sadc.int/files/9313/5293/3536/Regional_Infrastructure_Development_Master_Plan_Transport_Sector_Plan.pdf. Date of access: 18 October 2015.
- Sapir, A (1992) "Regional integration in Europe", The Economic Journal, Vol. 102 No. 415.
- Sojitz Corporation (2011) Sojitz enters wood chip manufacturing business in Africa, <https://www.sojitz.com/en/news/2011/07/20110701.php>. Date of access: 8 June 2016.

Tomko, M, Winter, S and Claramunt, C (2008) "Experiential hierarchies of streets", Computers, environment and urban systems, Vol. 32 No. 1.

USAID (2008) Maputo Corridor summary report, http://www.mcli.co.za/mcli-web/downloads/docs/nathan-211252-v2-maputo_corridor_summary_report_may_2008.pdf.
Date of access: 6 June 2016.

Whebell, C.F (1969) "Corridors: a theory of urban systems", Annals of the association of American geographers, Vol. 59 No. 1.

The Impact of Population Increase and Urban Migration on Global Sustainability and Quality of Life

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ABSTRACT

For more than 80 years, global population has steadily increased and could reach 10 billion by 2030. Concurrently, the percentage of the world's population living in urban areas has increased at an even faster rate – exceeding 50% in 2008 (both globally and in the U.S.), and is projected by the United Nations to reach 75% by 2030. This paper reports on the impact of urban migration in the context of global growth and how it is affected by five key components – Urban Form, Food, Energy, Water, and Transport. From analysis of historic precedents, direct observation of current industry practices, and professional global urban design experience, it is concluded that the practice of city planning and urban design could adopt the principles of High Resolution Development, using compact neighbourhoods as the basic module to compose cities. The "City of Tomorrow" will contain both historic and technologically advanced components, relating to citizens on a human-scale.

WHERE WE ARE HEADED

The Earth is getting more crowded.

Despite the 1960s zero population movement and China's One-Child Policy (1979 through today), global population growth has progressed unabated. In 2008, for the first time in known history, a majority of the world's population was located in urban areas. In "2010 Census Urban and Rural Classification and Urban Area Criteria" (available from: <http://www.census.gov/geo/reference/urban-rural-2010.html>, Washington, D.C., accessed January 2013), the U.S. Census Bureau defined an "urban area" as a city with 50,000 persons or greater. This news was met with a modicum of interest by the news media, but it heralded a significant change in urban growth and human development. As shown in Table 1, actual census data from the United Nations and the U.S. Census Bureau shows continual growth in the post-World War II period from 1950 to 2010. Both also project continued growth through 2030.

The most typical concern about population growth has focused on the absolute number of people, rather than their location. However, projections show that the majority of the future population will be located in urban areas, which significantly influences how existing cities are designed and redeveloped.

In "The Next 100 Million" (Nelson, A.C. & Lang, R.E., American Planning Association, Washington, D.C., January 2007), the authors projected that as the United States reaches 400 million people (by approximately 2030), there would be a demand for 30 billion square feet

(27.87 billion square meters) of new construction including 70 million new residences. By 2030, Nelson and Lang also project that two-thirds of American jobs will be located in cities that were not considered "urban" in 1950 – i.e., today's suburbs.

Should Nelson's and Lang's projections come to pass, it would be a fundamental shift from the traditional city/suburb relationship and has economic, transportation, infrastructural, and demographic implications that invert that relationship.

Table 1: Global and US Population Growth, 1950-2030

Data Type	Year	Global Population * (in millions)	US Population ** (in millions)
Census Data	1950	2500	150
	1960	3000	180
	1970	3700	203
	1980	4500	226
	1990	5300	248
	2000	6100	281
	2010	7000	308
Population Projections	2020	8200	341
	2030	9800	398

* – United Nations, Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects*, New York, November 2010.

** – University of California at Los Angeles, *U.S. Census Statistics and Information* (available from: <http://guides.library.ucla.edu/content.php?pid=104346&sid=10>)

Shortly after the publication of the Nelson and Lang study, the 2007 *Great Recession* severely impacted numerous U.S. regions and markets, effectively decelerating the pace of a significant portion of the economy. With the ending of the *Great Recession* in 2010, pre-recession demands returned to many regions and markets, but not all. Areas such as Detroit (Michigan) continue to suffer the shrinkage of the employment base. Neighbourhoods were left devastated when high unemployment and bank foreclosures caused residents to leave.

Despite the widespread economic impact of the *Great Recession*, demands associated with population growth have proven to be recession-resistant – economic conditions have little impact on births, deaths, and demands for housing, energy, food, and education.

To accommodate the projected growth presented in Table 1, the number of large metropolitan areas will also continue to increase. From 1950 through 2000, the number of urbanized regions of 1 million persons (or more) increased from 83 to 468 cities – a 463.9% increase over 50 years. Between 2000 and 2030, that number is projected to increase to over 750 cities, with at least 221 located in China (Brinkhoff, T., *Principal Agglomerations of the World*, available from: <http://www.city-population.de>, Berlin, accessed December 2012). In those 8 decades, the number of +1 million cities will have increased by over 800%.

The result of this growth is the creation of multi-nodal/multi-centric *Megapolitan Areas* – regions in which a large city is surrounded by numerous smaller cities whose total population

exceeds the core city and makes up the larger percentage of regional population. Examples of these are found today from Los Angeles (California) to Phoenix (Arizona) to Dallas-Fort Worth (Texas) and beyond.

How did we get to this point?

THE LAW OF UNINTENDED CONSEQUENCES

Urban growth patterns have been influenced by a series of unplanned events with unintended and unimagined consequences. The U.S. has no national comprehensive urban growth policy, so urban growth and development has continued without any imposed federal direction. Instead, U.S. growth and development policies are most commonly left to the local jurisdictions.

From the American perspective, the period between 1865 and 1958 contains key influencers that have shaped our current urban form.

Influencer #1 – Advancements in Construction Technology (1895 through 1916)

The late 1800s were a difficult period for the U.S. and Europe. The American Civil War (1861-65) was followed by a bleak economic period known as the *Long Depression* (1873-79), with a similar economic experience occurring in Europe between 1873 and 1896 (National Bureau of Economic Research, *Business Cycle Expansions and Contractions*, available from: <http://www.nber.org/cycles.html>, Cambridge, Massachusetts, accessed January 2013). In the face of economic uncertainty, building technology made great strides.

Vertical structures of the period were restricted by the physical limitations of wood-frame or stone construction. The development of steel framing, combined with mechanical elevating, allowed for much taller structures. Prior to the introduction of interior electrified lighting, the ability to manufacture large pane glass allowed more sunlight to penetrate building cores, thus allowing for deeper floorplates. As the U.S. emerged from the *Long Depression*, use of this new technology helped to rebuild Chicago after the Great Fire of 1871. It also led to a new generation of new high-rise buildings in other cities in the late 1800s and early 1900s. Emerging from the *Long Depression*, corporations and financial institutions used this technology to construct impressive high-rise edifices as a means to proclaim their financial strength and stability.

One such structure was the Bankers Trust & Equitable Building ("Equitable"), located at 120 Broadway in New York City (NYC). Opened in 1911 as the then-world's tallest building (38 stories – value-engineered down from the originally-proposed 62 stories), Equitable was designed to announce the company's stability after their previous wood-frame headquarters burned in 1908. An impressive architectural statement that still stands today, Equitable also cast a perpetual 7-acre shadow on Lower Broadway. This was such a divisive issue that even the most pro-business industry trade journal at the time – the *New York Real Estate Record & Guide* – accused Equitable of the "wholesale theft of daylight" (Gray, C., "1915 Equitable Building Becomes a 1996 Landmark", *New York Times*, New York, 08 September 1996). While Equitable was not the only high-rise in NYC, as the tallest it became a lightning rod for criticism of high-rise buildings.

Influencer #2 – The Rise of Development Regulations (1916 to 1926)

Equitable was so polarizing that NYC was compelled to take regulatory action to prevent further large buildings from impeding light and air circulation. The result was the first Zoning Ordinance (1916) – a landmark regulatory tool that was also the first *form-based code*, controlling the shape of a building. The 1916 NYC Zoning Ordinance regulated a building’s overall height and required upper floors to be further set back from the street as the structure rose so light and air circulation would reach the street level. The Ordinance resulted in the classic “tiered/wedding cake” architecture evident in buildings of the period. However, the 1916 NYC Zoning Ordinance did not address the uses contained within buildings – an issue that would be addressed six years later and 475 miles (764.4 kilometers) to the west.

Incorporated in 1796, the village of Euclid (Ohio) is a small community located immediately northeast of Cleveland and along the shores of Lake Erie. The Village pre-dated the incorporation of the city of Cleveland by 40 years, the latter being incorporated in 1836. Euclid enjoyed its relationship as a bedroom community and had no aspirations to grow in a similar fashion – in 1920, Euclid had a population of 3,363, compared to Cleveland’s 796,841 people (“American FactFinder”, U.S. Census Bureau, Washington, D.C.).

In 1922, developer Ambler Realty proposed to build a 68-acre (27.5-hectare) industrial park adjacent to the railroad line that was the border between Euclid and Cleveland. Ambler believed industrial to be the logical use of the property since this same use existed on the Cleveland side. The Village disagreed and rejected Ambler Realty’s proposal – Euclid did not want to grow in the same manner as Cleveland.

To assure that Cleveland’s land use pattern would not govern Euclid’s development, the Village adopted a new type of zoning ordinance – one that controlled not only building form but also *land use*. The 1922 Euclid Zoning Code segregated intensive and sensitive uses horizontally through the designation of *Zoning Districts*. The 1922 Euclid Zoning Code effectively prohibited Ambler’s proposed development.

Understandably displeased with the Village’s actions, Ambler Realty sued the Village, claiming the new Code limited the value of their land and violated their Constitutional Fourteenth Amendment rights (depriving liberty and property without due process).

From 1922 to 1926, a series of lower court decisions and appeals ensued and eventually the case was argued before the U.S. Supreme Court. In 1926, in a 6-to-3 vote, the Supreme Court upheld the Village’s code as constitutional (U.S. Supreme Court, *Ambler Realty v. The Village of Euclid*, 275 U.S. 365, 1926). The Euclid Zoning Ordinance quickly became the model for U.S. cities as a way to mandate separating land uses by type and activity – an approach that became known as *cumulative zoning* and *Euclidean zoning*. Ninety years after the Supreme Court decision, *Euclidean zoning* still remains the basis for thousands of municipal zoning ordinances across the U.S.

Influencer #3 – The City Beautiful and City Practical Movements (1893 to 1950)

American cities of late 1800s and early 1900s were dirty and unsanitary places with unpaved roads and dangerous neighbourhoods – they were anything but beautiful or inspiring places.

Many U.S. residents who had emigrated from Europe, the United Kingdom, or Asia, longed for the inspiring and beautiful cities they left behind. Thus was the beginning of the *City Beautiful Movement*.

Beautiful cities abroad were often easier to achieve because they could be built through royal decree, through the beneficence of a wealthy family, or through burdensome taxation. But building beautiful cities in the U.S. was prohibitively expensive. An early attempt was the 1893 Columbian Exposition in Chicago (also called the 1893 World's Fair).

Built at the height of an economic recession, the 1893 World's Fair was an impressive example of a beautiful city, built at the then-audacious cost of over \$24 million (over \$500 million in current dollars). Designed by Chicago architect Daniel Hudson Burnham and famed landscape architect Frederick Law Olmsted, the core of the 1893 World's Fair exemplified the principles of scale, harmony and ensemble and attracted more than 27 million visitors during its six-month run. The 1893 World's Fair was never designed to be a permanent part of Chicago and before any attempts could be made to preserve it, it was destroyed by an arsonist in 1894. But the 1893 World's Fair was proof that the Americans could design a "beautiful city", even if only as a temporary place.

In the early 1900's, a parallel movement was gaining favour. The *City Practical Movement* was focused on engineering as a way to provide reliable infrastructure and sanitary living conditions. Urban form would be defined by efficiency, not aesthetics. The *City Practical Movement* is often cited by critics as a key reason that today's American cities and suburbs are non-descript and contextually benign.

Influencer #4 – The Servicemen's Readjustment Act (1944)

In 1944, the U.S. enacted the Servicemen's Readjustment Act (Public Law 78-346, Washington, D.C., 1944) to address the inequities of how previously returning veterans in World War I had been treated. Known as the *G.I. Bill*, it offered returning veterans new benefits and guarantees, including low-interest mortgage loans. More than 7 million World War II veterans qualified for such loans, creating an unprecedented demand for new home construction. The American *suburb* and *Baby Boom* were created.

By the early 1950s, new suburbs were developing across the eastern U.S., comprised of homes designed for mass delivery and affordability, not architectural beauty. At an average size of 900 square feet (83.6 square meters), they were relatively modest homes, built on small parcels (5,000 square feet or 464.5 square meters, or less). The *G.I. Bill* has been cited as the key factor in fostering a period of unprecedented middle-class growth and expansion that lasted from 1946 to 1964, setting the pattern for suburban expansion that continues through today.

Influencer #5 – The Federal Highway Act (1956)

As Supreme Commander in World War II, General Dwight Eisenhower was impressed by Germany's *Autobahn* and Italy's *Autostrada* as a means to efficiently transport troops and equipment. There were no American roads at the time that had the scope or reach of their European counterparts. Eisenhower saw the lack of a U.S. national roadway network as

security and strategic weaknesses, especially after the difficulties he experienced as one of the leaders of 1919 Transcontinental Motor Convoy (a strategic test of moving men and equipment across the U.S., hampered by unpaved roads and insufficient bridges).

As President, Eisenhower had the opportunity to create a great national transportation system that would be the equivalent of the European models. In his first term, he signed the *Interstate Highway Act* (Public Law 84-627, Washington, D.C., 1956), creating the American interstate highway system, officially called the National Interstate Highway Defense System. The system would be a network of high-speed roadways to deploy troops and equipment, avoiding urban traffic congestion. The entire system would cost \$25 billion and would be completed by 1968. Of course, the reality is that in 2016, portions of the system remain unbuilt, are currently still under construction, and the estimated system cost has ballooned to over \$250 billion (and growing). Inadvertently, interstate highways actually fostered suburban expansion and increased traffic congestion. Today, it seems foolish to use an interstate highway to quickly deploy anything if the intent is to avoid congestion and density.

Influencer #6 – Technological Advancements (1948 to 1958)

Two scientific innovations unintentionally influenced future urban form and daily life. In 1948, researchers at Bell Laboratories (Murray Hill, New Jersey) developed the *transistor* as an alternative to mechanical telephone switch gear, accelerating telephone connections and minimizing down-time for maintenance and replacement of network components. The Bell researchers never imagined that their invention would create a new class of consumer and industrial products. Invention of the transistor was so important that the Bell researchers were awarded the 1956 Nobel Prize in Physics.

By 1958, researchers at Texas Instruments (Dallas, Texas) created the *integrated circuit* which greatly magnified computing power by combining multiple transistors on a single layer. This led to the proliferation of personal electronics now used daily by billions of people, from laptop computers to smartphones. Like the Bell researchers, the invention resulted in the award of the Nobel Prize in Physics (in 2000).

The work of Bell and Texas Instruments unintentionally changed the nature of cities. People, homes, cars, and buildings all perform more efficiently. Transportation systems can provide real-time information on accidents and congestion. Personal electronics and digital devices allow employees to work anywhere in the world, challenging the very concept of "office". None of this would have been possible without the transistor or the integrated circuit.

URBANIZATION KEY COMPONENTS

The aforementioned events influenced urban development over the last century and a half, yet the end result has not been the general improvement of the built environment. Cities across the globe have continued to grow but have largely failed to improve on the urban condition. Traffic congestion has risen, despite the construction of thousands of new roadway lane-miles. Suburban sprawl has contributed to the urban heat island effect, increasing carbon monoxide levels and significantly contributing to climate change. It is hard to imagine how current urban development models could sustainably accommodate projected growth through 2030. The following equally-important components are necessary to effectively reinvent the future.

Key Component #1 – Urban Form

Mankind has a history of building urban areas. The public realm (*Res Publica*) provides the necessary structure (roadways, parks, open space, plazas, schools and public buildings) which supports the private sector (*Res Economica*) to build homes and businesses. While historic precedent has always kept cities compact, new regulations and improvements in mobility and technology have pushed these uses further apart from each other. Many formerly-vibrant urban neighbourhoods have been replaced by single-use developments, thus diminishing sense of place and increasing traffic.

Until roughly the end of World War II, compact urban development was the norm. But with increased population growth, access to low-interest mortgages, and the expansion of suburban development and supporting infrastructure, that compact urban form became less common. The rise of *New Urbanism* (since about 1978) renewed interest in compact development, but many of these “new towns” are still highly dependent on cars and are developed on the edges of urbanized areas. But *New Urbanism* remains a relatively niche market and the horizontal expansion of most American urban areas continues unabated.

Key Component #2 – Food

Current agricultural practices are almost always geographically separate from where consumers live (a *Euclidean* problem). Even large “industrial-scale” farms tend to be horizontal in nature. Agricultural production is also highly susceptible to weather patterns – drought, flood, snow, and excessive heat/cold impede agricultural production. The larger challenge is how to provide food for a future global population of 10 billion people – current agricultural production practices and per-acre yields cannot meet this demand.

Cities have re-discovered the benefits of community gardens – often developed on vacant lots or on building rooftops – which bring affordable produce and healthy food choices closer to consumers. This helps to address “food deserts” that exist in many cities, where there simply are no grocery stores or markets to serve the local population, who then must rely on fast food and other unhealthy options to survive.

Euclidean logic has pushed agriculture away from residential areas and urban cores. But urban agriculture is one way to address both local and global food needs. Combined with the provision of open space, these uses can add value to adjacent urban areas for both aesthetic and recreational reasons.

For example, Portland (Oregon) and Lancaster (Pennsylvania) have recognized the value of agriculture to the local economy and as a compatible use adjacent to residential neighbourhoods. Portland and Lancaster have adopted “urban growth boundaries” as a means of protecting adjacent agricultural areas from conversion to non-agricultural uses. Both cities know understand that open space and urban agriculture are vital to protecting sources of food production for a growing planet.

Key Component #3 – Energy

Energy demands are increasing even faster than population growth. For example, in 2013, the number of web-connected devices in the U.S. exceeded the population.

The reliance on technology also shifts and increases overall energy demands. Every text message, voice mail message, and email is stored in a data center somewhere. Data centers vary in size from a small closet to several hundred acres, but each requires power for servers and air conditioning (to combat the heat associated with servers). Low-power chips can help reduce overall energy demand but more is needed. Data centers can be location-agnostic, sited in remote climates to utilize cool outside air to replace the need for mechanical air conditioning. Google is considering locations in Sweden for such a data center.

Technologies also shift energy demand from one source to another. Switching to electric vehicles (EVs) shifts overall energy demand from gasoline to electricity, potentially overwhelming power generation distribution and capacity. In a similar vein, wireless connectivity greatly increases power demands, as more devices need to connect and recharge. Universities that converted to wireless found their power demands doubled or tripled. And an unintended consequence was that the humble electrical outlet became a significant form-giver in most public spaces – everyone wants to plug in at some point.

To meet growing energy demands, buildings and neighbourhoods could generate some degree of energy through solar panels, wind turbines, or other technologies. Yet, many local development regulations and building codes impede the application of this technology – some ban it outright.

While overall gasoline use may decrease with adoption of alternate fuel vehicles, the demands on total energy output increase as the source of refuelling/recharging shifts.

Key Component #4 – Water

There is no substitute for water. Water has an undeniable duality – it is vital for human development, and it can also be deadly.

Early human settlements often located near water sources for strategic value (economic, agricultural, military) as well as to serve basic human needs. Today, many of these cities are also susceptible to hurricanes, tidal waves, and rising sea levels. Hurricane Katrina (New Orleans, 2005) and “Super Storm” Sandy (New York/New Jersey/Connecticut, 2012) demonstrated the devastating power a storm can have on a modern metropolis.

Lack of water is also critical. A decade-long drought has gripped most of the central, southern, and western U.S. Aside from reliance on seasonal rain cycles or snow pack melt, there are no effective man-made strategies for reducing drought conditions.

For the planet to accommodate cities of 7.5 billion people, water usage can become more efficient, but it can never go to zero. Since the mid-1980s, U.S. residential water usage has decreased 30%, from 100 gallons per person per day to 70 – and some project that can eventually go as low as 50 (American Water Works Association, Denver, Colorado). However, it is equally important that non-residential uses become more efficient for all industries (including agriculture). Otherwise, there will be insufficient water supplies to service both future industries and human consumption.

Key Component #5 – Transport

In 1896, architect Louis Sullivan's observed that "form follows function" (Sullivan, L., "The Tall Office Building Artistically Considered", *Lippincott's Magazine*, issue #57, Philadelphia, Pennsylvania, March 1896). However, today one would speculate (as many have noted) that "form follows parking". The proliferation of affordable personal transportation has made the car a significant but unintended urban form-giver.

Cities large and small are defined by an intricate network of highways, local streets, parking lots, and garages. Regardless of the number of roadway widenings or new alignments, traffic congestion remains unabated. Building more roads has not reduced vehicular traffic congestion. In fact it can be postulated that it has made the problem worse.

An emerging middle-class expands automobile ownership. It happened in the U.S. in the 1950s, in Mexico in the 1990s, and is currently happening in China where the China National Bureau of Statistics reported 2012 car ownership at over 65 million, a 25% increase over the previous year. China's growing adoption of an auto-centric lifestyle can be seen in recent reports of massive traffic congestion, sometimes stretching for more than 100 miles (160.9 kilometers) and lasting for days. Automobile emissions contribute to China's increasingly poor urban air quality. Developments that mimic U.S. suburbs (Beijing's *Orange County*) exacerbate the problem of auto-centric development patterns, congestion, and air pollution.

Zoning and development regulations also contribute to auto-centric design. A typical U.S. zoning ordinance requires office developments to provide between 4 and 5 parking spaces for every 1000 square feet (92.9 square meters) of office space. The average parking space consumes 325 square feet (30.2 square meters, including drive aisles and landscaping). Therefore, the total space dedicated to parking in a typical office development exceeds leasable built space by 40% to 75%. Institutions that finance developments often increase this parking ratio to 5 to 7 spaces per 1000 square feet, further aggravating the problem. Parking ratios tend to be lower in dense urban environments, but the space dedicated to cars remains high, often exceeding total built occupied space.

A relatively recent unintended consequence has been the adoption of the high-performance workspace, wherein offices and cubicles are eliminated in favour of collaborative spaces ("benching"). This effectively puts as many as 8 employees per 1,000 square feet in the same space previously occupied by perhaps 4 to 5 workers. Companies talk about this trend in terms of collaboration, but it also is a simple real estate issue – the more people you put in the same space, the more money employers can save instead of expanding to larger offices. Those arguments aside, the unintended consequence is the increase in parking demand. In the absence of any viable alternative mode (transit, bicycle or walking), the impact on existing parking lots, garages, and roadways is significant, especially for older buildings. Simply stated, "benching" also causes traffic congestion.

HIGH RESOLUTION DEVELOPMENT – REINVENTING THE FUTURE

To meet the increasing global urbanization and local population growth demands, application of current development patterns are neither sufficient nor sustainable. To meet these demands, a new paradigm is proposed – *High Resolution Development* (HRD), which is based

on established compact urban patterns and scalable to adapt globally to various sizes and cultures while promoting traditional successful neighbourhood design practices.

HRD principles incorporate basic tenet of urban place-making used for centuries. Future urban areas – the “City of Tomorrow”, if you will – may incorporate various and diverse architectural styles, but the relationship of uses and built spaces that adhere to HRD principles more effectively encourage sustainable growth patterns. HRD principles may also be integrated into existing “standard” development ordinances for ease of implementation in established neighbourhoods experiencing the next generation of development.

HRD’s principles can be summarized simply as a 3/3/3 relationship, applied within a compact 5-to-10 minute walking distance, roughly a 1,250 to 2,500-foot (381 to 762 meter) radius:

- Diversity – A minimum of 3 different land use types mixed both vertically and horizontally;
- Density – A minimum building height of 3 stories; and,
- Accessibility – A minimum of 3 distinct travel modes.

One may apply these 3/3/3 principles to historic and new urban/suburban development to determine if they truly are “high resolution”. Established neighbourhoods like Chelsea (New York) and Kensington (London), and new developments including CityPlace (West Palm Beach, Florida) and Roppongi Hills (Tokyo, Japan) do, in fact, pass the 3/3/3 test. They are also financially successful, sustainable, and have a sense of place.

But merely being a densely-developed urban neighbourhood does not necessarily meet HRD standards. An intensely dense urban neighbourhood may be principally residential uses, with few, if any, supporting uses (retail, schools, or offices). This would not meet the HRD definition.

Similarly, many new U.S. “town centers” (or “lifestyle retail centers”) do not qualify as HRDs. In fact, they would be considered *Low Resolution Developments* (LRDs) since they are monolithic (no significant mix of uses), are composed primarily of low-scale buildings, and rely almost completely on automobiles for access. Typical U.S. suburbs, too, are almost always characterized as LRDs as they are almost exclusively single-use developments (such as single-family subdivisions) designed principally for automobile access. Even many examples of *New Urbanism* developments do not pass the HRD test.

Internationally, the trend of building “designer cities” does not guarantee HRD developments. For example, Dubai’s Palm Jumeirah – a terra-formed island containing principally upper-income residential uses, with a hotel and some retail uses – is an undeniably impressive engineering feat, but it does not create walkable, diverse, or vibrant neighbourhoods.

In addition to these urban form influences, HRD also impacts the following influencers:

- Food – HRD can also help promote more effective and efficient agriculture production by allowing its integration into a modern urban development model. One example is Plantagon International AB (Sweden) that began construction of a new urban vertical farm in 2012 (Plantagon International AB, available from: <http://plantagon.com>, retrieved December 2012). Known as the *International Centre of Excellence for Urban Agriculture* (also known

as the *plantscraper*), the new model is located in downtown Linköping (southwest of Stockholm). *Plantscraper* is a vertical urban farm prototype that promises to provide a controlled growing climate to increase production yields and bring food sources closer to consumers and urban areas. It also fits in with the vertical nature of a downtown. Open space and food production can be a vital land use in all urban developments.

- Energy – Energy consumption may be partially reduced through a more compact development pattern. Alternate-fuel vehicles may be a short-term response to reliance on fossil fuels, but ultimately reliance on walkable neighbourhoods
- Water – Preservation of open space areas through compact development also allow for groundwater to be recharged, to create local small-scale reservoirs, and to encourage rainwater catchment systems for local or individual use. This may support and enhance traditional water treatment and distribution systems to meet future needs.
- Transport – Applying the HRD principles of 3/3/3 can reduce the impact of automobiles. In Zurich (Switzerland), the Bahnhofstrasse – a 0.8 mile (1.25 kilometers) street linking the main train station with Lake Zurich – is one of the most affluent shopping streets in the world and is home to numerous private banks and wealth management firms. Its access is limited to pedestrians, streetcars, and bicycles (HRD’s three modes), with cars allowed only along adjacent blocks (a ferry at the southern terminus of the adds a fourth mode). Similar patterns are replicated throughout the urban core of Zurich, with small, diverse neighbourhoods connected by streetcars that minimize the need for daily car use. Relying on multiple transport modes has not diminished Zurich’s economy or quality of life.

An emerging technology that has the potential to radically alter urban form is the autonomous (or self-driving) car. The self-driving car is the result of incrementally implemented technology over the last 10 years – from automatic braking to lane-keeping technologies to heads-up displays with infrared cameras. Before we realized it, self-driving cars seemed a real possibility. In 2016, major manufacturers from Tesla to Toyota have stated they will offer self-driving cars for sale by 2020. But even if that deadline slips, the introduction of self-driving cars could change the way we think about development.

One significant impact could be the reduction in parking space demand. But how many parking spaces would be reduced? An Internet search of the question “How many parking spaces are in the U.S.?” yields no definitive answer. The most common result is somewhere between 3 and 4 spaces per registered vehicle. For the sake of argument, taking the current estimate of the number of U.S. registered vehicles (around 300 million), the above multiplier yields close to 1 billion parking spaces. A 1% reduction in U.S. parking demand attributable to self-driving cars could result in 10 million fewer spaces.

Using the average parking space area above (325 square feet, or 30.2 square meters, per space), a 1% decrease in U.S. demand could result in a reduction of 3.25 billion square feet dedicated to parking – that is equivalent to roughly 116 square miles (30,193.53 hectares), depending on how many surface or garage parking spaces are reduced. The global reduction would be even greater. Reduction in parking demand presents opportunities for adaptive reuse for portions of existing parking facilities, as well as a re-thinking of municipal development regulations associated with required parking ratios.

While there is no clear direction yet regarding self-driving cars, it holds the potential for significantly reshaping urban areas and how developments are accessed.

SUMMARY

Throughout human history, urban patterns have – intentionally or unintentionally – yielded sustainable forms of growth and development. But for the last 80 to 90 years, these patterns have been disrupted by policies and technologies that have artificially encouraged monolithic development patterns which are accessed predominantly by personal automobiles on high-volume roadways. This unintentionally resulted in the unsustainable patterns of urban and suburban development that today we consider to be “standard”.

To accommodate projected growth through 2030 (and beyond), historic precedents of horizontally and vertically mixed-use coupled with compact neighbourhood designs can be adapted. The design principles proposed by HRD are based in compact neighbourhood design and provide a scalable template for a sustainable urban form that promotes land use diversity, economic opportunity, and improved quality of life. These principles can be integrated into existing regulatory language, ensuring promotion of historically-proven urban patterns and visual aesthetics that are contextually appropriate.

In the face of disruptive technologies – including self-driving cars – reliance on HRD principles becomes more relevant when considering the potential for large-scale adaptive reuse of existing urban fabric. A reduction in parking demand, for example, can help reclaim urban and suburban areas for new mixed-use development, new parks, or new agricultural use – all within a walkable radius of homes, schools, offices, and retail. New parking garages can be “future-proofed” to accommodate their re-imagining when (and if) parking demand decreases.

The repetition of past development patterns because it is “easy” or the “standard way of doing things” is no longer a sufficient response to meeting the challenges associated with the growing global urban population. HRD can help cities and suburbs address the challenges associated with food and energy production, transport, and environmental concerns. It is a significant tool that public officials, developers, planners, designers, and engineers can use to ensure that our cities and suburbs are liveable, walkable, and sustainable places to be.

The City (and suburb) of Tomorrow will not happen by accident. The planning and design of our future begins today.

Detroit: here Urban Meets Rural **Victoria OLIVIER, Detroit Future City, USA**

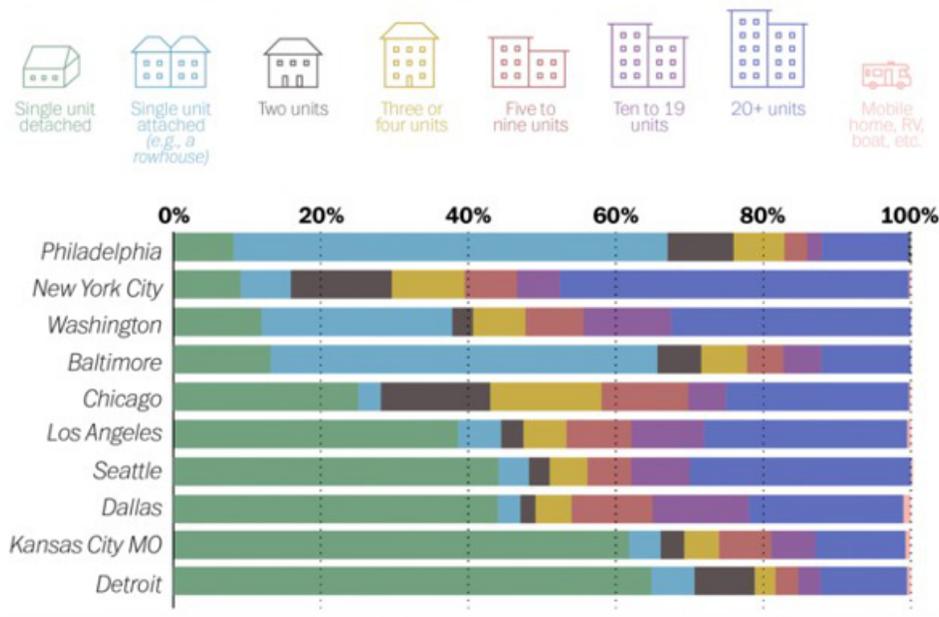
Abstract: Detroit in its current form has both urban and rural characteristics and challenges. With vacant land as its greatest opportunity to distinguish itself as an innovative and resilient city for all residents, integrated urban and rural strategies must be deployed to meet current and future needs.

Men and women once flocked to Detroit from the cotton and citrus fields of the southern United States for well-paying automobile factory jobs. Detroit became a mecca for those hoping to prosper in the booming economy of World War I as part of what is known as the Great Migration. Between 1910 and 1930, Detroit's population grew by 236 percent, making it the nation's fourth largest city and Detroit's African American population grew from 6,000 people to more than 120,000 in that same time period. It became known as the Motor City, assembling most of the world's automobiles, and the Arsenal of Democracy, manufacturing World War II armaments. As was the case with World War I, the 'Arsenal of Democracy' attracted a new wave to work in factories and escape low wages in the South. Over two-thirds of the African Americans living in Detroit in 1940 and 1950 were born in the southern United States.

Due to numerous issues that perpetuated 'White Flight' by 2013 Detroit's population had fallen to 689,000, from a height of 1.8 million in the 1950 census. The population is now 83% African American per the 2010 census and half of Detroit households live on less than \$25,000 a year. While few original participants in the Great Migration remain, hundreds of thousands of decedents are just one generation away from their parents' dangerous and courageous escape from the segregated South. Today, those descents endure the economic and physical conditions of their neighborhoods which more closely resemble it.

In 1910, Detroit had become a top-10 American city, with a population density that was in line with many other big cities of the day, at about 11,500 people per square mile. The population boom and automobile boom coincided and led to a proliferation of single-family detached houses. Even as the city has lost over a million people since 1950, the housing mix has remained skewed heavily in favor of the single-family detached dwelling, with over 65 percent of all occupied residential lots inside the city being used for this purpose.

Occupied housing units, by building type

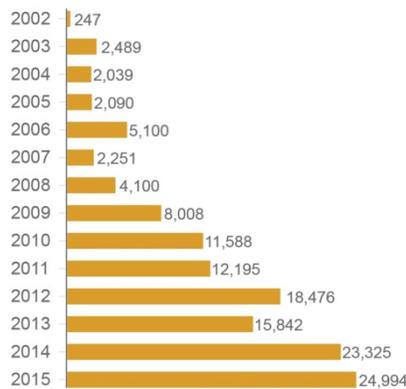


WAPO.ST/WONKBLOG
 Source: U.S. Census Bureau, American Community Survey
 Icons by Martin Lebreton and Arthur Shlain, The Noun Project

<https://www.washingtonpost.com/news/wonk/wp/2015/09/21/the-most-popular-type-of-home-in-every-major-american-city-charted/>

Detroit currently has 23.4 square miles (60.6 square kilometers) of vacant land—roughly the size of the island of Manhattan. The city has 29 % of parcels are without a structure, and 18 % of the structures are unoccupied which indicates an increased portfolio of vacant land in the coming years. The U.S. Treasury Department, under its Hardest Hit Fund program, is the primary funder of the demolition the single family houses that have become blighted as a result of the foreclosure crisis, white flight, housing stock excess and a host of systemic factors.

A STEADY CLIMB IN FORECLOSURES



Source: Loveland Technologies
 NOTE: Data is current as of Oct. 5, 2015. Homes included above were sold in auction to private buyers or went unsold and were processed by municipalities.

<http://america.aljazeera.com/multimedia/2015/10/detroit-foreclosure-crisis-.html>

In April 2016 Detroit was awarded another \$88 million in these federal 'Hardest Hit Fund' dollars for its blight fight and has reiterated plans to take down about 11,000 more homes by the end of 2017. In the past two years alone, Detroit has demolished more than 8,200 vacant buildings in neighborhoods across the city. Mayor Mike Duggan hopes to keep at this pace to remove 40,000 blighted structures in about eight years, instead of the 30 years it would have taken the previous rate.

To the eye (if not to the US Census), Detroit is both urban and rural: a Detroiter is someone on the 24th floor of a residential structure looking beyond to Canada across the river, and someone who is the last occupied house on their street looking beyond at a prairie. The urban environment and land of economic opportunity that many of the African Americans who migrated to Detroit from the rural South sought slipped away during their lifetime.

Contrary to the framing of many stories on Detroit--the size of the city is not too big and the population is not too small-- the population density actually ranks 69th among 300 US cities with populations over 100,000 people, and denser than cities like Sacramento, Denver, Austin and Atlanta. However, Detroit suffers from limited financial resources and aging infrastructure, and needs to reframe the conversation about how to realign the historic urban form to grow the economy and create a more strategic and efficient use of the land. To do this, Detroit must look to not only its sister US and global post-industrial cities for innovation, but to models of healthy economies and land stewardship in rural areas and small towns to adapt strategies to fit this new form of urbanity.

Open Space

Strategy

Vacant land has a direct impact on the health of urban areas. The dominant narrative in Detroit has been that vacant land is a not just a nuisance, but accelerates the deterioration of neighborhoods, increases criminal activity and robs the city of valuable financial resources. Today organizations like Detroit Future City are working to flip that narrative on its head—turning vacant land from a liability to an amenity. The need to transform Detroit's vacant land into a new and multifaceted open space system is at the heart of Detroit Future City's 2012 Detroit Strategic Framework Plan, a city-wide plan culminating from three years of intensive community engagement, research, collaboration, and analysis, which resulted in a shared vision for Detroit.

In recent years growth has returned to U.S. city centers, and many municipalities have shown a renewed interest in incorporating green space and vegetation into the urban environment. In 2011 New York City opened the High Line, an elevated linear park converted from an abandoned rail line, while cities as diverse as Los Angeles, Denver and Miami have launched campaigns to plant 1 million trees. These cities are struggling to carve out the space. Detroit is yet to start growing again overall, but the population is nearly stable, so now is the vital time to envision the type of city we want to be.

The future land use vision for Detroit consists of a strategy that falls into three key areas: - Areas of growth include employment districts located strategically throughout the city, building on existing economic assets as well as mixed-use areas designated as city center, district center, or neighborhood center, where increased residential density will be focused. - Areas of stabilization include areas designated as traditional and green residential neighborhoods. These areas will be stabilized and continue to be the residential core of the city. Areas of transformation include areas designated as innovation ecological and innovation productive. With the greatest amount of vacant land, these areas will continue to support residents, but will focus on transforming vacant land into open space. This strategic approach to these three areas must occur simultaneously and symbiotically in order to be successful. Specifically, a targeted growth strategy will not be successful without taking the vast vacant land liability off-line and transforming into an open space asset. At the same time, neighborhoods will not be stabilized without improving quality of life through vacant land transformation and necessary economic growth to provide jobs and commercial amenities for residents.

Open space is defined as structure-free land that is intentionally used. The Detroit Future City Open Space report identifies five different types of open space that an open space plan should consider. These types are not mutually exclusive and in some cases can be combined on a single site to provide increased benefits. These types include:



Natural Areas are landscapes that provide important ecological functions such as habitat for plants and animals, and cleaning the air, water, and soil. Examples include meadows, forests, wetlands, or riparian corridors.



Green Stormwater Infrastructure (GSI) involves using land in a manner that promotes the natural storage and infiltration of stormwater into the ground. Examples include bioswales or rain gardens.



Productive Landscapes are intentionally cultivated to produce food, energy, and other harvestable products. Examples include urban agriculture, energy production, or tree farms



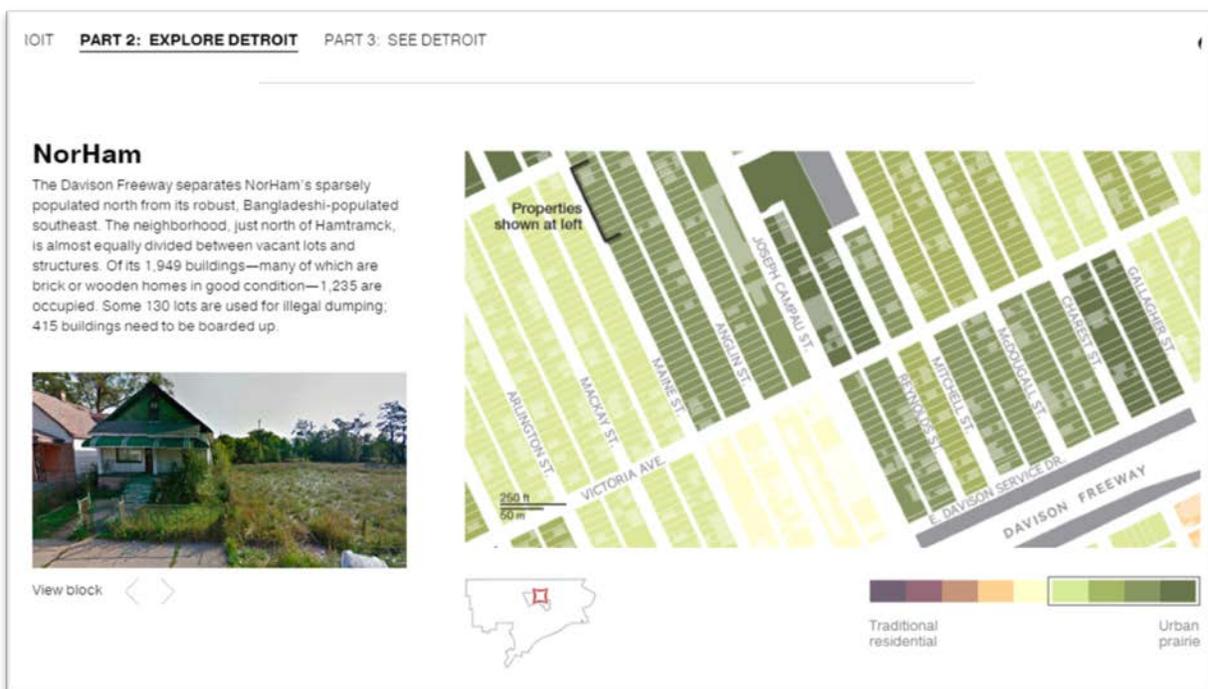
Parks & Recreation are publicly used for recreation activities such as biking, walking, and playing sports. Examples include greenways, playgrounds, or ball fields.



Buffers are vegetated areas located around highways and industrial areas that utilize plant materials to block hazardous particulate matter, absorb noxious fumes from residential areas, and help reduce visual and sound impacts.

<http://detroitfuturecity.com/wp-content/uploads/2015/06/DFC-Open-Space-Report-1.pdf>

The network will connect all areas of the city, improving quality of life for all Detroiters. This vision for an open space plan does not mean that people will be forced to move out of their homes from a high vacancy area. Instead, this vision is focused on improving quality of life and addressing the extreme levels of vacancy in some areas of the city. Detroit is known for urban farming, but that should not account for all 23.4 square miles of vacant land. The engagement process will allow the community to identify types of open space that are particularly desirable, or undesirable. Based on community values, interests, opportunities, and concerns, the community can prioritize certain types of open space.



National Geographic profiles 'NorHam' and looks at areas 'reverting to nature' due to its characteristics of Least densely populated; Most vacant lots; Most abandoned buildings
<http://www.nationalgeographic.com/taking-back-detroit/explore-detroit.html>

Many of these open space types do not look like what has been planned in America's urban environments like Boston Common or New York's Central Park. The more natural, less groomed, less planned are relegated to the rural realm in America. Research has begun to address the psychology of open space, including the work of Joan Nassauer that concluded "good" landscapes or those of high ecological quality are not perceived to be of value, or worth caring about, unless they are provided with additional visual or spatial cues indicating "neatness", "stewardship" or "naturalness" to their human viewers. Messy is okay for uninhabited lands but it is considered a negative quality when applied to human-influenced landscapes, such as land in lower density neighborhoods. While large amounts of open space may be present in Detroit-- having orderliness, colorful and familiar flowers, edges and rows, boundaries and signs or ornament help marry the urban culture with the ecological benefits.

Fresh Coast Capital is real estate development firm that specializes in reutilizing vacant properties into working landscapes such as tree farms. The company's current focus is on

growing hybrid poplar trees for harvest in combination with fresh cut flowers. The hybrid poplar is a fast growing tree that can provide many benefits, including the ability to clean the air and to help manage stormwater runoff particularly because the hybrid Poplar requires more water than most tree species. Additionally, these trees can improve the quality of the soil by removing some contamination, leaving a cleaner site when the trees are harvested in 12-15 years. Fresh Coast currently has projects underway in cities across the Midwest United States including, Gary and Elkhart Indiana and Flint Michigan which have significant amounts of vacant land.

Many Detroit residents convey concerns that 'urban forests' would have safety implications or are uncomfortable ceding land in an urban neighborhood to trees for 12-15 years. Hamilton Anderson Associates was commissioned to create the renderings below to be a tool to address the reservations from community members and serve as an engagement tool.



Concept 1 Perspectives

Fresh Coast Capital

The renderings show a tree and flower concept at 1 year, 5 years and 10 years after planting.

Policy

Traditionally, humans' intrusion into the wildlands and then the resulting disruption in natural systems and habitat is studied. In most urban areas, residents no longer consider themselves to be part of nature—it has been dominated, and now what remains was intentionally planned for. After decades of disinvestment and abandonment some areas of Detroit have wildlife intrusion on human habitat and now experience more rural characteristics by default taking the form of pheasants, raccoons, deer, and coyotes. While Detroit cannot always control the collision of nature, they can use policy to adapt for it.

In March 2013, Detroit City Council adopted the city's first urban agriculture zoning ordinance recognizing agriculture as a legitimate land use and setting standards for it. The ordinance establishes legal definitions for an array of types of urban agriculture uses, including aquaculture, aquaponics, farm stands, farmer's markets, greenhouses, rainwater catchment systems, hoopouses, orchards, tree farms, urban farms and urban gardens. The ordinance operates as an overlay to the city's existing zoning ordinance, specifying the existing zoning classifications allowing urban agriculture by right or conditional use.

Detroit city officials are nearing completion on an urban livestock ordinance that would allow some residents and urban farmers to raise egg-laying chickens, ducks, rabbits and goats legally. Despite often being called the 'Urban Agriculture Capital of America' with approximately 1,400 community gardens and farms, vast engagement is necessary ahead of its adoption: "When I purchased my house over 20 years ago, we did not expect it would turn into farmland," Angela Peavy, an east-side resident near Outer Drive and Chalmers, said in an interview. "I get wanting to know where your food comes from ... I just don't feel it necessarily has to be on my block."



Mark Covington tends to crops, four beehives, pens with nearly 30 chickens and a separate, larger pen for five goats at 'Georgia Street Collective' on Detroit's east side,. Photo: Jessica J. Trevino/Detroit Free Press <http://www.freep.com/story/news/local/michigan/detroit/2015/11/22/detroit-eyes-adding-livestock-urban-farms/76123622/>

The Detroit Future City Open Space report asserts the single most critical action Detroit can take to ensure the feasibility of a long-term open space network is to craft and adopt a comprehensive Open Space Plan, Master Plan of Policies, and Zoning Ordinance that detail and codify permanently designated open space areas. The community must shape the plan through robust engagement and ensure the plan addresses the concerns of people in Detroit with some flexibility to create neighborhood level decisions about types of open space.

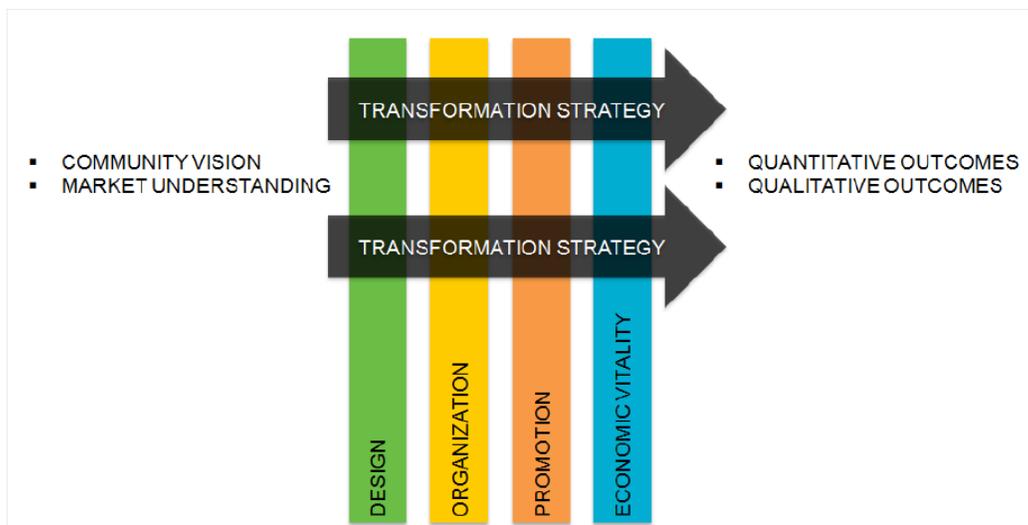
The National Wildlife Federation published a fact sheet that details many of the mind, body and spirit benefits of exposure to nature. Greening of Detroit's executive director Rebecca Salminen Witt notes that "despite heightened access to nature, Detroiters still suffer from the ills that exposure to nature is supposed to alleviate: ADHD, hypertension, obesity, diabetes, autism, increased depression, stress and pain. Our kids are asthmatic and hyperactive. Our adults are depressed, obese, and suffer from heart disease. It's no wonder that most Detroiters aren't embracing the nature that has appeared in their urban space—they aren't getting any of its benefits!" By working to put together a comprehensive open space plan that will be implemented with a focus on equity and accessibility can help alleviate these health issues and create a more transparent co-existence of urban and rural characteristics.

conomic Development

Main Street Model

Before World War II, Main Street was the American small town's primary commercial hub for the town's residents and those in the rural areas surrounding it. The buildings usually had mixed uses -- typically a ground-floor retailer and, frequently, several upper-floor offices or apartments; which provided enough rent for property owners to keep their buildings in good condition. Shopping, services and government often converged at this hub of commercial and social life. In the past half century, these main streets changed drastically with the creation of interstate highways and subsequent growth of suburban communities where traveling longer distances became easier and more options were offered. Detroit's neighborhood corridors have suffered from similar issues and as businesses' property values and sales tax revenues dropped the resulting vacancy lead to blight and general apathy. However, many older Detroiters excitedly recount never having to leave their neighborhoods for goods and services and being able to walk to them. Many younger residents want those same amenities again as well.

The National Trust for Historic Preservation's National Main Street Center has led the development of a national network of over 2,000 historic downtowns and neighborhood commercial districts over the past 35 years. While they primarily work with small towns or commercial districts, their model is applicable to the urban commercial corridor as well.



The Main Street Approach consists of "three tightly integrated components: community visioning and marketing understanding (the inputs), transformation strategies (implemented using the Four Points), and implementation and measurement (the outcomes)." http://www.preservationnation.org/main-street/about-main-street/main-street-america/the-main-street-approach.html#.V1Rh6_krLIU

According to the National Trust the "Main Street-style transformation is a combination of art and science: communities first need to learn about the local economy, its primary drivers, and its regional context (the science), but they also need to convey that special sense of place through storytelling, preserving the older and historic structures that set it apart, broad and inclusive civic engagement, and marketing." Having a dedicated, trained Main Street manager or leveraging volunteers, which is often the rural model due to less resources, makes a huge difference in creating and keeping momentum going.

The current retail trends indicate a renewed interest in shopping locally on "Main Street" but when there are transportation accessibility issues like Detroit, it becomes a necessity. When the surrounding neighborhood has lower density it becomes a planning task to find the right mix of tenants and uses and taking advantage of special opportunities to brand and program to show the area off to the wider city and region to help support the businesses who have weaker adjacent residential numbers and buying power.

Digital divide

High-speed Internet access has become a fundamental part of modern life-- on the job, at home, or at school. The Internet can overcome geographic isolation by connecting users to information and economic opportunity, even the most remote communities. There is a digital divide that particularly impacts rural America who are three times less likely to have access to broadband than citizens in urban areas.

Poverty, rather than infrastructure, has led to Detroit having the lowest rate of Internet access of any large American city: four in 10 of the 689,000 residents lack broadband, according to the Federal Communications Commission. While difficulties in connecting to the Internet in rural

areas are well known, Detroit can be a case study in how the digital divide in an urban setting can impact a revitalization.

Mesh networks are being implemented in underserved corners of American cities, including Detroit where Allied Media Projects has worked with locals to install three networks. A wireless mesh network is created through the connection of wireless access points installed at each network user's locale. Rooftops serve as "nodes" to pass along a connection to other locales, allowing communities to be reliably connected and avoid high costs. These networks are a relatively simple way to offer high-speed Wi-Fi and have further advantages for communities affected by natural disasters and power outages.

The introduction "splash" page for the mesh network can contain neighborhood news and events, but also job and educational opportunities that can help bridge that digital divide. An award winning example of a mesh network includes Ponca City, OK, which delivers free wireless broadband to all 25,000 residents who benefit from one of the fastest Wi-Fi mesh networks in the world.

The screenshot shows the website for Ponca City, Oklahoma, specifically the page for their free Wi-Fi service. The page layout includes a top navigation menu, a main header with the city name and logo, and a sidebar with various utility links. The central content area is titled 'Wi-Fi (Wireless Internet)' and contains introductory text about the service, its benefits, and a FAQ section. The FAQ section lists several common questions and answers related to the Wi-Fi service, such as 'Who do I contact with questions about free public wireless (Wi-Fi)?' and 'How do I connect?'.

<http://www.poncacityok.gov/wifi>

Detroit needs more programs that address internet inequity, but also increased access to computers and skills classes must complement these efforts. While the internet is available to many lower income residents by cell phone the skills needed to compose a document, write a resume, and type proficiently.

Immigration

Immigration is reshaping the landscape of rural America and a rapidly growing Hispanic population is driving this trend. New immigrants are offsetting population loss-- a challenge

faced by many small communities. Between 2000 and 2010, racial and ethnic minorities accounted for 83% of rural population growth.

Without its former core industrial base, Detroit has had to look for new ways out of economic decline. Within Detroit the foreign born population is around 4% according to 2010 Census data and less than half of the four metro Detroit metro counties who have 8.6%. The same factors that have driven other groups to leave Detroit—crime, poor city services, low performing schools and low economic opportunity keep the immigrant numbers down. Although the city is attractive to some working class populations from Mexico, the Middle East and Asia but of the nation's 25 largest cities, Detroit has by far the smallest immigrant population.

Detroit has acknowledged attracting immigrants as a key strategy to grow population. Welcoming immigrants into the economic and social fabric helps to make the city more attractive to businesses, tourists and future waves of immigrants. Detroit should not use massive swaths of vacant land or vacant buildings to develop immigrant communities if they are cut off from efficient transportation, economic opportunity and the rest of the residents. The strategy must be deliberate to build inclusive and welcoming communities to bridge racial and ethnic divides and encourage all to prosper.

Transportation

Public transportation in rural areas is a vital contributor to accessibility and quality of life, especially for those who cannot or choose not to drive. There are 22% of adult Detroiters who do not have access to a private vehicle-- which is based primarily on lack of resources, rather than personal choice or alternative transportation options. The city's relatively low density and long distances between employment and neighborhoods, coupled with the 61% of Detroiters who commute every day to the suburbs for work, will challenge the city and region to devise strategies to increase transit access and use.

Transit planning requires creativity in rural areas because of the lack of density typically required to justify providing fixed-route transit services. While fixed-route services can be feasible along main corridors or between major employment centers, other transit programs are being pursued in rural areas, including ride-sharing, demand-response (dial-a-ride) transit, and car-sharing.

Detroit has approximately 50 ZipCars, but they are located in the densest areas and do not benefit residents who live in areas of vacancy disconnected from healthcare, food options and employment centers. In Traverse City, Michigan, the 'CarSharing Traverse' case study illustrates an innovative form of transit planning through the use of a car-sharing program. The model broke new ground in that it had no hired staff, did no marketing other than word of mouth, and was one of the first of its kind in a rural community. The business began with two cars and a handful of members and ultimately expanded to three cars and about thirty members at its conclusion nearly three years later. Members would call the organizer's cell phone to reserve cars for specific times, then go to one of the three car locations, punch in the lockbox code to get the car keys and log their time in a logbook once they were done borrowing the car.

Membership in the program was \$25 to join, \$2 per hour and \$0.50 per mile to rent the cars. Cars could also be rented at a daily rate of \$50. Gasoline and insurance were included in these prices. While Traverse City has a very different geography and demographics from Detroit, it shows how neighbors can come together to support each other's needs.

Metro Detroit's Regional Transit Authority's master plan was released June 2016 and if funded by local voters in the November 2016 election will be implemented to address many of the significant gaps in the regional transportation network. The plan includes 'Paratransit and Mobility Management' which will be expanded to improve the mobility of those unable to utilize traditional transit and offer a consistent level of service throughout the region. While it is important to address paratransit from a regional scale, the on demand model can also be a more efficient way to respond in areas with high need, but low density regardless of special needs at a local scale.

In New Orleans, after Hurricane Katrina, several neighborhoods were inundated with water and their population slow to rebound. As a way to ensure that all residents had access to transit the 'Lil' Easy' program was developed where customers book rides by phone on 14-seat vans that crisscross the area, stopping within a few blocks of every residence. For the standard \$1.25 fare, the Lil' Easy program allows customers to reserve a seat on a van, which can accommodate two wheelchairs and uses cleaner-burning biodiesel fuel, up to a week out, or as little as an hour in advance. Based on the customer's address dispatchers tell them where the closest stop is located and then provide a 10-minute pickup window. As customers book rides, a computer program plots a route for pickups and dispatchers use radios to help drivers adjust routes to account for reservations that come in after a van hits the road.



Traditional New Orleans Regional Transit buses vs. the Lil' Easy van <http://www.norta.com/>

This program was never meant to be permanent, but flexible: as the city's demographics change, NORTA adjusted the service plan to change with them. As the recovery progressed they were nimble with addressing service levels, a lesson particularly applicable to Detroit which is now also in transition. Where the population is limited, it makes more sense to use small, efficient vehicles rather than large, gas-guzzling buses.

Transportation that is affordable and dependable in underserved areas is not just about bridging the "urban and rural divide" but it is about connection to opportunity which can play a role in

mitigating narratives that emerge from fractured places undergoing change: old vs. new; rich vs. poor; white vs. black. There are creative transportation options that exist in Detroit's informal economy, but where there is an appropriate models they should be formally adopted, well publicized to those in need and funded as part of a robust, but integrated transit strategy.

Infrastructure

Detroit was designed for nearly 2 million people, and with under 700,000 the extra capacity in city systems like streetlights, utility networks and waste management is not only going to waste, it is underperforming for the current residents. The Detroit Future City Strategic Framework asserts "Just as we can find new ways to manage the abundance of land in the city, we can unlock innovations to manage surplus system capacity and reallocate resources to upgrade and maintain core systems, improve service, and heal the environment. Systems renewal will be coordinated with land use change to better relate neighborhoods and employment districts, as well as the systems that serve them." Underinvested infrastructure is a nationwide worry, but reshaping this overscaled infrastructure into an efficient, environmentally sustainable set of 21st century systems can help Detroit be a leader in resiliency.

Detroit's impoverished residents face some of the highest water costs in the country. These costs have risen because the water department has had to spread costs across fewer and poorer residents due to lack of tax revenue, and use debt to fund basic maintenance of the system. Between May and October 2015, The Detroit Water and Sewage Department shutoff water to more than 13,000 delinquent accounts, many of which are Detroit families experiencing financial hardship. Shut offs are resuming again as of May 2016 with 23,000 households that owe money to the Detroit Water and Sewerage Department. The UN has stated "Disconnection of water services because of failure to pay due to lack of means constitutes a violation of the human right to water and other international human rights,"

Energy insecurity—an inability to adequately meet basic household heating, cooling, and water needs—is a far-reaching and problematic issue in Detroit. This reality calls for some 'out of the box' innovative solutions, for both the city and the resident some of which look at rural infrastructure. Could these properties have rural utility systems like private wells or rainwater catchment with cisterns instead of city water mains? Septic systems instead of city sewerage treatment plants? Propane tanks instead of piped natural gas? The argument could be made that the City converting the occupied homes in low density areas where vacant land is being transformed to these smaller independent systems would be less expensive than trying to maintain miles of municipal infrastructure across the entire city.

Nassau New York, a town of 5,000 near Albany, has decided to rely on solar, wind, landfill gas and battery storage by 2020. They are leading a national campaign to develop "microgrids" which are designed to make communities more energy independent and the grid more resilient. Natural disasters have been a driving force, but cities like Detroit who need to save money would be incentivized by selling excess power to utilities.

"Campus microgrids" are familiar at places like hospitals, colleges and industrial plants, but development of microgrids that serve communities has been slowed by technical and regulatory

hurdles. Utility companies often show resistance to a threat to their monopoly especially in community models where the cost savings would go directly to community owners of the grid instead of their grid. In Detroit, some pockets of housing surrounded by vacant land could use nearby land for solar and wind to help pay for utilities and address the energy inequity.

Conclusion

Detroit Mayor Mike Duggan's neighborhood plan when he ran for mayor in 2013 was entitled "Every Neighborhood Has a Future." For Detroit to thrive, that must be true. Just as countries redistribute wealth to towns, cities need to view themselves as a geography of neighborhoods--even if some areas will look more rural or like small towns for the next 20 years, or beyond. Austerity and bankruptcy alone will not stabilize the Detroit's finances, much less bring about an economic recovery. Strategies for vacant land, economic development, transportation and infrastructure should not be looked at from not just an aspirational urban lens, but looking beyond to successful town and rural models that can be adapted to support Detroit's 'can do' attitude. Growth, stabilization and transformation strategies must work together to knit the city together and ensure that no section of residents are left behind as the city revitalizes.

References:

Detroit Future City. (2012) *Detroit Strategic Framework Plan*. 2nd Printing. Detroit: Inland Press.

Bethencourt, Daniel. (2015) 'Detroit eyes adding livestock to urban farms.' Detroit Free Press. 23 November. Available at: <http://www.freep.com/story/news/local/michigan/detroit/2015/11/22/detroit-eyes-adding-livestock-urban-farms/76123622/>

Depew, Brian (2014) New Immigrants Deliver Opportunity, Challenges to Small Towns. Available at: <http://www.cfra.org/news/140605/new-immigrants-deliver-opportunity-challenges-small-towns>

A Summary of the Urban Agriculture Amendments to Detroit's Zoning Ordinance
<https://www.law.msu.edu/clinics/food/busdickerfact.pdf>

Ignaczak, Nina. (2013) No Stranger to Urban Agriculture, Detroit Makes it Official with New Zoning Ordinance. Available at: <http://seedstock.com/2013/04/09/no-stranger-to-urban-agriculture-detroit-makes-it-official-with-new-zoning-ordinance/>

University of Guelph (2010) A Guide to Rural Community Economic Development. Available at: <http://www.ruralplanninganddevelopment.ca/Best%20Practices%20Guide%20-%20Version%202.pdf>

National Cooperative Highway Research Program. (2007) Best Practices to Enhance the Transportation–Land Use Connection in the Rural United States. Available at: http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_582a.pdf

Eugenia Garvin, Charles Branas, Shimrit Keddem, Jeffrey Sellman, and Carolyn Cannuscio. (2013) More Than Just An Eyesore: Local Insights And Solutions on Vacant Land And Urban Health. Available at: <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3665973/>

Douze, Frank. (2010) 'RTA will halt minibus service in Lakeview, Gentilly.' The Times-Picayune. 23 May. Available at: http://www.nola.com/politics/index.ssf/2010/05/rta_will_halt_minibus_service.html

Nassauer, Joan. (1995) Messy Ecosystem, Orderly Frames. Available at: http://www.ncrs.fs.fed.us/pubs/jrnl/1995/nc_1995_nassauer_001.pdf

Detroit Demolition Program. <http://www.detroitmi.gov/demolition>

National Wildlife Federation.(2010)There's a reason they call it the great outdoors. Available at: http://www.nwf.org/pdf/Be%20Out%20There/MindBodySpirit_FactSheet_May2010.pdf

The Main Street Approach - Main Street America. Available at: http://www.preservationnation.org/main-street/about-main-street/main-street-america/the-main-street-approach.html#.V1Rh6_krLIU

Witt, Rebecca Salmien. (2015) Wild in Detroit: Realizing Opportunity in a New Nature. Available at: <http://www.thenatureofcities.com/2015/07/08/wild-in-detroit-realizing-opportunity-in-a-new-nature/>

Ferretti, Christine. (2016) 'Detroit gets another \$88M to aid in blight fight.' The Detroit News. 1 June. Available at: <http://www.detroitnews.com/story/news/local/detroit-city/2016/06/01/blight-fight-federal-funds/85262372/>

Grunow, Francis M. (2015) A brief history of housing in Detroit. Available at: <http://www.modeldmedia.com/features/detroit-housing-pt1-111715.aspx>

Kellogg, Alex. (2015) In Detroit, massive foreclosures strip neighborhoods of people and homes. Available at: <http://america.aljazeera.com/multimedia/2015/10/detroit-foreclosure-crisis-.html>

Regional Transit Authority Masterplan (2016) Available at: http://www.rtamichigan.org/wp-content/uploads/RMTP_foldout-map_FINAL-full-bleed-2016-05-16.pdf

Tobocman, Steve. (2014) Revitalizing Detroit: Is There a Role for Immigration? <http://www.migrationpolicy.org/research/revitalizing-detroit-is-there-a-role-for-immigration>

Kang, Cecilia. (2016) 'Unemployed Detroit Residents Are Trapped by a Digital Divide.' New York Times. 22 May. Available at: http://www.nytimes.com/2016/05/23/technology/unemployed-detroit-residents-are-trapped-by-a-digital-divide.html?emc=edit_tnt_20160522&nliid=47607190&tntemail0=y

Bradley, Bill. (2014) How Mesh Networks Can Bridge the Digital Divide. Available at: <https://nextcity.org/daily/entry/how-mesh-networks-can-bridge-the-digital-divide>

Digital Stewards launch community wireless networks in Detroit. (2013) Available at: <https://alliedmedia.org/news/2013/07/19/digital-stewards-launch-community-wireless-networks-detroit>

Metzger, Kurt. (2002) African Americans in the United States, Michigan and Metropolitan Detroit Available at: <http://www.cus.wayne.edu/media/1356/aawork8.pdf>

National Geographic. (2015) Rethinking Detroit. Available at: <http://www.nationalgeographic.com/taking-back-detroit/explore-detroit.html>

Nowakowski, Kelsey. (2015) These Charts Show That Detroit Is Surprisingly Crowded. Available at: <http://news.nationalgeographic.com/2015/04/150424-detroit-cities-population-density-charts/>

Walsh, George M. (2016) Driven by Power Outages and Savings, Towns Look to Microgrid. Associated Press. Available at: <http://www.usnews.com/news/business/articles/2016-02-07/driven-by-power-outages-and-savings-towns-look-to-microgrid>

Hunter, George. (2016) 'Detroit to start water shut-offs Monday.' The Detroit News. 2 May. Available at: <http://www.detroitnews.com/story/news/local/detroit-city/2016/04/30/hundreds-detroiters-line-avoid-water-shut-offs/83753926/>

Gottesdiener, Laura. (2014) UN officials 'shocked' by Detroit's mass water shutoffs. Available at: <http://america.aljazeera.com/articles/2014/10/20/detroit-water-un.html>

Rural: The history and future of the city-- Research on the current situation and utilization strategy of the traditional villages in Linhai

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Abstract: Based on an investigation commissioned by the government of Linhai, this paper sorts out and analyzes the current situation of the traditional villages in Linhai, and puts forward the overall strategy for the revival of the traditional villages in Linhai.

Rural is the city's past, and also the future. In the past urbanization process of China, rural always became the victim of the urban development. However, with the gradual increase of problems in the urban area, people began to look back and miss the rural areas for their beautiful environment, lower pressure and sparsely population in recent years. But due to the neglect before, rural area today is also a place with dilapidated houses and economic depression. People have started a lot of attempts to revive the country area, trying to achieve the harmonious between urban and rural areas.

1. Basic Information of Linhai City and Our Missions

Linhai is one of the coastal cities of eastern China, consisting of 1 central city, 14 towns and 688 villages around. Linhai is a microcosm of China's urban development. Its center city and 14 towns now enjoy a large population and developed economy, while its villages with serious damage. Most of the villages now only have the elderly and children left behind, the economy is totally depressed.

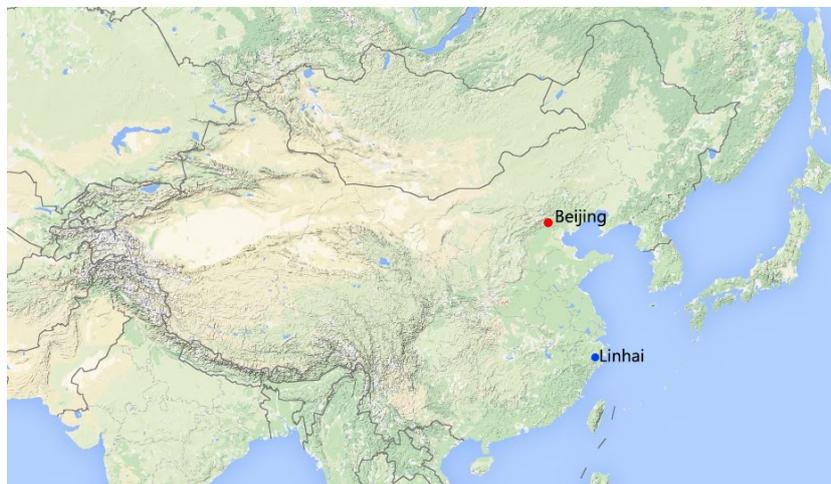


Figure 1: Location map of Linhai (Base map is Google topographic map.)

As a second- or third-tier city, urban size of Linhai is not large and life pressures in urban areas are not as heavy as that in Beijing and Shanghai. However, life is not easy for young people who are not natives here. According to official statistics, the average monthly salary in Linhai is 3,990 RMB in 2014; in comparison, on January 2015, housing price of Linhai has reached 11,567 RMB/m² on average, which is 3 times larger than the average monthly salary.

While 688 villages of Linhai are unoccupied in most cases. In line with the data, quantitative descriptions can be presented. As it is known to all, demographic statistics in China consists of registered population and permanent resident population. For the former, it usually indicates how many people are born here; while the latter shows how many people are living here. Main reason that deviation occurs between them is population mobility. Considering the special household registration system of China, people who live in a city may fail to obtain permanent urban residence certificate for a long term so that his/her household registration is still at the village where he/she was born. For example, in Beijing, the registered population in 2013 was 13.121 million while the permanent resident population reached 21.148 million according to relevant statistics. To sum up, due to Chinese household registration system, the number of registered population and permanent resident population is provided with a particular significance of population mobility observation.

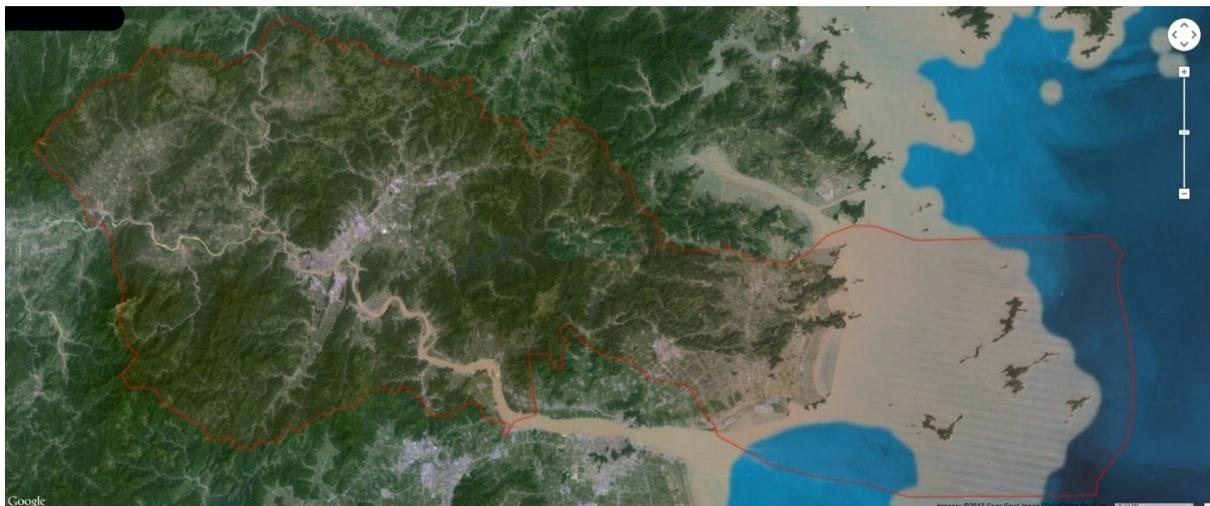


Figure 2: Satellite image of Linhai (from google map)

Specific situations in Linhai are described as follows. 2010 official statistical data of Linhai indicate that the number of registered population and permanent resident population is 375,061 and 377,290 respectively in one central city and 14 towns of Linhai; but in 688 villages, it is 644,903 and 506,950 separately. Such data reflect that urban problems here are not very serious, especially when compared with Beijing. However, according to our observation during rural researches, almost all houses are empty; considering this situation, these data prominently have big problems that can be expressed from two aspects. First, data statistics have been made a long time ago (but, these are data recently acquired by us); second,

technical deviation has taken place during the execution of statistics. Fortunately, quantitative analysis is adopted without these data which are only used for intuitive senses. Furthermore, information below can be acquired based on the data. Permanent resident population in villages of Linhai is dropping while increasing in the city; that is, the population flow direction of Linhai is from the village to the city.

All over China or even the whole world, such occasions are not rare. But, regarding the long historical background and abundant cultural resources of Linhai, these villages not only bear historical memories, but also reserve rather plentiful humanistic resources; moreover, they are also equipped with a very sound natural environment, despite that they will be gradually abandoned due to attraction losses in the tide of modernization development. As a result, increasingly more attentions are paid to them.

In social networking sites, it can be frequently seen that some travelers are stunned at the beauty of ancient villages in Linhai, marvel at being ramshackle and vulnerable, and also worried about their plight of possible disappearance. Even, such appeals attract attentions from Friends of Spirit Community, a well-known voluntary agency of historical village preservation. Professional institutes like us are also able to get involved, because of a good opportunity of "Chinese Traditional Village" Selection throughout the country.



Figure 3: Photos of traditional villages in Linhai (by Wen LUO)

In recent years, a series of effective measures have been taken by the Chinese government in terms of cultural protection so as to promote the entire society to protect cultural heritage. Specific to the so-called traditional village, it is defined to be villages where historical development is largely reserved, such as no substantial changes in built environment, architectural scene and village location, provided with unique folk customs and still serve people at present despite that they are formed in remote times.

On the level of Chinese government, in order to facilitate traditional villages conservation, the Ministry of Housing and Urban-Rural Development, the Ministry of Culture and the Ministry of Finance jointly issued regulations and opinions such as the *Guidance for Enhancement of Traditional Village Preservation* and the *Development and Traditional Village Evaluation Approval Index System (Trial)*, etc., and also examined and approved the first batch of the *Directory of Chinese Traditional Villages*. It has been included in the traditional village

conservation directory supported by central finance; each of them is endowed with a subsidy of no less than RMB 3 million.

Besides, an interesting tendency occurs among the people in Linhai in recent years. Many citizens start to rent houses for reconstruction in surrounding traditional villages with better cultural resources; these houses are used for dwelling during weekends or holidays, or managed as featured hotels. During us researches, mayor of Xiaozhi Town in Linhai City encounters several enthusiastic cash-rich village constructors, which is a good thing for ramshackle villages. However, what makes the local regulator headache is that design drawings presented by such constructors tend to be too modern to be implemented, as certain damages can be caused to the original features of them. Under a general background of cultural heritage protection emphasized by the government of China, they are puzzled about how to achieve a balance between economic development and feature conservation.

This is the working background for us to be got involved in Linhai matters as a professional consulting agency. Missions assigned to us by the government is to carry out a rough general investigation specific to villages in the administrative region of Linhai; by value evaluation from a perspective of cultural heritage, a list of the most valuable villages selected is given to establish a detailed record to prepare for the declaration of Traditional Chinese Village. In practical work, not only are fundamental missions accomplished, but resource type, threats and utilization strategy of these villages are also studied to form relevant reports submitted to the government; moreover, these reports serve as references for village regeneration strategy formulation. For villages with particularly favorable conditions, long-term relationships are established between us and the local administrators and voluntary non-native constructors; diverse problems encountered by them can be explained at any time. Among them, Shengkeng Village is an interesting instance and it will be described in detail at the end.

2.Required Investigation and Recommendation Study

It was impossible to complete the field investigation and follow-up study of all the 688 villages one by one in such a short period of time. With the approval of the government, we decided to start with the analysis of satellite images. It was easy to identify the traditional architectural complex from the images which helped us to confirm where the traditional villages lied. Meanwhile, the government also had sent some staff who were familiar with the local village situation to assist us filtering the appropriate ones. They provider us a preliminary village list of key research objects. With the satellite images analysis and the list, finally we finally confirmed 58 villages as the objects of the field investigation.

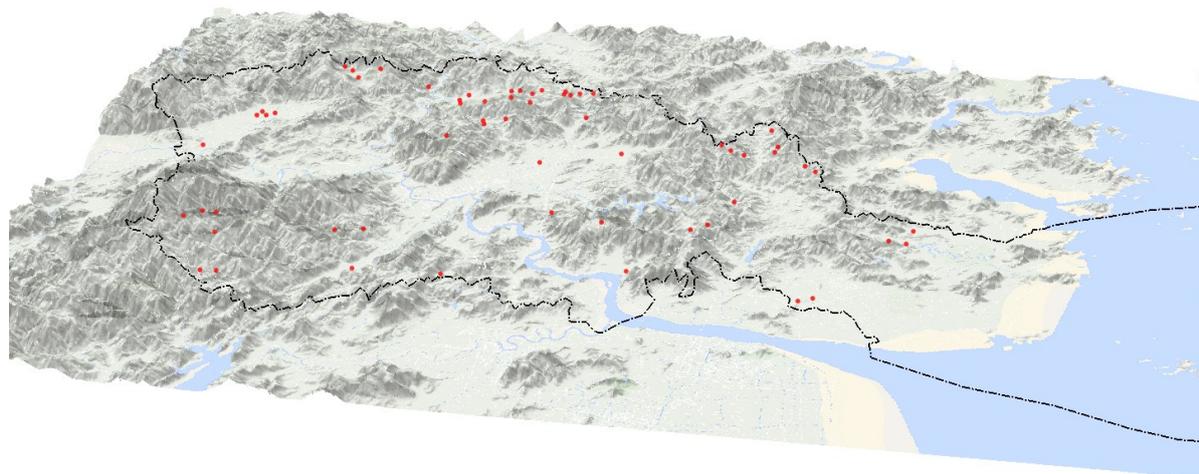


Figure 4: Distribution map of key villages in Linhai (by Wen LUO)

At the same time, with the consideration of the Chinese Traditional Villages selection criteria and the elements of the village cultural heritage, we had built a reasonable index assessment system for the village resources, which divided the index into three categories, twenty subclasses. In order to quantitatively evaluate and get the score for every village, we set 100 points to each category and divided the 100 points to each subclasses.

Categories	Subclasses	Explanation
Architecture in the traditional village (100)	Time (10)	<i>It refers to the build time of the earliest existing building in the village.</i>
		<i>It refers to the build time of the traditional architectural complex in the village.</i>
	Scarcity (10)	<i>It refers to the preciousness and importance of the officially protected sites</i>
	Scale (20)	<i>It refers to the traditional buildings area.</i>
	Proportion (15)	<i>It refers to the ratio of traditional building area to the whole village construction land area.</i>
	Abundance (10)	<i>It refers to different types of building function.</i>
	Integrity (15)	<i>It refers to the preservation degree of the existing buildings and the surroundings.</i>
	Aesthetic value (12)	<i>It refers to the aesthetic value of the existing buildings in architectural style, structure, material, and decoration.</i>
Inheritance (10)	<i>It refers whether there are a lot of traditional construction technology still applied into the construction activities.</i>	
Site and layout of the traditional village	Time (5)	<i>It refers to the forming time of the village site.</i>
	Abundance (15)	<i>It refers to the varieties of the existing historic environment element in the village.</i>
	Integrity (30)	<i>It refers to the preservation degree of the village's traditional layout.</i>
	Scientific and	<i>It refers to the value in the science, culture, history and archaeology</i>

	cultural value (35)	<i>reflected from the village's site, layout planning and construction</i>
	Coordination (15)	<i>It refers to coordination degree of the relationship between the village and the surrounding natural environment.</i>
Intangible cultural heritage in the traditional village (100)	Scarcity (15)	<i>It refers to the preciousness and importance of the different intangible cultural heritage.</i>
	Richness (5)	<i>It refers to the sort quantity of the different intangible cultural heritage.</i>
	Inheritance (15)	<i>It refers to the lasting time of the intangible cultural heritage.</i>
	Scale (5)	<i>It refers to the activity scale of the intangible cultural heritage.</i>
	Inheritors (5)	<i>It refers whether there are inheritors of the intangible cultural heritage.</i>
	Living state (25)	<i>It refers to the fact of the inheritance situation of the intangible cultural heritage.</i>
	Relevance (30)	<i>It refers to the relevance between the inheritance activities and the surrounding environment.</i>

Table 1: The evaluation index system of traditional villages

After detailed field interview and research, we got 58 villages' scores. During the work time, we took photos and records for what we saw, such as the village layout, the traditional buildings and the intangible cultural heritage in the village. And finally we built a valuable record file database. The record contents contained the basic information of the village, domain environment, location and pattern information, traditional architecture, historical elements, intangible culture, literature, etc.

In the result of value score assessment, there were more than 50% villages which got more than 120 points, indicating traditional villages in Linhai city had high value and good basic resource condition in the traditional architecture, the site location culture, the intangible cultural heritage, and the outstanding traditional culture. And there were 18 villages which got more than 150 points, meaning they could be set as the regional key protective villages.

According to the score result, we has carried on the classification to the villages. In addition to the four villages which had been included in the list of Chinese Traditional Villages, traditional villages according to the grading results we divided the 54 villages into four levels as follows: The first grade tradition village refers to the score over 150 points and there were 14 villages included. The second grade tradition village refers to the score between 120 points and 150 points and there were 12 villages included. The third grade tradition village refers to the score between 90 points and 120 points and there were 22 villages included. The fourth grade tradition village refers to the score less than 90 points and there were 6 villages included.

There is no doubt that the 14 traditional village in the first grade were our recommendation list to the government for declaration of the Chinese Traditional Village. At this point, we finished the recommendation consulting study.

3.Threat Factors Analysis

According to the field survey result of villages in Linhai, we knew there were two kinds of threat factors, including human factors and natural factors. We also gave the different scores to different subclauses as follows.

Categories	Subclause	Detail article	Full score
Human factors	Empty-nested phenomenon	<i>the number of permanent residents</i>	20
		<i>the living situation in the existing buildings</i>	
	Modernization construction	<i>the new buildings in the village</i>	20
		<i>the preservation of traditional roads in the village</i>	
		<i>the sewage disposal facilities</i>	
		<i>the water facilities improvement</i>	
	Village management	<i>The preservation of the traditional buildings in the village</i>	20
		<i>the transformation of land property rights</i>	
		<i>the homogenization in the village landscape</i>	
		<i>the environmental contamination</i>	
	Tourism exploitation	<i>the new-built or renovated buildings for tourism trade</i>	20
		<i>the tourists' interference to the normal order in the village</i>	
Natural factors	Natural hazards	<i>geologic hazard</i>	20
		<i>climatic disaster</i>	
		<i>vegetation deterioration</i>	
Total			100

Table2: Index system of traditional village threat factors

After scoring the threat assessment for all the 54 villages in Linhai city, there were 25 villages in 46.3% getting scores over 40 points, which meant the integrality of these 25 villages were in a big threat status and more protection were needed. With further analysis of the terrain in Linhai city, we found that there were 10 villages in the hilly region which accounted for 34.5% of the whole hilly region village, 12 villages in the basin area which accounted for 63.2% of the whole basin area village, 3 villages in the plain region which accounted for 50% of the whole plain region village.

For another, there were 29 villages in 53.7% getting scores under 40 points, which meant they were in a good preservation status. Also with the further analysis of the terrain, we found that there were 19 villages in the hilly region which accounted for 65.5% of the whole hilly region village, 7 villages in the basin area which accounted for 36.8% of the whole basin area village, 3 villages in the plain region which accounted for 50% of the whole plain region village.

So we got the conclusion and thought that the villages in basin area were greatly influenced by more threats, villages in hilly region got less threat that was beneficial to protection. Empty-nested phenomenon and modernization construction were two main treat factors to the preservation of traditional villages. The villages with empty-nest phenomenon mostly distributed in the hill region and the total number is 12. The villages with modernization construction mostly distributed in the basin area and the total number is 11. The villages mainly treated by natural disasters were often located in the hilly area and the total number is 6.

4.Presentation Condition Assessment

The assessment analysis was focused on the traditional village resource condition and presentation potential, and through setting up corresponding assessment article and scoring them to formulate an assessment system.

The traditional village resource condition assessment aimed at the village domain resource and the surrounding environment resource. And the presentation potential aimed at the regional traffic condition, supporting facilities and market prospect. We set different score points on every assessment article.

<i>Presentation condition assessment</i>	<i>Traditional village resource condition assessment</i>	<i>Domain resource</i>	<i>Traditional buildings in the village</i>
			<i>Site and layout of the village</i>
			<i>Intangible cultural heritage and outstanding traditional culture</i>
	<i>Surrounding resource</i>	<i>quality condition</i>	
		<i>Species richness</i>	
	<i>Presentation potential assessment</i>	<i>Location and regional traffic condition</i>	<i>Transportation convenience degree</i>
			<i>Accessibility to the downtown</i>
			<i>Surrounding tourism resources</i>
		<i>Supporting facilities</i>	<i>Exploitation degree</i>
			<i>Central town</i>
<i>Facilities integrity</i>			
<i>Market prospect</i>	<i>Industrial structure</i>		

Table3: The evaluation system of the utilization of traditional villages

There were 29 traditional villages getting more than 40 points which accounted for about 53% of the village total, meaning the good presentation potential within these traditional villages. The rich resources inside and near the village, complete supporting facilities, convenient regional transportation, and good market condition determined the 29 villages could be set as a key display one in the Linhai area.

5. Type Analysis for Traditional Villages

According to cultural heritage features and resource characteristics in traditional villages, they

can be classified into the following seven categories roughly.

(1) *With Outstanding Landmark Value*. Villages of this type have a certain number of culture relic protection sites with the rank, a rich variety of landmarks, antique and favorably conserved buildings and building protection & utilization measures; or, it refers to villages which are provided with favorably conserved traditional buildings of high utilization and exquisite workmanship, and are able to serve as the typical representative of historical buildings in Linhai City.

(2) *With Traditional Features*. For this type of villages, traditional buildings occupy a higher proportion, are conserved in a favorable manner in terms of quality and built before the Qing Dynasty; in addition, not only is its traditional workmanship has local typicality, but site selection layout of them is prominent and the integral pattern is preserved in a good condition.

(3) *With Natural Landscape*. It refers to plentiful natural scenery tourist resources surrounding the village; landscape related to such villages is beautiful and provided with featured natural sceneries or natural sceneries with legendary stories.

(4) *With the Red Culture*. In villages of this type, red revolutionary memorial sites and relics are preserved together with people honored because of the red revolution; additionally, they have fixed dates and places of commemoration, and good Red publicity campaigns.

(5) *With Folk Culture*. In the village of this type, folk culture activities are more active, have been inherited continuously for a long time; there are also intangible cultural heritage and excellent traditional culture inheritance activities with a large size, a great number of participants, definite inheritors and exhibition sites for folk culture activities.

(6) *With Historical Culture*. The village of this type has been formed ages ago; it inherits historical and cultural celebrities as well as relevant legends; in addition to fixed worship sites and abundant historic environment elements, sacrifice beliefs of later generations are inherited and continued in a good condition.

(7) *With Manufacturing Technique*. In the village of this type, there are all kinds of manufacturing techniques and producing activities with typical regional features; moreover, they have certain popularity and influences as well as favorable continuity. As for sales status of finished products which have rarity, they take a certain percentage in local economy.

Type evaluation is performed for every village and they are denoted by wind-rose diagrams for the convenience of local government to grasp the type of traditional villages under their jurisdictions. Besides, references are also provided for village development and utilization in the future.

6. Protection Strategy Suggestions

As a consulting project of resource censor and evaluation, only general strategies can be currently presented below for the follow-up village protection and utilization activities. By contrast, for protection and utilization of each village, masses of archival data and literatures are left behind to serve as references for the government to make further decisions. We are

willing to act as a long-term consulting agency to observe and serve the coordinated development of urban and rural areas under the jurisdiction of Linhai.

The integral protection and utilization strategies are described as follows.

Overall Protection; Development Considered. Based on the protection of traditional resources in villages, traditional village residential environment should be improved.

Combination of Protection and Utilization. Traditional villages serve as sites for the production life of villagers in the first place; protection of them must be established on the basis of respecting production method and life style in traditional villages, to ensure that the active state of their traditional buildings can be continued.

Adjust Measures to Local Conditions; Gear to Actual Circumstances. After peculiarity of traditional villages is studied and analyzed, the targeted village protection scheme should be put forward. Various protective measures that are taken for traditional buildings should inherit local traditions, and adopt traditional craft and materials to guarantee the continuity of regional characteristics.

A Principle of Government Guidance and Villagers as Participants. As the main body of a traditional village, local villagers inherit the traditional rural culture in practice and they are part of the traditional village. Therefore, opinions from villagers should be taken into full consideration when relevant planning, protective schemes and action plans are formulated, not only to ensure their inheritance of production and life modes, but to respect the original living habits.

Protection Based on Level and Classification. Ancient villages are evaluated to be national, provincial, and city and county respectively; some are protected specifically as key points according to their levels and a system of ancient village directory is also set up.

7.The Case of Sheng Keng Village

From the beginning of this project, we hope that our work will not only be able to exert positive efforts of traditional villages selection for Linhai, but also continues to guide the specific construction of some village in the subsequent. For example, the managers of Sheng Keng village often continue to consultation on specific issues. Big as whether to relocate residents of the Central plains in order to concentrate on tourism development, small as whether to rebuilt embankments, and so on. The most interesting problem is how to draw some investors the bottom line of the building renovation program in Sheng Keng village.

In order to analyze these problems, first of all, we located Sheng Keng village in our database. In our assessment system, Sheng Keng village which located in hilly areas is one of the best resources in the best traditional villages. The possible damaging factors include threat of modernization, future tourist development, as well as natural disasters such as flood, landslides. However, at present, the threats didn't significantly affect the village.

With excellent resource conditions and traffic conditions, Sheng Keng village score a high point in the assessment of utilization potential, belonging to the 8 best villages. While in the assessment of the type of village, Sheng Keng village is a typical traditional style village.

In this case, we should not only encourage the display and use of the village, but also strictly protect the village's overall style and traditional buildings, living environment, as well as intangible cultural heritage and so on.

Taking into account the living continuation of village culture, we naturally didn't recommend a large number of indigenous people to move out. Instead, we suggest government improve the living conditions of aboriginal people and take appropriate mechanism to ensure the villagers could benefit from the future development of tourism to make up their sacrifice of resisting modernization and keeping the ancient village style.

To answer the second question, we made a simple assessment of the flood control function of the existing river in the village. According to the results, we advised them to make natural slope instead of cement hard embankment in original scheme. we also hoped that the government should learn from the ancients and the natural when carrying out the base infrastructure construction in the village. Of course, in the guarantee under the premise of the villagers' basic survival security.

We talked with Sheng Keng village investors -- a couple from the provincial capital Hangzhou, understanding their needs and construction will, and to come to the design drawings. Through communication, we know that they are tired of the pressure of life in big cities, hoped to build ideal B&B in the country, enjoying a good and healthy life.

This represents the idea of many young people. And running a B&B in the country does not cost too much. Realistically speaking, a lot of traditional villages not far from the city will face more and more new residents in the future. Rejuvenation is a good thing. We support their ideas, and guide them to understand the basic concept of protection of traditional villages. Finally, we persuaded them to give up some of the original design scheme which has too modern elements, and try to ensure them respect for the style of the villages and buildings.



Figure 5: Photos of the traditional houses after transformation in Sheng Keng village (by Shui Cao)

We give them some cases of traditional villages transformation that are good to follow,

meanwhile sharing the latest protection ideas of traditional villages and the cases of house transformation. These cases and information imperceptibly influence on their activities. for example, they once had a plan to transform the run-down ancestral hall of the village into a bar. Now they totally gave up the plan. Instead, they gradually fell in love with the rural original ecology life. They enjoyed to collect histories of the village, respecting the traditions and appreciating the beauty of the villages from the deep heart.

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References

- [1] Jianming ZHOU, (2014), Protection and Development of Traditional Chinese Villages, Beijing: China Architecture & Building Press.
- [2] Jicai FENG, (2014), Filing and Investigation Model for Traditional Chinese Villages, Beijing: Culture and Art Publishing House.
- [3] Yuncai WANG, Huancheng GUO, Li YANG, (2006), "Discussion on Value Evaluation and Sustainable Utilization Model of Traditional Villages in Suburban District of Beijing—illustrated by the investigation and research on traditional villages in Mentougou district of Beijing", Scientia Geographica Sinica, No.6, pp:735-742
- [4] Deying LUO, (2014), "On Pedigree Establishment in Traditional Chinese Villages", World Architecture, pp:104-107, No 6, pp:118.

middle cabin for eating and resting and the back cabin as kitchen as well as toilet. Boat dwellers with good economic conditions built their main cabin as a small wooden house, with roofs, windows and practical external decorations; but the poor fishermen have to arrange all family members including elderly and children in only one shabby houseboat. The boat dwellers have formed a unique form of settlement pattern by adapting the living condition on water, a fishing based industry and the corresponding cultural customs have also been fixed from then on.

For thousands of years, the boat dwellers have experienced from living on water to Amphibious living and then settling ashore, so the settlement patterns and characteristics have been evolved correspondingly. After entering the 21st century, an increasing number of boat dwellers move ashore actively or passively under the background of rapid urbanization. Through an analysis of different modes of this phenomenon, this paper focus on discussing explicit and implicit problems about the extinction of traditional settlement culture in passive urbanization of boat dwellers, and put forward some methods for better inheritance of traditional settlement.

2. Historical Evolution of Traditional Boat Dwellers' Settlements

The settlement is a relatively independent geographical space which is composed of a group of people with common social activities, relations and way of life(Yu, 2001). Settlement does not only contains the natural environment and artificial environment after the reform of people, but also includes a variety of relationships between the residents and the complex economic and cultural phenomena occurring within the environment(Zhang, 2003). Settlement in the history will continue to develop and update, so as to form a unique context.

The ancient boat dwellers had no choice but boat living due to the limited conditions. For better surviving environment, the location of settlement was generally set in ports or along the riverbank on convenient and safe parking conditions, and the forms of the settlement are of concentration-type or dispersion-type. The inland water settlements are mainly of the dispersion-type which occupy convenient transportation locations of water in town or in the market place, becoming important places for material exchanges of residents both on water and ashore. Coastal water settlements are mainly of the concentration-type: household boats parked directly in the harbor after fishing. Their position are relatively fixed and connected by wood blocks, which is convenient for mutual aid and conducive to resist the tides and storm(Figure 1 and 2).



Figure 1(left): concentration-type settlement of boat dwellers on Pearl River

Figure 2(right): dispersion-type settlement of boat dwellers in Sanshui

Sources: Luo Linhu Studio

During the Northern and Southern Dynasties (A.D.439) to the Ming Dynasty (A.D.1644), the boat dwellers in Guangdong and Guangxi have started to build free-style shacks and water column connected with their boat at the edge of water surface to strike back serious natural disasters, which became a significant transitional form for them to change from boat dwelling to settling ashore(Wu and Situ, 2011). Shacks were generally built by the sea or river land, using bamboo and straw as walls and roof; the indoor layout was as simple as the boat(Figure 3).Water column is the the grass huts supported by wooden pillars in the water(Figure 4). When the strong typhoon or flood attack boat dwellers' settlements, such humble shacks and water column are often destroyed or severely damaged. Therefore, the seeking for a more stable residence has become an inevitable trend for boat dwellers(Xu, 2012).



Figure 3(left): the shacks of boat dwellers in Shatian, Guangzhou before liberation

Sources: Government of Shatian County

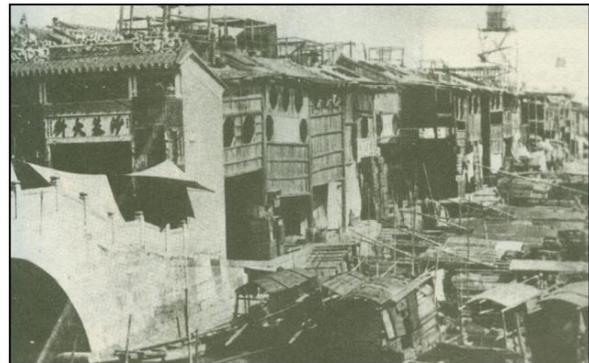


Figure 4(right):water column in western suburb of Guangzhou in P.R.China period

Sources: Luo Linhu Studio

After hundreds of years' painstaking working, the boat dwellers gradually gathered to form little villages in the coastal and riparian area to live a semi-farming and semi-fishing life. In the early 20th century, boat dwellers in Lisha Island of Fujian started the foreshore reclamation: at first there was a vast expanse of water and the only beach can hardly grow crops due to salinization, after the boat dwellers' land reclamation and arrangement of fishing nets, the former wasteland became waterfront village for amphibious residents.

3. Evolution of Traditional Boat Dwellers' Settlements in the Process of Urbanization

Generally speaking, before China's entering the urbanization process, the settlements of boat dwellers on shore were in form of clutter; layout of humble shacks and water column was messy and remote; living conditions were still harsh and under risk of disasters.

After the founding of P.R.China, the modern urbanization process began. *The Land Reform Movement* in the 1950s historically insured the boat dwellers to obtain the access to land for building. Local governments have introduced policies to abolish the discrimination to boat dwellers and arrange them to living ashore in newly-planned villages of the coastal area. At this stage, due to the insufficient urban development, the gap between urban and rural areas is not huge enough to generate the thrust pushing population from rural to urban, so the vast majority of boat dwellers remained living on water or amphibious. There still exist settlements of concentration-type or dispersion-type. At the same time, the immovable household boats poured by cement appeared: beds, cabinets and other modern furniture such as liquefied petroleum gas stoves were all equipped. They functioned similarly as the land house except

for fixing on water(Figure 5). The impact of winds and waves were weakened, and thus the life stability was enhanced.



Figure 5: the household boat poured by cement in Guangdong
Sources: Li Yuxiang's photograph

After the *Reform and Open Policy* in 1978, with the rapid development of China's urbanization process, the labor-intensive industry of urban area has generated strong demand for rural labors, and the boat dwellers no longer need to all stay in the boat for fishery operations due to the improvement of efficiency, which has led some boat dwellers especially the young people to work ashore for more incomes. Unified planning of fishermen village has become the mainstream form of settlement during this period: the architectural style was mainly 2-3 storey cottage in unity. For example, in Xincun county of Hainan province, the house boat dwellers held after settling ashore was generally referred to as "long house" (Figure 6): as high as two to three layers, the house has two lobbies at two ends and the middle strip is separated into several small rooms, leaving a one-meter-wide corridor on the left(Liu, 2011). This is because there usually lived several households in just one boat when the residents were on the water, so the government divided the land to boat dwellers as the pattern of long blocks. Each family can build and separate their house according to the number of their offspring. Several rows of the long house seem just like several three-layers ships getting close to each other, becoming the unique symbolic for boat dwellers and from the psychological significance, acting as the reconstruction of their lives on water.

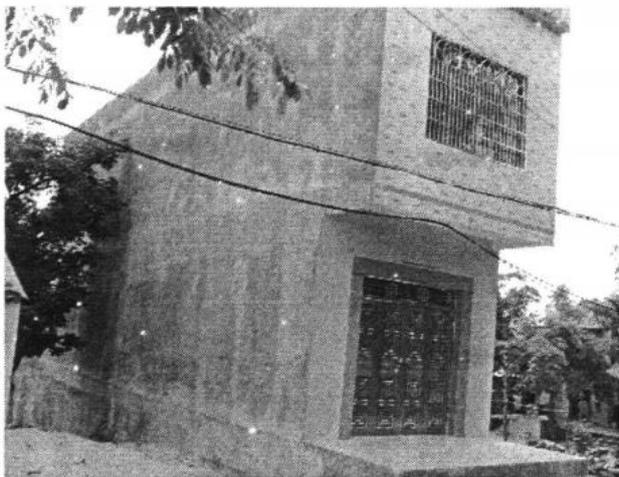


Figure 6: the "long house" built by boat dwellers after settling on land in Hainan Province
Sources: Liu, L.(2011) *Fate Being Bound by Water*, Minzu University of China.

Since the 1990s, local governments in southeast China have strengthened restrictions on the administration of coastal boats as well as strongly encouraging boat dwellers to settle ashore for the benefit of urban landscape and public health and soon the boats on water were almost extinct(Li, 2009). At this time, the living standard and educational quality of the boat dwellers have been greatly improved compared with the past. After living ashore, the boat dwellers took the jobs like workers, businessmen, farmers or still fishermen engaged in fishing, aquaculture, water transport, dredging etc. Also, government sometimes provided employment support and economic subsidy for them. Urbanization has promoted land prices, and thus the fishermen villages government provided are multi-storey buildings or high-rise buildings in unified styles for saving the expenditure.

But almost at the same time, the land prices' soaring again has caused the boat dwellers to face the second relocation even if they have just settled down not long ago. Taking Guangzhou as an example, in 1994, development of Ersha Island started; this area has soon become a symbol of wealth and power and aroused high attentions of developers. After being the most expensive place in Guangzhou, the fishermen aboriginals living here and their boats were forced to move away again from where they just built a common memory of living. The boat dwellers are always giving way to the urbanization, always living at the edge of the city from past to now.

No matter settling ashore actively or passively under the guidance of government policy, the boat dwellers still belong to the vulnerable groups due to the forced change of life style and constraints of working mode. How to improve the living standard of them and inherit the traditional culture at the same time under rapid economic development and urbanization process has become a severe problem to be solved.

4. Modes and Case Studies of the Boat Dwellers' Setting Ashore

4.1 The Mode of Passive Relocation—Boat Dwellers in Lisha Island, Guangdong(Figure 7)



Figure 7: Transformation of the settlement texture from 2003 to 2013 in Lisha island
Sources: Google Earth

The Lisha island is surrounded by the sea and was formed by the the foreshore reclamation. For many years, the traffic is inconvenient, so every household had to keep the boat for transportation. New houses are built on land, while the old water column and shacks were near the water, what was worth mentioning is that several elderly residents still live on the boat for years. After *Humen Port Planning's* being published in 2003, Lisha island has been positioned as fine chemical industry park and high-tech industrial agglomeration area instead of the former ecological tourism village, causing a total of 1.1 million people to migrate and relocate in high-rise buildings. Under the background of scaled petrochemical base, the original ecological rural landscapes are disappearing(Figure 8): large banana plantation, sugar cane forest and fish pond are replaced by factories and storage tanks. The traditional

local emotions and confusions about the unknown future make aboriginals want to stay, however, the potential security and health problems caused by chemical industries have become the main anxiety cause for people's leaving.



Figure 8: Water column in the background of chemical industry park

Sources: <http://blog.163.com/dgcfdc@126/blog/static/106150519201071111590222/>

4.2 The Mode of Leaving a “Culture Sample”——Boat Dwellers in Shapowei Bay, Fujian



Figure 9: Transformation of the settlement texture from 2003 to 2015 in Shapowei Bay

Sources: Google Earth

The Shapowei Bay was used as dock for fishing boats at the very beginning, but after the Yanwu Bridge was opened to traffic, the bay has lost its original function ever. Besides, the primitive living conditions of boat dwellers have caused a number of environmental pollution and fire hazards. Since June of 2015, Shapowei Bay has been closed for remediation with the planning suggesting there will be no more reserved living boat, leaving only a few boats for entertainment. As a result, the historic traces boat dwellers can leave here are just several marine culture antiques and videos displayed in little museum. It will be such hard to appreciate the original waterfront symbiotic multicultural scene again(Figure 9).

4.3 The Mode of Exclusion Zones——Boat Dwellers in Xiapu, Fujian

Xiapu is located in the eastern part of South China Sea, and the winding coastline is an advantaged condition for fishing culture. Under the support of the local government, part of the sea was designated as the exclusive breeding area; countless cages for fish, bamboo rafts and boathouses are connected together. Such fishing villages on the sea have existed for more than 20 years like a low-rise city on land. Contiguous colorful boats act like single buildings and fishing vessels and waterway act as streets. The boat dwellers also obtain houses on land, but they are more used to living on the sea because their main industry is fishing and breeding. Especially, this unique style of life and production has generated the heat of tourism: many tourists are attracted to be here to experience the charming scenery and the living in boat dwellers' style(Figure 10).

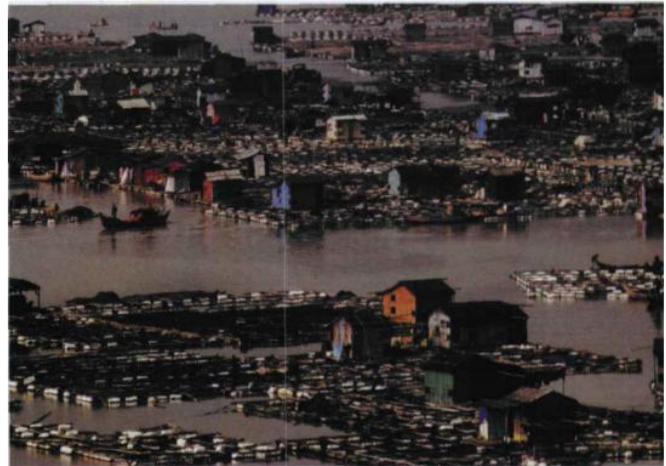


Figure 10: Settlement texture and scenery of Xiapu
Sources: Google Earth and Shan Huajie's photograph

4.4 The Mode of Folk Culture Village Combined with Tourism——Boat Dwellers in Waisha Island, Guangxi



Figure 11: Transformation of the settlement texture from 2003 to 2015 in Waisha island
Sources: Google Earth



Figure 12: Wierd European architectural style with no connections with Chinese traditional culture in Waisha island
Sources: Baidu Photograph

Waisha Island is at the north of Beihai City of Guangxi, only dozens of meters away from the land. The bay of Waisha island has been inhabited by the local boat dwellers until 1950s(Figure 11). Later, some bamboo-made high-feet shacks were also built by aboriginals in the nearby beach. In recent years, the island has been developed and reconstructed by huge amount of funds, lots of folk culture villages rose straight from the ground. However, the operations of culture villages lacked overall planning, with only seafood stands offering same

foods and drinks and the shore resorts providing accommodations. Even the resorts are of South Asian and European styles(Figure 12), which shows no connection with the traditional folk culture of boat dwellers and thus lead a complete loss of the inheritance about the characteristics of traditional settlements as well as the historic heritage.

5. The Plight Faced with Boat Dwellers After Setting Ashore

5.1 the Social Economic Aspect

5.1.1 Unsustainable Industrial Structures

Under the background of the damage of marine ecological, depletion of fishery resources and the rapid development of transportation industry, it seems like the collapse of boat dwellers' fishing and boating is inevitable. Due to the primitive civilization level and hesitant ways of doing things, most boat dwellers find it difficult to adapt to the complex changes in current economic situations. However, even they can hardly make ends meet, many elderly boat dwellers still choose continuing their fishery related work; while educated young people realized they can not rely on the sea all the time, so they managed to turn to low-technology-level works such as porters, the rickshaw pullers, fishmongers and so on. They have given up their unique cultural characteristics in order to take the expediency of getting rid of marginalization(Wu, 2010). In such situation, the industrial structure of boat dwellers is very fragile and unsustainable: the tertiary industry shares are very high, but mainly are the low-end service jobs. Relatively, the secondary industry which can create jobs just accounted for a low ratio, which is very unfavorable for the whole group's development. Take Xiapu mentioned above as an example, the proportion of the three industry structure is 28.6:31.9:39.5 in the year 2014. If there is no improvement about the industrial structure, the people's living standards are difficult to be raised.

5.1.2 The Economic and Social Problems Raised by Passive Urbanization of the Boat Dwellers

Passive urbanization refers to the phenomenon that although the residents do not want to be urbanized or haven't yet prepared, they are forced to abandon the mode of agricultural production and rural lifestyle to be integrated into the city due to various objective reasons(Zhang and Gu, 2006). In most cases, the relocation behavior of boat dwellers is the result of land expropriation or landscape improvement guidance, those aboriginals who are adapted to the lives on water and resist relocation have permanently lost the quiet homeland.

Such phenomena often happen in the process of relocation: the compensation standard is not appropriate or the resettlement houses are even not provided; urban social security system is not sound; the difficulty for government to ensure the re-employment problems of boat dwellers, which all do great harm of their benefits. Apart from the institutional reasons, many personal factors also add to the life difficulties: due to the unemployment, income has not increased while the boat dwellers' cost of living has been a rapid rise; part of the water residents hold a fear, rejection or even offensive attitude towards the land society, and thus they have problems to integrate into the society in short term. It might be even worse when these people gradually lose the interest in regular work, which will trigger a series of social problems afterwards.

5.2 *the Urban Space Aspect*

5.2.1 *The Relocation Settlements with Homogenization and Ruralisation*

The resettlement houses for boat dwellers on land are mostly built in recent ten years, dozens of high-rise buildings have sprung up in cheap lands; the housing style is doomed to be stereotyped and boring due to the high construction speed: similar elements piled up to the buildings to form a large scaled apathetic settlement, with homogenization and without beauty.

At the same time, the boat dwellers did not really realize the goal of settling into the lives on land: most of them are not used to the elevator in high-rise buildings and still look forward to a countryside lifestyle. The Lisha boat dwellers as mentioned above, developed the open space under the fence of the residential side gate into farmland planting fruits, which adds a piece of dramatic rural landscape in urban area.

5.2.2 *The Extinction of the Traditional Settlement Characteristics and the Group Spirits*

The majority of the boat dwellers especially the younger generations will try to fit in with the so-called "mainstream culture" and abandon their original cultural identities after settling into nearby cities. Unique waterfront settlements and their traditional clan temples are gradually disappearing; the diversified cultures like "salty water songs", costumes, foods, dances, special fishing methods of boat dwellers are also on the verge of extinction, which will certainly be a regrettable loss for the regional history and culture.

6. Prospects : The Strategies of the Inheritance of Traditional Boat Dwellers' Settlements in Urbanization Process

Under the rapid development of current economy and the process of new-type urbanization, the key point to increase the living standard of boat dwellers as well as inherit their unique cultures proves to be the cooperation of government, cultural industry investors and aboriginals.

The government should try to improve the relocation subsidy policy, at least ensuring the supply of resettlement housing for boat dwellers; secondly, the issues of port environmental protection and education popularization which are conducive to sustainable development should be put on the agenda. In addition, more attentions should be paid to the tourism major in local colleges and universities especially the curriculum of folk customs and culture contents, to train qualified professionals in folk tourism and heritage preservation as well as avoiding the vulgarization and marginalization about the water culture(Zhang and Zhang, 2008). The most important point is the boat dwellers should raise the sense of innovation to attract high added value investment such as aquatic product processing and custom tourism to achieve the sustainable development of the industrial structure and better traditional cultural inheritance.

For boat dwellers, the most important is to recognize the position and adapt to the rapid development of economy as soon as possible in cultural conflict. It should be encouraged for residents to attend various innovative industry groups under the guidance of the government, and their main goal is to protect and then carrying forward the traditional culture such as the operations of authentic folk villages and special aquatic products processing and export.

Hopefully, the above strategies can realize the inheritance of the cultural context and explore the possibility of unique new forms of settlements lived by traditional boat dwellers under the background of urbanization in the new era.

References

- Li, J.M.(2009) "Origin and Changes of Boat Dwellers in Eastern Fujian", Journal of Ningde Normal University, 14(2):38-44.
- Liu, L.(2011) Fate Being Bound by Water, Minzu University of China.
- Luo, X.(1978) Sources and Culture of Ancient Yue Ethnic Group, Chinese books Committee.
- Wu, R.L.(2010) The Boat Dwellers, Rickshaw Pullers and Villages in Guangzhou of the Republic of China, Guangdong People's Press.
- Wu, S.T.and Situ, S.J(2011) "Study on the Cultural and Architectural Landscape of Boat Dwellers in Southern China", Tropical Geography, 31(5):514-520.
- Xu, Z.Y.(2012) "The Inheritance and Protection of Traditional Culture in Modern Society -- Taking Culture of Boat Dwellers as an Example", Journal of Zhangzhou Normal University, 18(1):128-133.
- Yu, Y.(2001) Study on the Type of Architecture in the Southeast of China, China Building Industry Press.
- Zhang, F.(2003) "Research on Chinese Traditional Settlement", Huazhong Architecture, 21(4):98-99.
- Zhang, G.R.and Gu, C.L.(2006) "Passive Urbanization in Rapid Urbanization", Urban Planning, 29(5):48-54.
- Zhang, K.C.and Zhang, G.L.(2008) "Study on the Transformation of Guangdong Coastal Fisherman Settlement", Economics and Management Science of China, 11(5):143-145.

Rural Development and Modernization of Villages in Tzaneen (Limpopo) Local Municipality: An Equivocal Dilemma

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Abstract Possible impacts of the rural development interventions in villages within the Tzaneen local municipality, Limpopo province of South Africa have been discussed in terms of the perceived dilemma between the slow paced modernization of the village and to conserve the peaceful, greener characteristic of a rural village where local indigenous traditions, customs, culture and values are conserved and maintained intact. Out of 125 villages within the local municipality, 42 are under Hosi Mhlaba of the Nkuna tribe where most of the respondents from this study are from. Structured questionnaires were distributed to freely willing participants while researcher's observation has been used in the triangulation of the findings. Findings show that local community needs based development would be the appropriate model to use as development initiator for a sustainable development intervention.

1. Introduction

In line with the South African National development plan (NDP) 2030, efforts are made to eliminate poverty and reduce inequality by 2030. The promotion of the citizenry, to favor development and accountability are among the main priorities. It is expected that rural development brings increased employment, opportunities for growth through education, vocational training, and work experience, health and nutrition, public transport and access to information. Communities living in rural areas are (externally) perceived experiencing hardship; this in comparison to the urban comfort. Transportation, running water, sanitation, and access to schooling and health facility are often challenging. Access to and utilisation level of energy and banking instruments usage are often used among the assessing parameters of the level of development. Easy access to villages, rapid electrification and rapid introduction of modern commercial instruments and facility eg shopping malls, mushrooming of small and medium businesses inside the villages and along the main and tared roads, seem to contribute to ozone burning in the area, contributing to a rapid climate change, leading to a degradation of the villages natural green landscape in the vicinity of the richer rural Limpopo province natural biodiversity heavens like greater Tzaneen district municipality

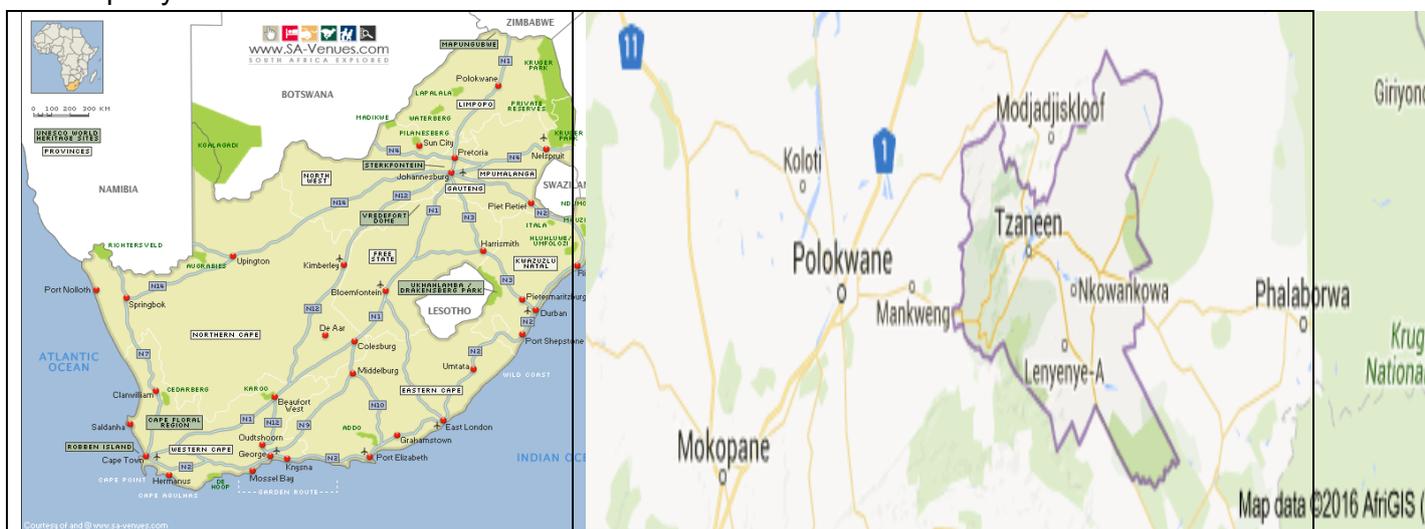


Figure 1. Map of South Africa showing the Polokwane in Limpopo (Google map, 2016).

Figure 2: Map showing Tzaneen local municipality, in Limpopo province (Google map, 2016)

2. Background and terminology

Complementary to the habit discontinuity hypothesis (Verplaken and Roy, 2016) supporting the effectiveness of behaviour change intervention when life course is changed, the trend to use technology for rural development, in addition to bringing in new adapted behavioural set as by Walker et al., (2007), leads to the obvious interrogation: To what extent a village should remain a village or alternatively to what extent a village should be transformed into a “location”, a township, a city or a town? Do we still need to keep and maintain the tranquillising and attracting mind-cooling characteristics of the villages or should we transform the latter into multiple and sporadic urban spots joined by high speed roads, contributing to the rapid formation of mega-cities in the heart of Southern African hemisphere?

2.1. Adequacy of terminology used

In agreement with Jingzhong et al., (2010) it is not easy to capture all the aspects rightly expressing the concept of rural development in one sentence. Many different definitions have been suggested where key driving ideas associate rural development with a “strategy” (Chambers, 1983), a “process” (Singh, 1999) or a concept supported and strengthened by sustainability aspect (Chhibbert et al., 1997). The underlying intention of “development” is two- fold: the promotion of economic growth and the overcoming of poverty (Bernstein, 2005). Although development drivers are conducted from the exterior of the system ie community the intentions of development interventions, including the means it employs are captured in the traditional family concept of the indigenous communities. This is close to the Marxist critique of economy and society while it also includes modernization which stands that growth and capitalist led development were the solution to poverty. Here development was equivalent to growth and industrialization. In this contribution, rural development concept would be understood as a set of efforts or interventions where technology, skills and experiences are used to better the life of the community living in a rural environment. A village is a good example of such a rural environment. In general, rural environment favors agricultural activities. Growth led agricultural and industrial development has a significant social, economic and environmental requirements. Although it is a general perception that social development is expected to be planned and managed by state (Bernstein, 2005), due to globalization some development interventions may be initiated and supported by large transitional corporations (TNC’s) or non-government organizations (NGO’s). rural development is seen as urbanization of villages and a rapid change in their economics landscape , and markets and trade are developed. A village would be then defined as per Wikipedia as a clustered human settlement or community with a population ranging from a few hundred to a few thousand. As defined in the dictionaries, a municipality is either a local area with its own government or an elected local government body having a corporate status and limited self- governance rights or an urban administrative division (wikepedia, business dictionary and your dictionary.com.). Local Tzaneen local municipality is located in the Mopani district municipality of Limpopo province, South Africa.

Table 1. Demographic characteristics of Greater Tzaneen local municipality, 2011 (Statistics South Africa).

Population	390095
Age band	
Population under 15	31.80%
Population 15 to 64	62.40%
Population over 65	5.70%
Dependency ratio per 100 (15-64)	60.10%
Gender ratio: Males per 100 females	87.10%
Population growth per annum	0.38%
Labor market	
Unemployment rate	36.70%
Youth unemployment rate 15-34	48.50%
Education (aged 20+)	
No schooling	18.70%
Higher education	8.70%
Matric	21.80%
House hold dynamics	
Households	108.926
Average household size	3.50
Female headed households	47.80%
Formal dwellings	92.40%
House owned	57.30%
House hold services	
Flush toilet connected sewage	15.30%
Weekly refuse removal	14.70%
Piped water inside dwelling	16.10%
Electricity for lighting	86.20%

2.2. Rural development factors and influences

Among factors depicting the level of industrialization, development or modernization is quantity of energy consumed and the quality of water used. As confirmed by the census of 2011 electricity from the grid is available. More than 86% of the population in the area use electricity for lighting. Dohery (2011) reported that, Figure 3, the source of energy mix used by local rural communities in the Limpopo province to cook is composed of fire wood, electricity, paraffin and gas bottle. In a period of 8 years between 2001 and 2009 more than 10% decrease has been noticed in the use of fire wood while a clear increase more than 20% of the use paraffin is shown. While maybe the CO₂ emission from burning the fire wood is reduced, the smell of paraffin, the danger of a higher temperature developed by paraffin and the risk that children confuse paraffin with water and drink it has been increased.

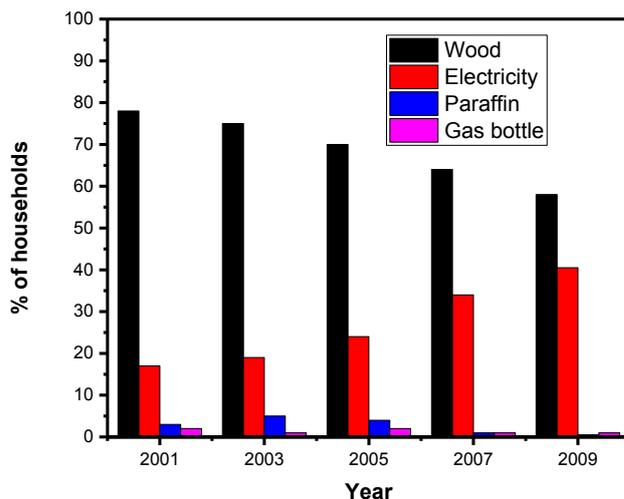


Figure 3. Power to cook as per fuel mix between 2001 and 2009 (Agincourt 2011) showing a decrease in the use of fire wood and an increase in the use of paraffin.

Hardship in villages force the youth to emigrate from their original villages. Some they go to neighboring villages perceived to be greener pasture while other go to other provinces or big cities like Polokwane, Palaborwa or Gauteng (Pretoria and Johannesburg). Temporary and permanent migration is observed. The migration changes the household composition and sometimes status of life style

3. Concept of Development

Although development of villages has been seen introducing inherent concepts of sustainable livelihood, use of information and communication technologies, small and cooperative farming has been encouraged and supported by state with an emphasis on poverty alleviation and job creation in rural areas, eradication etc...training of population to ensure the acceptability of concepts and related technologies has been a challenge. At a time, questions are asked on whether to maintain the natural peaceful and green site of the village or bring in modernization with climate change and pollution? To what extent one should modernize a village? Who benefit from it? is it the prestige of the state or the essential needs of the rural population? While economic growth might be a natural corollaries of the development intervention the consequent climate change and its impact on the environment have to be mitigated. The poor of the rural villages were not necessary prepared to face the above. This paper, emanating from the community engagement efforts done in the Limpopo province by the presenter, will discuss the observed and experienced dilemma faced with by development agents during the whole cycle of the rural development process. From the identification of needs for a specific intervention, to its implementation via the planning, stake holders engagement, socio-economic and environmental impact assessment, feasibility study, and the hand over to the community followed by the assessment of the impact of the intervention done. In agreement with Meijer et al., (2015), as there is a close relationship between attitude and behaviour, how the culture of the local community, their costumes and traditions are affected or impacted on by the success of the development intervention? Although the work is on rural communities around the greater Tzaneen, one agrees that findings here from may be generalised in all rural community based villages in South Africa.

4. Methodology and research instruments

This is a non-participative piece of research work (where the researcher is not a respondent). Using qualitative approach, structured questionnaires were distributed to 17 respondents with a 100% collection back. Observation was used for triangulation purposes. The sample was composed of the group of the population/community who attended the regular Sunday community gathering on the 19 June 2016, thus it was incidentally randomly selected. An expected limitation in the design of the research is that as the targeted community lives in less than an hour drive to Tzaneen town, they are exposed to town./city trend of life; hence the strict originality of the rural life might have been already tempered with by this regular exposure to city life.

5. Findings and outcomes

While development in villages leads to economic and social growth with modernization and industrialization, it comes with some prices to pay. The change brought by external interventions to a natural environment, leads to original natural biodiversity modification and loss. In the event of agricultural businesses have been developed, the use of pesticide and chemical fertilizers lead to water and air pollution and possible climate change and floods and droughts. Intensification of industrial agriculture leads to the production of high level of agricultural waste.

The study was conducted on a sample of respondents from the 42 villages under the Hosi Mhlaba (Tzaneen) from the Nkuna tribe. The sample was male dominated as per the Figure 1. The questionnaires were distributed on a Sunday during the regular community gathering. This shows that the management of the community affaires is mainly done by males of the community. The views and opinions collected from this study will unfortunately biased by the male dominance.

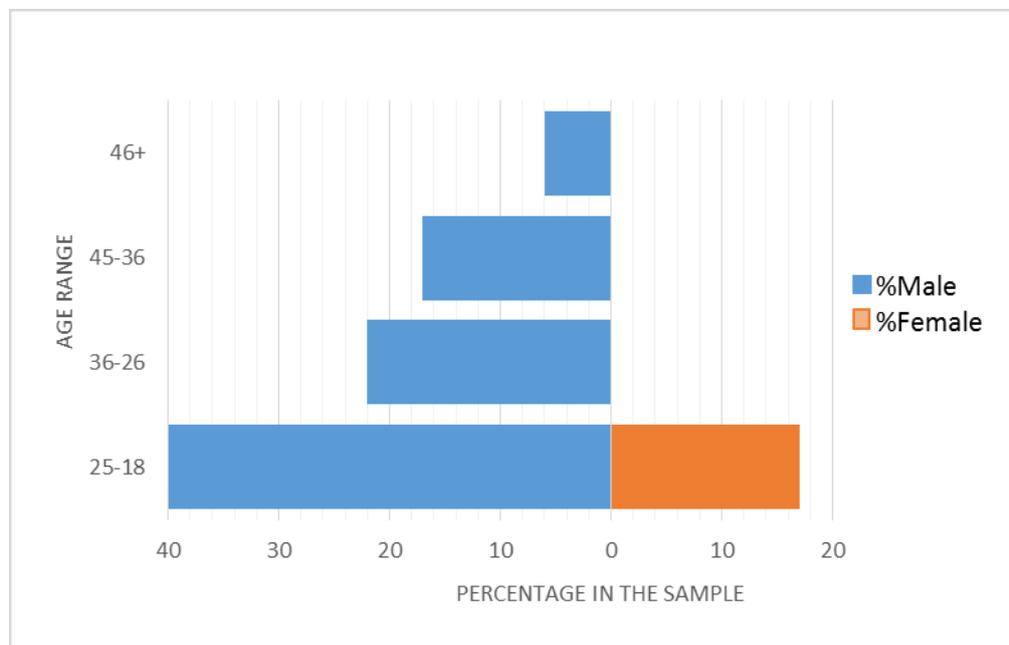


Figure 4: Population pyramid. A strong domination of male in the community gatherings is observed.

The age, gender and education levels of the respondents were among background criteria gauged. Figure 5 shows the distribution of education span in the sample used.

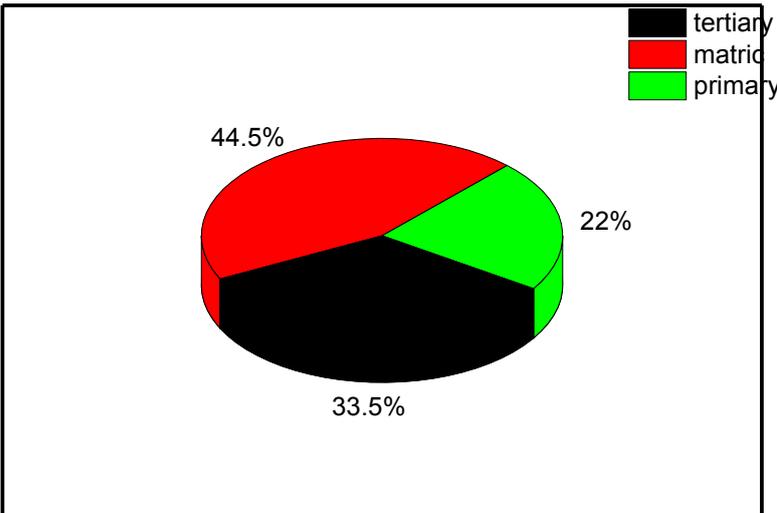


Figure 5.: Education level of responds. It is noticed that 44.5 % of the responded have a high school leaving certificate ie matric. They are educated. Only 22 % of respondents have a lower matric qualification.

The expectation of respondents in terms of what the village development should bring to the quality of life of the community and to the traditional culture was assessed with respect to their education level. It was noticed that an overwhelming 61% (distributed as 36.4% tertiary, 45.5% matric and 18.1% below matric) was of the opinion that village development has positive impact on their culture while 28% (20% from tertiary, 40% from matric and 40% below matric) saw that village development negatively impacted on their culture, and 5.5 % has a balanced opinion (ie both effect) and 5.5 has expressed no opinion. It is interesting to note the high number of respondents with negative opinion of village development impact on the culture in the education range matric and below matric. It seems that education here has a big role to play.

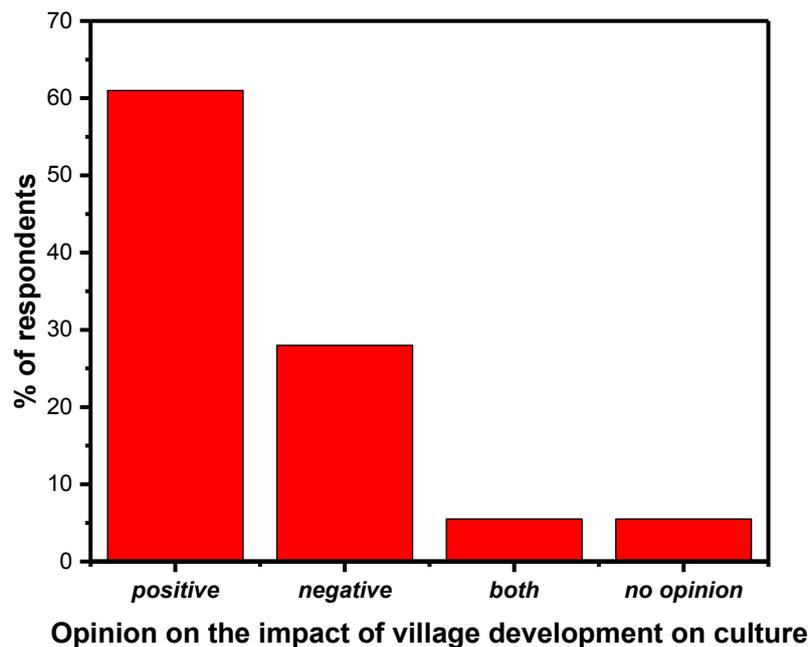


Figure 6: Opinion on the possible impact of village development on local traditions and culture.

It is here seen that opening up to new information and communication technology, infrastructure (road, school, hospitals) and transport has a positive impact on culture as people would gain exposure to other traditions and have the possibility to select from. The other opinion is of cultural conservation which is mainly maintained by respondent of lower education levels (matric and below). This confirms the consequent culture transformation and change as expressed in cultural evolution theory. This brings to the concern about the culture of development. It has been noticed that those who had the opportunity to travel ex go to town were easily amenable to the change of traditions.

The dictionary defines tradition as “ any time-honored set of practices, beliefs passed down from generation to generation”. This means that at a given time if not maintained tradition may die off. Culture is defined as “the arts, beliefs, customs, institutions, and all other products of human work and thought created by people or a group at a particular time”. This means that opening up to other cultures through development and ICT may lead to a change of culture. Is it a positive or a negative aspect? When development is perceived as a good practice, it is deemed necessary to ascertain the impact of traditions and cultural values on development. It may require a change in attitudes in order to enable the receptivity of development concepts and projects eg tourism, office industry and information and communication technology, small and medium enterprises. A gender comparison showed that only 17% of the respondents were females. This shows a little involvement of women in the decision of the community hence on possible future development interventions. It was noticed that children are just dragged in without any consultation may be due to the cultural consideration or differentiation of age groups or generations.

6. Conclusions

The challenge to reconcile the traditional life style and a sustainable development of villages in the Tzaneen local municipality has been assessed by means of a questionnaire on a

sample of respondents coming to attend the regular Sunday community gathering. As aimed at by the South African rural development frame work of 1997, the development of villages in general lead to local institutions being developed, willing investment in basic infrastructure and social services, improvement of income and employment opportunity, broadening access to natural resources, establishment of periodic market, conservation of resources and safety and security of rural population is ensured including women and children. The above planned to have “nice” do not come without costs. Deterioration of natural environment and biodiversity, increasing climate change, perturbation of traditional culture and traditions etc.. Now the question still remains. Should we develop our villages or not? If yes to what extent? 61 % of the respondent confirmed that development of villages around Tzaneen has positively impacted on their traditions and culture. While the level of education showed a trend toward opening up to other cultures, the impact of culture on the acceptability of the development effort showed the need to be improved in the positive direction.

Acknowledgements

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References

- Bernstein, S. 2005, The Changing Discourse on Population and Development: Toward a New Political Demography, *Studies in family planning*, Vol.36, Issue 2,P.127–132.
- Chambers, R. 1983. *Rural development: putting the last first*. Harlow: Prentice Hall.
- Chhibber, A.; Simon J.; Evans, Alison, M., Fuhr, Harald, L.; Kane, Cheikh, T.; Leechor, Chad; Levy, Brian D.; Pradhan, Sanjay; Weder, Beatrice S.; *World development report 1997 : the state in a changing world, 1997/06/01 ,Report Number 17300*.
- Clugston, R. 2016, Faith traditions and sustainable development, , <http://earthcharter.org> accessed on 26 June 2016.
- Dohery 2011, SAPMTCTE report, early (4-8 weeks post-delivery) population level effectiveness of WHO PMTCT option A, South Africa, MRC.
- [http:// www.gov.za/issues/national-development-plan-2030](http://www.gov.za/issues/national-development-plan-2030)
- [http:// www.statssa.gov.za/publications/P03014/P030142011.pdf](http://www.statssa.gov.za/publications/P03014/P030142011.pdf)
- Jingzhong, Y., Schneider, S. and Van der ploeg, J.D., 2010. Rural development reconsidered: Building on comparative perspectives from China, Brazil and the European Union, <http://www.jandouwvanderploeg.com>, accessed on 20 June 2016.
- Meijer, S. S., Catacutan, D., Sileshi, G. W. & Nieuwenhuis, M. 2015. Tree planting by smallholder farmers in Malawi: Using the theory of planned behaviour to examine the relationship between attitudes and behaviour. *Journal of Environmental Psychology* 43: 1-12
- Singh, K., 1999, *Rural Development: Principles Policies and Management*, Sage Publications, New Delhi.
- Tollman S. 2011, Agincourt rural Public Health & Health Transition Research Unit, Wits.
- Verplanken, B. and Roy, D., 2016. Empowering interventions to promote sustainable lifestyles:testing the habit discontinuity hypothesis in a field experiment. *Journal of Environmental Psychology*, 45, pp. 127-134.
- Walker , J.E. Shea, T.M. and Bauer , A.M. (2007), *Behavior management: A practical approach for educators* (9th ed.). New York; Prentice –Hill.2015

Impacts of National Rural Policy on the Urban-Rural Relationship: A Case Study from Changfu, Guangxi, China

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Abstract/Short abstract *this paper attempts to figure out the underlying policy mechanism in changes of farmers and rural families since the reform and opening-up through a case study of Changfu village, to present the changes of farmers' life trajectory under the macro national policies and the impacts of these changes on the rural-urban relations and farmers' life.*

1. Introduction

Since the reform and opening-up, China has experienced accelerated economic development and rapid urbanization, but also brought about the heatedly debated issues, such as rural-urban binary partition and rural hollowing. Not only the income of farmers is far lower than that of citizens, rural infrastructure construction, rural education and social welfare all fall behind the urban development level. The rural aging and hollowing loomed large all over the country (Liu, 2013). To mitigate the aggravation of these phenomenon, China government has introduced a series of rural policies to narrow the gap between urban and rural development and optimize the rural-urban relations.

The effects and efficiency of rural policies have been the hot issues of academic researches, most of which currently focus on the macroscopic fields, such as the review and summary of the development of national rural policies, the evolution of agricultural subsidy policies and the development stages of agricultural social security policies (Zhou, 2009; Ma, 2011). Wang (2011), Zong (2006) and Wang and Luo (2012) proposed the development direction of rural policies from the macroscopic perspective. From the feasibility of implementation modes, Luo (2011) and Tan (2012) discussed how to improve the efficiency of rural policies. In addition, the relationship of rural policies and rural development has been explored based on mathematic models (Carter, 2001; Fu, 2002).

Microscopic study on rural issues mainly concentrated on the behavior characteristics and activities of temporary workers in the city. For instance, researches on urban villages in 1980s, such as Zhejiang Village, Henan Village and Xinjiang Village in Beijing, probed into the characteristics of peasant urbanization (Xiang, 1996; Zhang, 2001; Li and Liu, 2011). However, only little researches selected rural areas as the objects.

As the distinguished international immigration scholar Portes stated, any macro theory cannot be expected to interpret every issue of immigrants and no a theory can independently provide the shortcut of explaining the population mobility. He advocated the middle range theory to illustrate a special issue through the specific empirical investigation. The researches on rural areas and farmers are also lack of in-depth study of rural communities and individuals, resulting in the researches on the development of Chinese rural-urban relations remain stagnant at the stage of data analysis and theory. Therefore, this paper attempts to figure out the underlying policy mechanism in changes of farmers and rural families since the reform and opening-up through a case study of Changfu village, to present the changes of farmers' life trajectory under the macro national policies and the impacts of these changes on the rural-urban relations and farmers' life. Here the rural policies issued since the reform and opening-up have been reviewed and summarized. Then the influences

of national policies on villagers' life trajectory and how they change the rural-urban relations are investigated by the methods of intrusive observation, in-depth interview and questionnaire survey. Finally the overall impacts of national policies on rural-urban relations and the future problems and challenges faced are discussed and concluded.

2. Research objects and methods

2.1 Research area

Changfu village is located in Laibin city at the center of the Guangxi Zhuang Autonomous Region, southeast China. This village encompasses 152 households with 1000 inhabitants or so. The superiority of this village as the research object embodies two aspects. The first one is that Laibin city is the hometown of the author. She masters the local dialect and can accurately record the internal social situations by informal talks, participatory observations and questionnaire surveys, which ensures the credibility of the data. The other one is the diversity of industries people in this village are occupied in. This provides an opportunity to comprehensively reflect the influences of national rural policies on rural populations of different occupations from a microscopic perspective. (Fig 1)

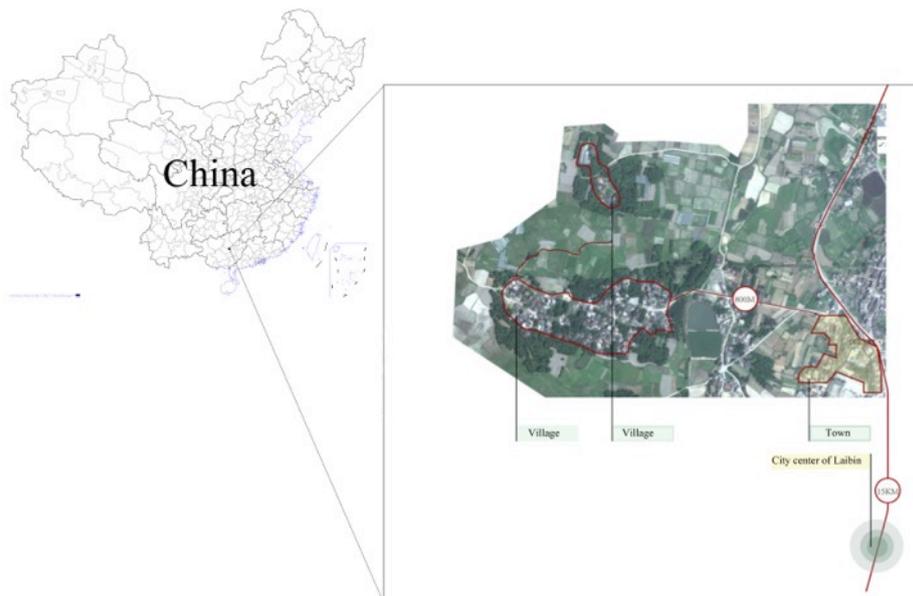


Figure 1: Location of research area

2.2 Methods

Participatory observations, unstructured interviews and questionnaire surveys were mainly used for the field survey of Changfu village from January 18 to January 30 and from February 20 to February 28 in 2014.

2.2.1 Document summaries

National rural policies since the reform and opening-up have been summarized from the academic monographs, academic periodicals and documents issued by the State Council.

2.2.2 Participatory observations

Involved in the village as a friend of local residents and fully trusted by villagers, the author lived together with the villagers for twenty days to observe and record the lifestyle of local

residents in detail. The behavior logs of current agricultural households were sourced from this intrusive investigation.

2.2.3 Unstructured interviews

Rural lifestyle at the beginning of the reform and opening-up was obtained by unstructured interviews. Through informal talks, the daily behavior logs thirty years before, individual trajectory of life, domestic and social relations and modes of production were recollected by villagers. The conversations were partly guided by the author but unlimited in specific details, and laid emphasis on their individual life experiences.

2.2.4 Questionnaire surveys

Based on the villager data provided by the village head, 273 of over 1000 villagers were selected by ages as the classification basis to fill out the questionnaire. The questionnaire involved the basic information of production and living of villagers and their individual trajectories of life. All of the 273 questionnaires, around 25% of the total population, were retracted and effective to mirror the entire conditions of this village to a certain extent.

2.3 Basic information of the objects

Of the overall 273 questionnaires, respondents of ages of 20~30 account for 32.2%, ages of 30~40 15.8%, ages of 40~50 11.7% and ages of 50~60 13.6% (Fig. 2a). Male respondents take up 51.3%, while female respondents occupy 48.7% (Fig. 2a). 31.8% of informants are occupied in agricultural production, 23.9% in temporary work in cities, 14.4% in permanent work in cities, and 28.9% in service industry in this village (Fig. 2b). Education levels of respondents varies, in which the population of junior high school occupies most, followed by primary school and senior high school (Fig. 2c). Less than 5% of respondents are college students (Fig. 2c). Of respondents of over 60 years old, 10 females are illiteracy.

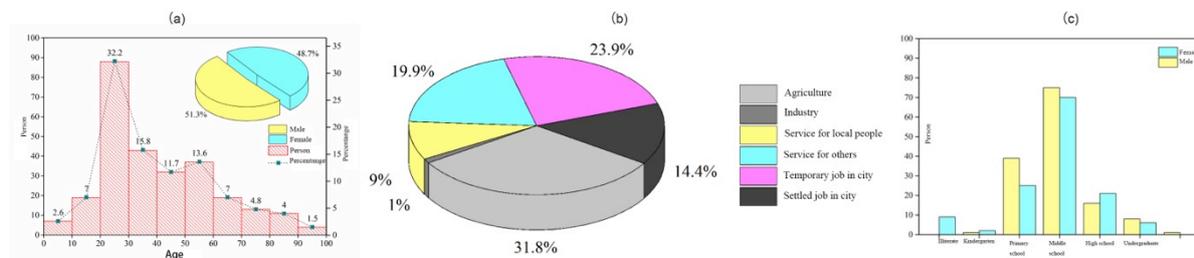


Fig.2 Basic information of the objects. (a) age distribution; (b) occupation distribution; (c) distribution of education levels

3. Results

3.1 National rural policies since the reform and opening-up

China's rural investment has continuously increased in the last thirty years. It increased from 0.116 trillion in 1980 to 3.88 trillion in 2006, after that it accelerated rapidly to reach 117 trillion in 2012. The weight of rural expense in finance expense was the another case, which experienced two drops during 1980~1985 and 1990~2005, decreasing from 12.2% to 7.7% and from 10.0% to 7.2%, respectively. Since 2005, the rural expense weight rose again at a relatively rapid rate, up to 9.6% until 2012 (Fig. 3). Four kinds of rural policies involving agriculture, social security, rural household management and rural market were selected as research objects to explore their impacts on the urban-rural relationship.

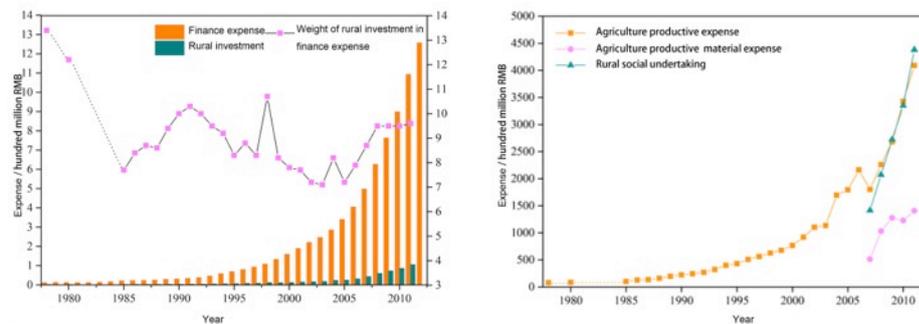


Fig. 3 Changes in China's finance expense and rural expense with its weight in finance expense from 1977 to 2012

3.1.1 Rural policies on Agriculture

China's rural agricultural support has been increasing since 1980. It increased relatively slowly during 1997~2003, while zoomed after 2003 at a rate of 0.1 trillion/yr. Until 2011, the agricultural investment has reached 1.05 trillion (Fig. 3). Agricultural productive expense was always given priority by Chinese government. Compared with slow growth before 2005, it has been enhanced significantly since 2005. After 2005, Chinese government also heightened the investment on agricultural productive materials, such as food, agricultural capitals, fine seeds, and farm machineries, and the development of rural social undertakings, from which farmers could receive certain cash subsidies. At the same time, Chinese government exempted agricultural tax.

3.1.2 Rural policies on social security

Rural policies on social security include low-income security, medical insurance, rural education and endowment insurance, in which the first one was put into practice since 1982. Rural education investment has increased continuously. Compulsory education policy was carried out since 1986, which exempted the tuition of students in the stages of nine-year compulsory education. Since 1989, Chinese government has provided education funding for rural needy students, and since 2000, college student loan has been implemented. Until 2005, total fees of rural compulsory education were exempted and additional living subsidies were provided.

3.1.3 Rural policies on household management

The difference of household registration system between cities and countryside always exists, but the limitation of rural population migrating into cities for occupation has been diminished. In 1977, the State Council stressed the rigid control of the population in cities and towns, and of the influx of rural population migrating into cities. Up to 1984, the conditionally opening policy for rural population flowing into cities was issued by the State Council. This policy permitted rural individuals with permanent residence and occupation in cities to possess the urban household. Until 1997, the State Council further issued policies to conduct rural populations to migrate into small towns and to own small-town household.

3.1.4 Rural policies on rural markets

Since the reform and opening-up, rural market policies have been opening gradually. In early 1980s, agricultural products were unified purchased and sold in markets by government agencies, but were prohibited to be sold directly in the market by farmers. Since 1983, the extent of agricultural products obliged to be unified purchased by the government has been narrowed, and part agricultural products could be sold freely by farmers. The policies of

unified product purchase were claimed to be terminated since 1993. After then, all agricultural products could be freely sold in the markets.

3.2 Changes of life trajectory since the reform and opening-up

Changes of life trajectory of rural population since the reform and opening-up were explored through the investigation of study or work places of Changfu villagers at different stages. For comparison, life trajectory of rural population was divided into two groups at the age of 60.

By comparing Fig. 4 and Fig. 5, more possibilities of rural individual development since the reform and opening-up are presented. Life trajectories of respondents below the age of 60 (under-60 respondents) are more diverse than those of respondents 60 years or older (over-60 respondents), indicating the richness of rural population's work or study places has increased since the reform and opening-up. All over-60 respondents worked in the village during the stage of compulsory education, while most under-60 respondents studied in the village and others studied in cities during the stage of compulsory education. This change shows the improvement of rural population's educational level and the opening of urban educational resources for villagers since the reform and opening-up. The majority of over-60 respondents returned this village to get married and settled. Although most under-60 respondents returned this village to settle, a considerable amount still worked in cities.

However, the life trajectory of under-60 respondents were limited to a certain extent. Among 59 respondents working in cities after marriage, 34 were occupied in temporary jobs, accounting for 57.6% of under-60 respondents working in cities. These respondents face numerous problems when they tried to blend in the urban life (Gao, 2009; Li and Liu, 2011). It is difficult for respondents not receiving urban compulsory education to find a stable job in the city. Of 25 villagers having permanent jobs in cities, only 9 have received rural compulsory education, taking up 36%. This means that since the reform and opening-up, only 3.3% of villagers receiving rural compulsory education possess a occupation with social welfare in cities (Fig. 4 and Fig. 5).



Fig.4 Life trajectory of above-60 respondents

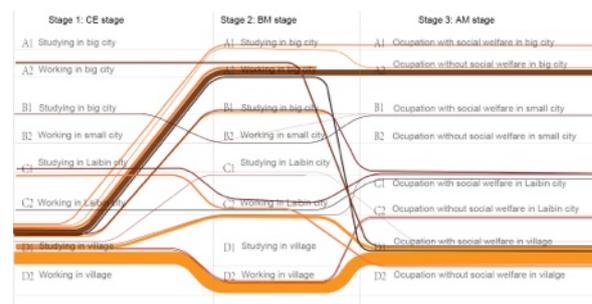


Fig. 5 Life trajectory of below-60 respondents

3.3 Roles of national policies in rural changes

What causes the changes of villagers' life trajectories and whether these factors were effected by national policies of agriculture, social security, household and rural market, are our primary concerns. To answer these questions, life trajectory is divided into three stages. The first one is during compulsory education (CE stage), the second one is after the compulsory education but before marriage (BM stage), and the last one is after marriage (AM stage). Causes of villagers migrating into cities at different stages were analyzed. During the CE stage, resulting from the elevation of native family income and the change of the revenue

structure, part farmers could receive urban compulsory education. Of 4 native families from which villagers received urban education, one family father was village cadres, and the other three parents were occupied in feed sale, waste recycling and individual doctor, respectively, all dwelling in the village but engaged in stable higher-income non-agricultural jobs. National investment on rural education promoted the increase of farmers' quality, which provided more opportunities for the rural individual development. All of the 15 surveyed college students in this village have received national student loans or grants. Rural population flowing into cities during the BM stage could be attributed to the gradual opening of household registration system which restricted farmers into cities (Tab. 1). Furthermore, urban economic growth offered opportunities for the development of rural population. In contrast to 1980s~1990s, the outwork places of villagers have expanded from Guangzhou, Shenzhen to Shanghai, Fujian and Zhejiang since 2000 (Fig. 6). This change is consistent with the transition from the rapid economic development of Pearl River Delta Region (i.e., Guangzhou, Shenzhen) during 1980s~1990s to the boost of economy in Yangtze River Delta Region since 2000.

Tab. 1 Interview contents from Changfu villagers

Interviewee 1 (62-year-old village head): Before the reform and opening up, villagers must report to village committee for going to cities, so we rarely went to cities. Not anyone could go to work in cities freely as well. Later the government abolished such restrictions, combined with the more work opportunities in cities than in rural areas, resulting in the enlarged number of rural population to work in cities.

Interviewee 2 (65-year-old grandfather Zou): Formerly, going to cities should be reported first, or you were not allowed to check in the hotel without the approval of the village committee. Nowadays, it became more convenient. You can go outside if you want.

Interviewee (Village accountant): Formerly farmers all wanted to leave the village for big cities. To control the urban population, the government restricted rigidly rural population moving into cities. Currently, rural social security and agricultural subsidies have increased, and farmers are not willing to obtain the urban household.

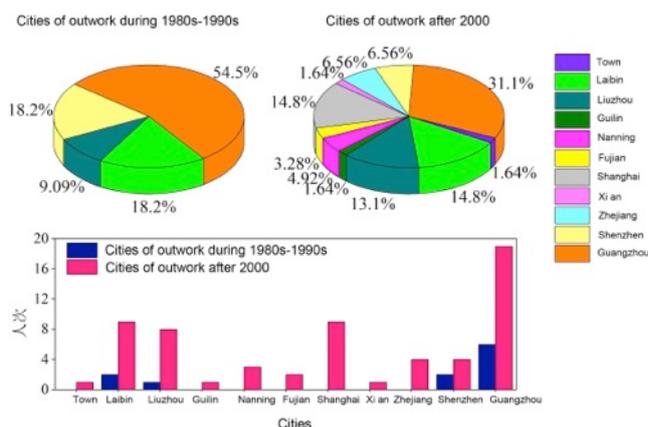


Fig. 6 Distribution of outwork places

The preliminary conclusions can be drawn so far. The opening of rural markets improved the non-agricultural incomes of farmers, which indirectly raising the possibility of villagers to receive a better education. Educational subsidy policy encouraged villagers to receive urban education and further settle in cities. Gradual opening of household registration system promoted the rural population to work in cities. The urban economic development had a certain appeal for the rural population.

3.4 *Effects of changes on urban-rural relations*

How did the changes of villagers' life trajectories affect the urban-rural relationship? Whether have higher-quality farmers possessing permanent jobs in cities been separated from the rural society and thereby aggravated the rural gentrification? What did the farmers temporarily working in cities insist on? What could they contribute to the changes of their hometown? Whether would the returned farmers from cities bring changes to the village? To answer these questions, 273 respondents were divided into four groups. The first one is the villager having a permanent job in cities (Villager I), the second one having a temporary job in cities (Villager II), the third one settled in village after having worked or studied in cities (Villager III), and the fourth one living in the village all the time (Villager IV). Through the study of section 3.2, the population of the former three has increased since the reform and opening-up. Hence, here the impacts of the former three kinds of villagers on the urban-rural relationship in economy, infrastructure and society were discussed.

3.4.1 *Urban-rural economic differences is reduced, but agricultural development faces challenges*

Increased farmers' income reduces the urban-rural economic difference

The change of villagers' life trajectory was realized by elevating the proportion of non-agricultural production to increase the farmer' income and then reduce the urban-rural income disparities. The average income of Villager I, Villager II and Villager III is 39.0 k yuan/yr, much higher than the average income of all the surveyed samples (24.1 k yuan/yr). The enlarged amount of these three groups of villagers at a certain extent reduced the urban-rural income disparities. The enhancement of Villager I's and Villager II's incomes could be attributed to the higher income level of the cities they worked than that of corresponding rural areas (Zeng and Hu, 2008). Since Villager III tended to be engaged in non-agricultural production, their income was higher than the average level of all the investigated samples despite of they remained in the village. The non-agricultural income of Villager III accounts for 75.5% of their total income, far more than the average 48.4% of permanent residents in this village. Also the average non-agricultural income of Changfu villagers (32.7 k yuan/yr) was far greater than their average agriculture income (12.5 k yuan/yr).

(2) Agricultural production faces difficulties

However, the increase of non-agricultural income brought some challenges to the agricultural development. The proportion of rural population engaged in agricultural production decreased due to part of them flowing towards non-agricultural activities and urban labor market. Of all the surveyed agricultural population, 66.7% was female and 53.6% over age 50 (Fig. 6a). The aging and feminization of agricultural population led to the low efficiency of agricultural production. The agricultural income of the surveyed only holds 20.5% of their total income (Fig. 6b). Through informal interviews, agricultural activities have been not economic pillar of villagers' sustenance and major source of income, but as their livelihood security to compensate the instability of non-agricultural income. As a result, farmers would not give up agricultural production in the foreseeing future, but they are also not willing to increase the investment in agricultural production. From this point, agricultural subsidy made little contribution to the improvement of agricultural production (Tab. 2).

Tab. 2 Interview contents from Changfu villagers

Interviewee 4 (62-year-old male villager both selling feed and farming): Money merely owned by farming cannot offset the daily expense, so feed sale is our main income source. However, farmers

would not give up farming, since it is our economic security. This is also ascribed to the high but instable income of feed sale and the low but stable income of farming. Farming makes us to be ease.

Interviewee 5 (54-year-old male villager both doing business in the market and farming): No matter with national agricultural subsidies, we have to do farming to be ease in mind. Indeed, doing business owned more money than farming, but it was also more instable. I once sold pork in the market, but returned to do farming when the market was damned. Sometimes I changed to do other businesses to choose the better one. Thus, the elder and the female were usually responsible of farming at home and I did business outside

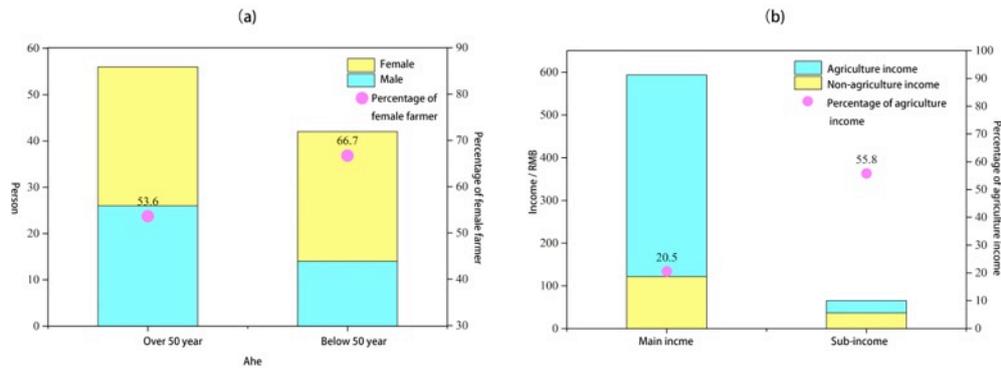


Fig. 6 Basic information of agriculture. . (a) age and gender imbalance of farmer; (b) weight of income of agriculture

3.4.2 Urban-rural relations are strengthened but connections within the rural family are weakened

(1) strengthened urban-rural relations

The social relations between countryside and cities have been strengthened. This could be partly attributed to the increase of farmers' income, which raised their frequency into cities. From informal talks, the frequency of farmers into cities was 2~3 times per year 30 years ago, but now has elevated up to 1~4 times per month (Fig. 7a). Their main goal into cities are shopping, followed by participating in banquets. Therefore, the increase of farmers' income is the main driving factor for going to cities and the enhancement of urban-rural residents' social relations contributes less (Fig. 7b).

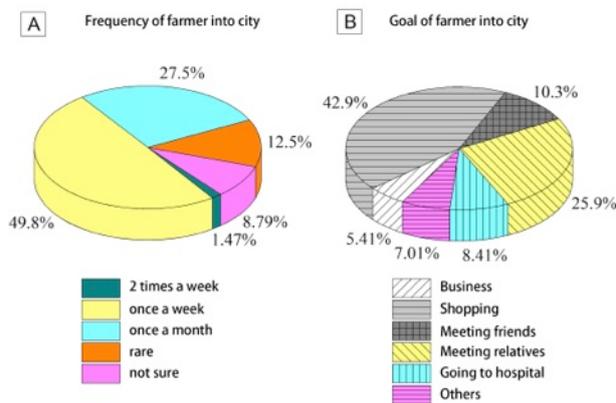


Fig 7: Urban-rural interaction. (a) frequency of farmer into cities; (b) main goal of farmer into cities

(2) Connections within family members decrease but outdoor associations increase

In the survey, Villager I and Villager II went home less than 3 times per year. Only at the Spring Festival, Tomb Sweeping Day or in the summer, they returned back home to reunite

with family members. Therefore, their connections within family members have been reduced significantly. Though Villager III was still engaged in non-agricultural production in the village, his association within family members also less than the outdoor relation. Taking the daily behavior logs of the family of Villager III and the family engaged in agricultural production for comparison, we find that the intersection of the daily trajectories of Villager III with his spouse is relatively less, but with outdoor members is more than that from the latter family. Both husband and wife from the latter family have the high consistency in daily activities. Hence, the change of life trajectory weakened the connections within family members, but strengthened their associations with the outdoor. (Fig. 8a, 8b, 8c, 8d)

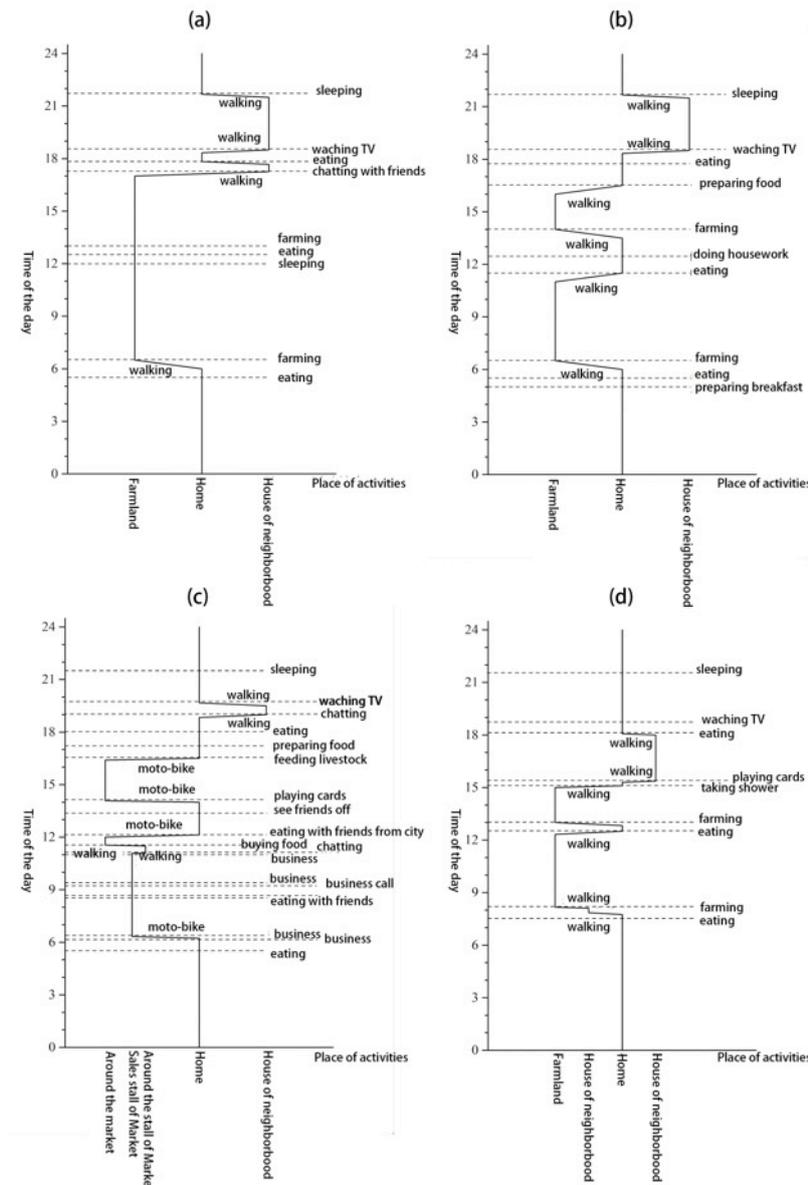


Fig 7: Daily life diary. (a) diary of male farmer; (b) diary of female farmer; (c) diary of male Villager III; (d) diary of female Villager III

3.4.3 Promotion of rural population into cities

From unstructured interviews, Villager I provided resources of living, working and studying for rural population into cities, while Villager II only offered work resources for villagers. Villager III would be well aware of the differences between countryside and cities, so they might

invest more in the education of the next generation and demand more rigidly to boost the improvement of villagers' quality. The increase of the proportion of these three groups would further facilitate rural population to get access to live or work in cities (Tab. 3).

Tab. 3 Interview contents from Changfu villagers

Interview 6 (58-year old villager returned and settled in the village after having working outside): What we gained working outside is our awareness of our difference with others outside. We could only earn little money by toil, so we demand our children to study harder for a better life in the future.

Interview 7 (20-year-old boy working in Guangdong): At first, we usually followed the elder experienced villagers to their familiar cities. They would help us to find the first job and we would live together with them.

Interview 8 (Villager as the master builder in Liuzhou, next to Laibin city): We would rather employ our relatives, friends or fellow villagers as workers since we know more about them.

4. Discussion and Conclusion

4.1 The direct or indirect impacts of macro national policies on farmers' life trajectory, family and the rural-urban relations

The changes of relationships between villagers, rural families, rural communities and urban areas cannot be separated from the influence of macro national policies. From the perspective of rural individual, the market opening policy, the elevated social welfare and freer household registration system increased the probability of rural population migrating into cities to work and settle and enlarged the number of Villager II and Villager III. Through establishing social network with urban residents when working in the cities, Villager II and Villager III raised the frequency of rural-urban communications. Their increased non-agricultural income diminished the rural-urban income gap but also inhibited the intimacy of rural development and rural families. Villager I could provide the basis for the new-coming villagers to settle in the cities by their urban resources, which further improved the rural-urban interactions and increased the income of farmers. Thus, the influence of macro national policies on the farmers' life trajectory is somewhat direct and decisive, such as deciding their access to cities and education resources. The life trajectory of farmers further indirectly impacted the rural and urban economies and their social relations. Therefore, people-oriented principle is the foremost basis of the enactment of macro national policies.

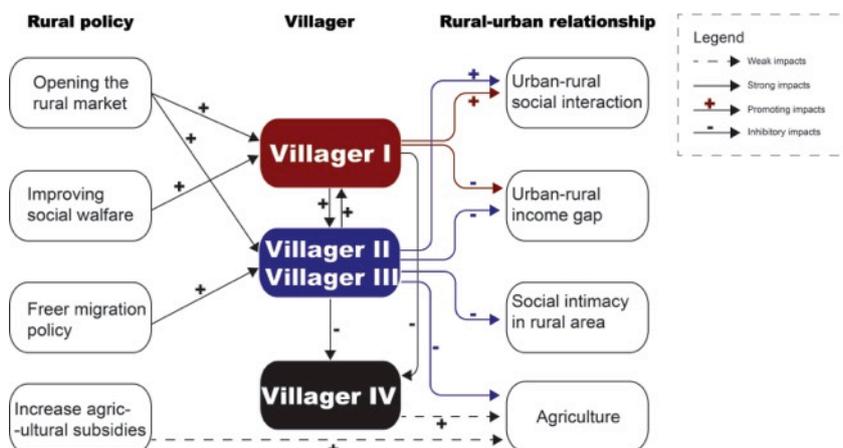


Fig 9: Driving mechanism of rural policy

4.2 Strengthened rural-urban relations accompanied by the resolution of rural internal society

The introduction of the national rural policy is to narrow the gap between urban and rural development, improve the income of farmers, and social welfare to revive the rural community. Learned from this study, the rural policy has a positive effect in economic development. The income of farmers, social welfare and education resources have been improved to some extent. The social interactions between rural and urban residents have been intensified and the rural-urban relationship tended to be more harmonic. In contrast, traditional close relations within the rural family and rural communities were weakened gradually with the intensification of rural-urban relations. Social welfare and agricultural production policy have not kept farmers to live in the village, resulting in the lasting rural hollowing (Fig. 9)

4.3 Migration of rural population has not facilitated the influx of talents, and the development of rural population faces the ceiling

The opening of household registration policy for rural population motivated the large-scale rural population migration into cities for jobs. Farmers had a certain degree of freedom to choose their work places. Farmers working in the city became a link in the rural-urban relations. Farmers settled in the city also have strong ties with rural life due to the rural culture, which further strengthened the rural-urban relations.

Nonetheless, by analyzing the life trajectory of rural population and informal interviews, working in the city does not mean that they could be settled in big cities. Even in a small neighboring town they could not find a good job. To settle in big cities, rural population should depend on the urban relation network, since the advantages of urban resources are much better than those of rural population. Though the opening of population flow mechanism brought benefits for rural areas, rural population was still lack of a freely accessible pathway into cities. The establishment of open flow mechanism of talents can be realized merely by the release of population flow policy. It is also affected by the selection of talents and the rural educational quality.

4.4 Agricultural development-support policy needs further exploration

Although China has increased investment in agricultural production and abolished the agricultural tax, the major income of most farmers is still sourced from non-agricultural production under the impacts of rural-urban production and life relations. Meanwhile, their enthusiasm for agricultural production is relatively low. Hence, the national policy supporting agricultural development needs further exploration.

Acknowledgements

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References

- Carter C.A., Estrin A.J. (2001) "Market Reforms Versus Structural Reforms in Rural China", *Journal of Comparative Economics*, Vol.51No.527-541(9)
- Liu, JY (2014) "Ageing, migration and familial support in rural China", *Geoforum*, Vol.51No.305-312(1)

- Fu, LF, (2002) "Optimal programming model of agricultural industrial structure adjustment of Hei Long Jiang Province and DEA estimation of multiple decision-make schemas", Northeast Agricultural University, Master dissertation, 65 pp.
- Gao, XD, (2009) "A study on floating population gather of outer suburban district in Shanghai", Urban Studies, Vol.16 No.105-108(2)
- Li, HX, (2003) "Investigation on the development of household registration system in China after 1949" East China Normal University, Master dissertation, 64 pp
- Li, ZG, Liu, Y. (2011) "Beyond spatial segregation: Neo-migrant and their social networks in Chinese cities", Acta Geographica Sinica, Vol.66 No.785-795(6)
- Ma, FY, (2011) "Problems and solutions in household registration system reform in China: A case study of Chengdu city", Journal of University of Science and Technology Beijing (Social Sciences Edition), Vol.27 No.29-133(3)
- Luo, WC, (2011) "Effect evaluation and impact factor analysis of Chinese rural policies from the perspective of village cadres" Chinese Rural Economy, No.15-26(1)
- Peng, HR, Zhong, ZB, (2011) "Stage decomposition and analysis of the agricultural subsidy policy in China" Rural Economy, No.6-10(1)
- Tan, QC, (2012) "Dishonest promise punishment and rural policy distortion" China Rural Survey, No.37-47(3)
- Wang, DX, Luo, Y, (2012) "Experiences and problems in China's countryside construction in last ten years", Journal of Northwest Sci-Tech University of Agriculture and Forestry (Social Science), Vol.12 No.8-15(2)
- Wang, YZ, (2001) "Talking about the development orientation of medical safeguard in Chinese rural areas in 21th century" Chinese Health Economics, Vol.20 No.6-8(2)
- Wang, YZ, Wei, X, Long, YQ, Shan, DS, Jiang, FL, (2009) "Social security in rural China: the current situation and development prospects" Social Security Studies, No.43-61(1)
- Xiang, B, (1996) "Formation of traditional and new social space: The history of a floating population in China" Strategy and Management, No.99-111(6)
- Zeng, GA, Hu, JJ, (2008) "Changes of Chinese urban-rural income gap and their influence on the consumption level of urban and rural residents since the end of 1970s" Economic Review, No.45-54(1)
- Zhang, L, (2001) "Strangers in the City: Reconfigurations of Space, Power, and Social Networks within China's Floating Population" California: Stanford University Press
- Zhou, J, (2009) "The study of changes in history of China's rural social security policy since reform and opening-up" Hunan Normal University, Master dissertation, 63 pp
- Zong, YX, (2006) "Evaluation of China's agricultural support and analysis of policy effect for the period before and after WTO accession" Chinese Academy of Agricultural Sciences, Doctoral dissertation, 163 pp

A STUDY OF RURAL-URBAN LINKAGES IN A DEVELOPING ECONOMY OF OWO REGION, NIGERIA.

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Abstract

The paper examined the existing structure of socio-economic development between rural and urban landscape in Owo Region. It identified the potentials of and the limiting factors affecting the development potentials of the two economic/development divide. It equally, evaluated measures that have been initiated in the time past to improve on the overall development of the rural-urban areas in the mist of the problems facing physical development initiatives in Nigeria. In achieving the above, the paper adopted Focused Group Discussion (FGD) and In-depth Interview (IDI) in its collection of relevant information from respondents (rural and urban). This information was further subjected to descriptive statistics using percentage and spearman's correlation analysis.

The paper observed some disparities in physical and socio-economic development of rural areas and their urban counterparts. These differences were lopsidedness in infrastructural development, lack of economic integration between the two entities and inequality in the scale of socio service provisions among rural and urban areas across the regional landscape.

A major factor found to be responsible for the inequality was the lack of inadequate coordination of rural activities and the ineptitude associated with planning which did not encourage the fusion and integration of rural activities into urban planning and development. The paper therefore, calls for physical and socio-economic linkage of rural and urban communities in the study area and across the Nigeria's landscape in general. It emphasized, though, that territorial planning is vital to the sustenance of all settlements, but this must be done within the framework of integrated regional planning and development, a feedback mechanism for local capacity enhancement and national growth.

1 Introduction

National landscapes are structured in line with their landmass, which is a function of the agreeable boundaries they share with other abutting nations. Moreover, their internal structures and emerging landscape patterns generally, are functions of settlement types, distributions and their relational characteristics in terms of specific interdependent roles they play and the linkages that exist between them. These relationships (rural-urban) which exist in the forms of socioeconomic and physical elements, although complex, have been described as necessary and a common ground upon which regional policy intervention should be initiated (CEMR, 2013).

Emerging facts from nations across the globe however, indicate some forms of structural imbalance in the spatial development of these major settlement types. In other words, a wide gap in development is noticed between rural areas and their urban counterparts, especially in the developing countries (UN Habitat, 2015; Cooperative Governance, 2013, and Tacoli 1988). This observation has necessitated the call for synergistic rural-urban policy initiative that would see to the development of the two entities without prejudice to their theoretical integrity (Md. Saiful, 2006). It is pertinent to state that attaining a synergistic rural-urban policy as a measure of bridging the wide gap between rural communities and the urban areas can only be achieved where there are functional platforms, as in the case of the advanced world, where rural areas are witnessing massive development and therefore becoming centers of attractions to urban population (EMCR, 2013).

In Nigeria, however, attaining a good level of development in the rural areas through rural-urban interaction seems to have defiled all known measures as a result of failures that were associated with rural development planning in the last four decades. This is evident in the works of Oluwasola, Idowu and Osintogun (2008) where rural-urban linkages/cooperation are seen as parasitic in nature and beneficial only to the urban communities. It is equally believed that for urban areas to grow, their rural hinterlands must be given a measure of developmental options which will help in the reduction of rural-urban migration, rural poverty and attaining reasonable level of social infrastructural development. The emerging questions thereof are; what is the scale of and forms of associations that exist between the rural areas and their urban counterparts in the study region? Why increasing widening differences in development—social, physical and economic—between the two economic divide in the face of government initiatives and rural policies for over four decades now? What will be the future of the region in terms development if the current widening gap is not checked?

The paper therefore, investigates the impact of functional linkages between rural and urban landscapes in bridging the widening gap in socio-economic development between the two economic divide with a view to providing information for rural-urban policy development at the regional level.

(2) **The Study Area**

Owo region is located between latitude $6^{\circ} 40'$ north and latitude $7^{\circ} 38'$ north of the equator and longitude $5^{\circ} 25'$ and $5^{\circ} 57'$ east of Greenwich meridian. It is made up of two autonomous local government areas namely; Owo Local government area with administrative headquarters at Owo and Ose Local government area, having Ifon as its administrative headquarters (Ondo State, 2012). The two administrative units, in aggregation, comprise of 185 localities of different geographical spread and structural configurations. It is noted however, that the two administrative centers are the only settlements with urban structure based on the administrative functions they perform and other institutional bodies and industrial complex they attract to themselves (Olujimi, 2000). The region has the widest landmass in Ondo State which provides

habitation for about three hundred thousand people (Olagbegi, 2013). Moreover, the 2006 population census put the regional population at 366,401 (NPC, 2006).

It is majorly an agrarian economy with major interest in cash crop and food crop production such as Cocoa, Kolanut, cashew, plantain and yam, cocoyam, cassava and sweet potatoes. This forms the basis for interaction between the rural areas where these produce are cultivated and their urban counterparts which represent spots of exchange between the rural farmers and their urban elites.

The study Area Map

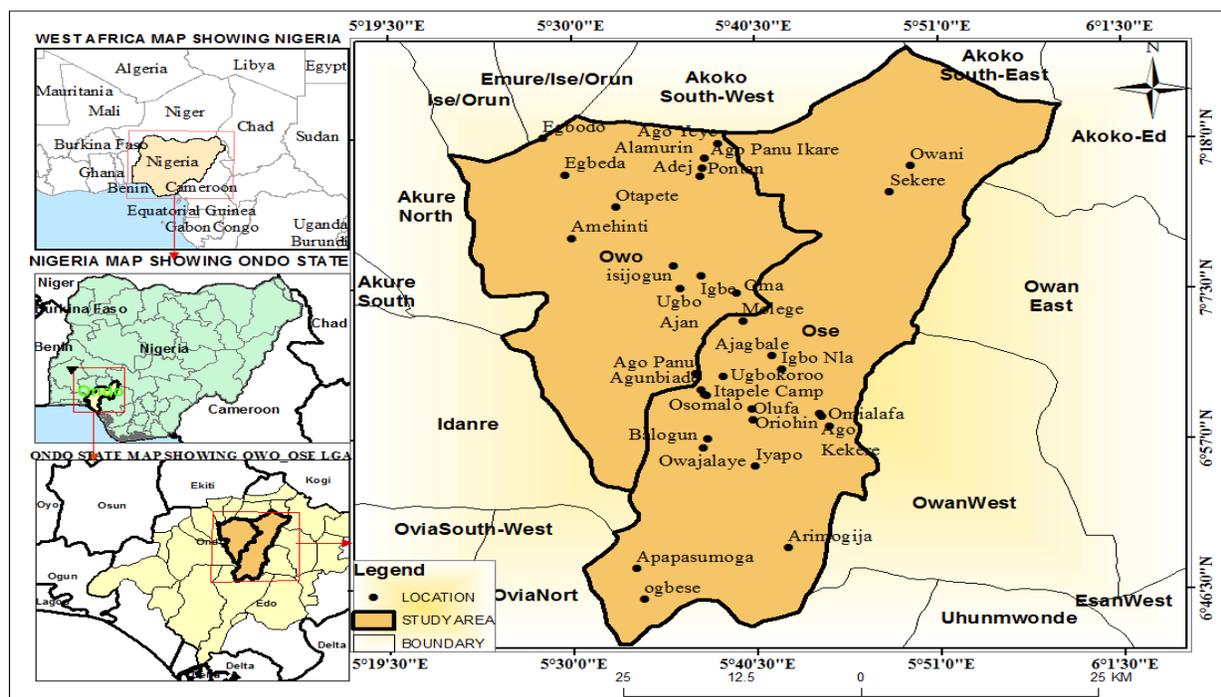


Fig 1: Disperse nature of Rural Communities in Owo Region; Google Earth, 2016.

(3) Literature Review and Theoretical underpinning

Central to regional development are the underpinning theories which best explain the process of development in their finest conceptions. In this wise, about four or more school of thoughts have evolved theories of development even at the regional scale. Amongst these theories are the Neo classical and structuralist models which take a different look at the process of regional development in its entire ramification. The Neo classical equilibrium was propounded by Ravenstern, (1815) which was further propagated by (Levis 1954, and Haris and Todaro 1976). The authors see development as a point phenomenon that propels equilibrium development to all nodes (villages, hamlets and urban areas) as soon as a state of optimality is achieved at the

initial point. The aftermath of the attainment of this development at a point scale is the trickle down effects of development to other nodes. The structuralist ideology sees the classical approach as defective because of its tendency to perpetuate poverty in the lagging settlements.

Following from the ideologies of the two theories is the issue of discrepancies that portend a settlement as being civilized or urban and others as being uncivilized, backward and rural in nature. It is, however, imperative to state that the understanding of rural-urban linkages is best realized when it is discussed within the framework of 'vicious circle of flows' which exists between the two development areas (rural-urban). In this direction, much has been said about development debates of the last 40 years which according to Tacoli (1998) "centered on the changing relationship between agriculture and industry and on the correct allocations between the two sectors.

This form of development was conceived as a two directional process which affects the rural and urban landscape proportionately. It further expresses confidence in the potency of these approaches in bringing the much desired development to the two development divide as well as the rural-urban interface. Escobar (1995) argues that providing the enabling environment for increment in agricultural sector will bring about surplus in industrial inputs and urban development, whereas industrial and urban growth will become the necessary impetus for a "more modernized productive agricultural sector. How this will play out in the less developed countries, however, has become a hot debate among and between the naturalist economist and social/physical development experts.

3.1 A review of literature

Tacoli (2016) sees Urban or rural landscape as the central focus of development theory and practice over the decades. This he said has empirical validation in studies which portray the interrelations between rural and urban areas to include movement of people, goods, capital and other socioeconomic transactions. It is believed that the form of interactions or linkages existing between the rural areas and their urban counterparts seems to be symbiotic in orientation as "many urban enterprises sustenance rely on demand from rural consumers, and access to urban markets and services is equally seen to be important for agricultural producers. However, this aspect of the linkages according to Tacoli (ibid) "makes no explicit reference to spatial dimension and often the most powerful factors affecting linkages between urban centers and the country sides.

Recent approaches in rural-urban relations emphasized synergistic development in realization of concrete development in rural areas. Md. Saiful (2006) in his review of Potter' and Unwin's (1989) work recognizes the "functional relationship between rural and urban areas and therefore wrote on the debacle of the rural-urban dichotomy as the bottom line for policy interactions in rural and urban development issues. He, therefore, advocated for a departure from the era "when rural and urban development affairs were largely handed as separate policy

issues and the linkages were not translated into policy formulation and finding. (Kammeier, 2002).

In the advanced countries, a constellation of studies, especially around European countries bring to bear on how best development could be advanced both at the urban and rural landscapes. CEMR (2013) survey on integrated territorial development in local and regional Europe (Austria, Bulgaria, England, France, Netherlands, Romania, Scotland and Sweden) observed that there is no one factor ('one size fits all'), which provides a common front for cooperation and improved linkages between urban-rural cooperation. For instance, in Upper-Austria, the basis for cooperation centers on Tax redistribution between rural and urban areas; while in Bulgarian, infrastructure development and public service delivery formed the bases for such cooperation between rural communities and their urban counterparts. In this wise, local action groups were set up under the rural development programme as platforms for urban-rural cooperation (CEMR, 2013). In England, for instance, the rural-urban synergistic development was idealized under the local enterprise partnership (LEPs) which pattern its own form of integration on the "economic geography of the functional areas which places less regard on the "urban or rural character of the local authorities involved". And in the Netherlands, the rural-urban linkage ideology was conceived on 'regional resilience in fields of Agriculture, tourism, rural identity and urban lifestyle. While some of these ideologies were based on a single criterion others were multifaceted and directed towards "public infrastructure, public service delivery and projects financed by the EU structural funds' (CEMR, 2013).

The introduction of the integration approach to the development of rural-urban landscapes in the developing world, where it is applied, equally showed some elements of success. In the account of Md. Saiful (2006), the "rural-urban linkages' programmes in Indonesia (PARIUL), Mexico and Nepal (RUPP), observed that Indonesia and Nepal approaches brought about dramatic changes in the spatial development of their rural regions. In Indonesia, the PARUL option was funded by UNDP while technical assistance was provided by the UN-HABITAT. Central to this approach is an institutional component based on public-private partnership between (local) government and the business communities (both producers and medium to large tradesman), which functions is to generate initiations and mobilize resources to strengthen rural-urban linkages for productions and incise" (Evans, 2001). However, the Mexico territorial approach centers around regional economy projects and the injection of rural poor into the employment and investment opportunities created by local growth (de Janvrya and Sadoulet, 2004). The underlying principle was to localize and cluster activity system (electricity, health, telephone services, sanitation, roads, piped water, commercial outlets and productive projects) in centers where households from the 'dispersed rural settlements are expected to access them.

4 Methods and Discussion

The study was a case study which drew data from the two local government areas that constitute Owo region. The two local government administrative headquarters were purposely selected as they constitute the major urban areas in the region based on the statutory roles they play at the local level. Moreover, about 185 settlements dot the two landscapes. 5 percent of these settlements were proportionately and randomly selected as sample population from the two local government areas. This resulted in the selection of a total of 8 settlements in all. Five hundred (500) questionnaires were distributed and 488 returned. The questionnaires were administered in the three settlement types that make up rural areas in the region in the following proportion farmsteads, 131; hamlets, 96 and villages, 261.

Questions reflecting social, economic and physical interactions between the selected villages and their urban nodes were asked using structured questionnaire. In addition to this, was the conduct of in-depth interview in each of the selected settlements on the scale of socioeconomic and physical interactions between their settlements and their respective administrative headquarters? Direct observation method was equally adopted.

Data collected from the field of research was coded and analyzed using spearman's correlation analysis and descriptive statistical tools.

5 Findings and Discussion

This research investigated three major variables in rural-urban linkages. These variables (social, economic and physical) represent the essentials in fostering greater cooperation between the rural areas and their urban counterparts in bringing wholesome development to the regional level.

5.1 Linkages in socio-economic characteristics: About three variables: income, primary occupation, and investment in child's education were evaluated. The study revealed a great deal of interaction and interdependence between the two economic divide. Income earned in the eight rural communities was a function of the degree of patronage enjoyed from the urban communities. Aside the provision of farm produce for the sustenance of the rural population, 90% of rural farm produce are meant for the urban elites who paid for these produce based on the dictates and dynamics of market mechanism, which is not static. It was equally found out that urban agriculture equally buoy up from the activities of the rural population in urban areas who could not find jobs in the industries. Interestingly, the research established a sort of cyclical flows of ideas and population from the rural areas to the urban areas and vice-visa. This flows occurred in the form of investment in plantation farming amongst urban elites who believed in exploring rural investment opportunities, especially in the areas oil palm plantations, cassava cultivation, plantain plantation etc. It should be stated that in the study area less than 2% of

such plantations is owned by investors who reside in urban areas, but who employed rural hands in the tending of such plantations. In the same vein, 54% of the rural population is equally exploring educational opportunities that the urban areas provide to send their children and wards to secondary and tertiary institutions outside the village environment. This set of rural population believed that investment on their children education will leverage the scale of poverty they suffer and at least bring the family fortune out of penury.

Table 1: Income as a reflection of the Socioeconomic Characteristics of Rural areas

Monthly Income	Farmstead		Hamlet		Village	
	Fr	%	Fr	%	Fr	%
< N10,000	25	19.1	15	15.6	60	23.0
N10,000 - N19,000	42	32.1	32	33.3	40	15.3
N20,000 - N29,000	22	16.8	14	14.6	28	10.7
>=N30,000	22	16.8	11	11.5	32	12.3
No response	20	15.3	24	25.0	101	38.7
Median monthly income	15,000		12,000		10,000	

Source: Author's Field Work, 2016.

5.2 Rural-urban cooperation in community development: A measure of interdependence operates between the rural communities and their urban counterparts in the study area. Three variables were evaluated as medium for the interdependence. These variables include: environmental infrastructural development and maintenance, cooperation in social service development and maintenance between government institutions and the local institution in the rural communities. The study, however noted that 64% of the eight rural communities selected for this study did not enjoy any form of social services as a result of the disperse nature of the rural settlements in the regions (see fig1). This has made accessibility to many of this infrastructure a mirage. Moreover, in villages where there are rural electricity, pipe-borne water, boreholes, etc. it was revealed that patronage of these facilities do come with a cost. This cost varies from village to village. For instance, a rate of ₦1000.00 is levied on every adult in whose village is linked with public tap water supply; while government provided 80% of funding for rural electrification, rural communities were expected to pay a counterpart funding of 20%. Although, this does not appear in any policy paper, however, rural communities must show their readiness to embrace, support and monitor projects executed in their domains. One of such means of

ensuring sustainability is by partnering with the local government and state government in funding such projects.

5.3 Environmental Infrastructure Development and Sustenance: An essential factor in rural-urban linkage is the level of interaction in environmental infrastructure development, usage and maintenance between them. The study prods into the extent of interdependence between rural and urban areas in terms of environmental infrastructure development (Water, and landfill, aqueduct and sewerage). It was revealed that the linkages between the two communities in the area of environmental infrastructure development, landfill etc. is not mutually beneficial. Where such relationship exists, it was not in equal proportion, as a result of the unfavorable policy initiatives that are always tilting towards urban development and growth. It is however, noted that 90% of these environmental infrastructure is located in the rural communities, but developed to take care of the urban needs. A case in question is the regional water board, whose source of water supply is from a remote village of Ose in Owo L.G.As. What the villages received back in the form of linkage is the unsightly receptacles of hips of "pure water sachets" which always found their ways back to the foot of the villages

5.4 Spatial Pattern and Physical Development: As shown in the study area map, communities in Owo region are not cluster around a point location, but scattered in different locations and along four major axial points of Owo, Uso, Ipele and Ifon. These four localities serve as service centers to all other communities in the region. It is however, observed that the flows of information, goods, people and services are pattern in line with this spatial arrangement. The Euclidean distance between the nearest villages to these centers, on the average, is 5 km; while the farthest is 20 km. The study revealed that accessibility to these centers is achievable with great costs both in terms of finance, length of time and distance between them. It was observed that apart from villages located in close proximity to the federal high ways in the region, rural road networks are structurally dysfunctional and majorly accessible, only, during the dry season. This has made access to the service centers difficult to attain. However, as a measure of bringing urban services to the rural communities, essential services that are crucial to the retention of rural-urban linkages were further de-centralized for administrative expediency.

The appreciation of any settlements in terms of physical development, according to Levis (2005) depends on how functional such a settlement is and how easy is it to travel through the various segment of such a society, before it could be said to be beautiful or ugly. Villages in the study area lack this quality and as such are structurally amorphous and physically dysfunctional. Pictorial views (see plate 1) of some of these villages showed that there were no conscious efforts to guide their development, even with the application of minimum standard stipulated by the Ondo State Physical development edict of 1984. Aside the facts that the provisions of this edict are out model, there is no physical planning department at the local government level to guide physical development at the regional level.



Plate 1: Structural Pattern of Eporo Community in Owo Region

5.5 Correlation between rural areas' socioeconomic status and Physical/ecological development: Table 1 revealed a strong and positive relationship between rural areas' socioeconomic status and their physical development ($p < 0.05$), but negative and weak relationship with their ecological footprint ($p > 0.05$). The emerging relationship was as a result of continual prodding of urban activities into rural resources to service urban investment and physical development.

6 Results of Focus Group Discursion and In-depth Interview: The focus group discussion was centered on key issues surrounding rural urban linkages and how these have brought about meaningful cooperation in terms of development. The entire group so interviewed affirmed skewness in the existing relationships between rural areas and their urban counterparts in the study region. Table 2 showed the disposition of the 'urban powers' towards social service provisions and infrastructural development in villages across Owo region. Apart from telecommunication which has a wide area coverage (47.5%), less than 15% of the rural settlements enjoyed these services, which was attributed to their disperse nature and locational characteristics.

Table 2: Distribution of Social Services in the Study Area

<i>Infrastrucure</i>	<i>Potable water</i>	<i>Borehole</i>	<i>Electricity</i>	<i>Telecom</i>	<i>Pry sch</i>	<i>Sec. sch</i>	<i>Health</i>	<i>Security</i>
Available	1(12.50)	2(25)	2(25)	3(47.5)	2(25)	1(12.50)	1(12.50)	1(12.50)
Not available	7(87.50)	6(75)	6(75)	5(62.50)	31(75)	7(87.50)	7(87.50)	7(87.50)

Source: Author's Field Work, 2016.

Future of Rural-Urban Linkages in Nigeria: Nigeria's urban areas and their rural counterparts have gone through series of developmental programmes and projects. Some of these programmes and projects are subject specific and targeted either at rural areas or urban centers, while others are omnibus in nature. However, after studying the lingering crises in policy initiatives between urban planning and development and rural growth, the Nigerian government, in the 1970s developed specific templates for the development of the nation. For instance, the Green revolution programme of the 1979 was developed to prop up improvement in rural development and at the same time increase food supply to the urban population through agriculture. This programme was later followed by the establishment of 11 river basin authourities which covers the 3 regions of Nigeria. This river basin programme was patterned in line of the Tennessee River basin development in the United States of America, which brought about proportionate development to all settlements in its sphere of influence. The difference between the United States experiment and the Nigerian river basin development programme was that, while the Tennessee templates influence major development in its region, its Nigeria's counterpart was a dismal failure as there was no correlation between their establishment and the purpose for which they are established.

Other policies conceived to reduce the widening gap between development and growth at the village and city level include: directorate for food and rural infrastructure (DFRRI), structural adjustment programme (SAP), school to land, poverty alleviation programme (PAP), and other

rural empowerment programmes. The only one that was widely acknowledged as bringing rural and urban areas on a platform of interaction and proportionate development was DFFRI whose philosophy was to link every rural community in Nigeria to their market centers usually located in urban areas. This programme opens up villages through the construction of earth roads that ease the flow of goods and services, dissemination of information and provide easy access to urban services. Other projects and programmes directed at achieving a measure of interaction between rural-urban communities were either over ambitious in conception or are reminiscence of political manifestoes which became moribund as soon as their initiators left office (Omosulu, Famutimi & osunsanmi, 2008).

An array of hope came the way of Nigeria's rural communities during the initiation of the Millennium Development Goals Agenda, which gave premium attention to poverty reduction and rural development. Pilots schemes carried out in Ondo State, where this study is situated, showed that development could be attained when rural and urban communities interact and exchange ideas and resources. Therefore, the scheme was seen as a developmental impetus which could be replicated in other regions of Nigeria. This is yet to commence in any part of Ondo State.

It is pertinent to state that Nigeria as a nation has to key in to the basic philosophy of the MDGs and should equally understudy the operations of the Rural Urban Partnership Programme (RUPP) in Nepal and the Poverty Alleviation through Rural-Urban Linkages (PARUL) in Indonesia, for its own programme development in rural-urban linkages.

Recommendations

Paradigm shift in rural-urban development conception at the regional level: There should be a clear distinction between regional development policies, regional strategic planning and political manifestoes in the initiation of regional development. Although the 3 developmental concepts seem to be interwoven, however, policy instruments and strategic planning need to be tied to a timeframe, which should be beyond the tenure of any democratic government in power. Moreover, policy instruments should be subject specific; while strategic planning should be long time oriented and detailed enough for every government in power to understand.

Institutionalization of rural- urban linkage programmes: Specific institution should be established to design and implement programmes for the development of sustainable linkages between rural areas and their urban counterparts. An alliance should be formed in the area of sustainable resource utilization and information flow between the two entities. More importantly, this approach should encourage backward linkages in the areas of rural urbanization through rural industrialization. This will serve as capacity development booster for rural communities to challenge the problems of rural poverty and underdevelopment.

Devolution of social services to the rural communities: One of the impetuses needed to challenge the lopsidedness in social service provision and infrastructural development is the concentration of power at the regional centers. For meaningful relationship to exist between rural and urban areas, the locals must be given a measure of administrative power to initiate, design, build and manage low level social services for the benefit of the rural inhabitants. It should be noted that the study area is marred with structurally defective road networks which often prevent them from accessing these services in urban areas.

Conclusion

There are misgivings amongst economist/sectoral planners and the physical development planners in the areas of what the outcome of interdependence between the rural areas and their urban counterpart should be. It is believed that any association between the two entities should be mutually beneficial in as much as they depend on each other for growth and development. This is not always the situation in the less developed countries where the relationship between rural and urban areas is parasitic in nature, but benefitting only the urban communities. This research has been able to capture the extent of this misgiving and therefore advocates for a paradigm shift in the conception of rural-urban linkages policies, programmes and projects to reflect what are obtainable in other regions of the world. If this policy directive is taken and strictly adhered to, the much needed symbiotic relationship between the two economic divide will be sustained in the fast growing Third world nations, especially Nigeria.

References

CEMR (2013) Urban-Rural Partnership: Survey on Integrated Territorial Development. The Council of European Municipalities and Regions, Bruxelles. www.ccre.org.

Cooperative Governance (2013) Towards an Integrated Urban Development Framework: A Discussion Document. Department of Cooperative Governance and Traditional Affairs; Republic of South Africa. <http://www.cogta.gov.za>.

De Hass, H. (2008) Migration and Development: A Theoretical Perspective International Migration Institute. James Martin 21st Century School, University of Oxford 7-11.

De Janvaya and Sadoulet. E. (2004:1) Toward a Territorial approach to Rural Development: Fourth Regional Thematic Forum in Latin America and the Caribbean, on Harvesting Opportunities: Rural Development in the 21st Century Costa Rica. Retrieved on 16/05/016; <http://www.bancomudial.org>.

Escobar, A. (1995) Encountering Development: The Making of the Third World. Studies in Culture/Power/History, Princeton University Press, Princeton.

Omosulu, S. B. and Osunsanmi, G. O.

Rural-Urban Linkages in a Developing Economy of Owo Region, Nigeria, '52nd ISOCARP Conference, 2016'

Evans, H.E. (2001) Regional Development through Rural-Urban Linkages: The PARUL Programme in Indonesia. Neo Regional Development Paradigm (NRDP); Vol: 3. Greenwood Publishing Group.

Haris, J and Todaro, M.P. (1970) Migration, Unemployment and Development: A Two Sector Analysis: American Economic Review, 60: 126-142.

Kammeir, H. D. (2002) Rural-Urban Linkages and the Role of small and Medium-Sized Towns in Development: Issues, Concepts and Policies. Workshop Paper on Poverty Alleviation through Rural Rural-Urban Linkages. Asian Institute of Technology.

Levis, W.A. (1954) Economics Development with Unlimited Supplies of Labour. The Manchester School of Economics and Social Studies 22(2): 139-191

Md. Saiful, M. (2006) Toward Synergistic Rural-Urban Development: the Experience of the Rural-Urban Partnership Programme 9RUPP) in Nepal. Working Paper Series on Rural-Urban Interactions and Livelihood Strategies(13). International Institute for Environment and Development.

NPC, (2006) Population and Housing Census of the Federal Republic of Nigeria: National and State Population and Housing Tables. Vol. 1.

Olagbegi, D. V. (2013) The Travails and Triumph of the Royal Highness, Oba David Victor Folagbade, Olateru-Olagbegi III. The Wilderness of Life; University Press Plc, Ibadan

Olujimi, J. A. B. (2000) Migrant Tenant Farmers' Settlements in Owo Local Government Areas of Ondo State. Journal of the Nigerian Institute of Town Planners vol.

Oluwasola, O.; E. O. Idowu and D. A. Osuntogun (2008) Increasing Agriculture Household Incomes through Rural-Urban Linkages in Nigeria. African Journal of Agricultural Research, 3(8): 566-573 (UGANDA).

Omosulu, S. B. ;Famutimi, J. T. and Osunsanmi, G. (2008) Strategic Planning for Ondo State.

Potter, R. B. and Unwin, T. (1998) The Geography of Urban-Rural Interaction in Developing Countries, Routledge, London.

Ravenstern, E. G. (1815) The Laws of Migration. Journal of the Royal Statistical Society, 52: 241-305.

Tacoli, C. (2016) Bridging the Divide: Rural-Urban Interaction and Livelihood Strategies. Sustainable Agriculture and Rural Livelihood Programme; International Institute for Environmental Development; Gatekeeper Series No SA77 (IIED) Endsleigh, London.

Omosulu, S. B. and Osunsanmi, G. O.

Rural-Urban Linkages in a Developing Economy of Owo Region, Nigeria, '52nd ISOCARP Conference, 2016'

UN HABITAT (2015) Habitat III Issue Paper on Rural-Urban Linkages, United Nations Conference on Housing and Sustainable Urban Development, New York, USA.

Integrated Rural-Urban Development in India: An Introspection

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Abstract

India is a vast country with an area of about 3.288 million Km² with a population of about 1.221 billion as per Census 2011 which included 0.37 billion urban population and 0.83 billion rural population. As compared to the previous census record of 2001, the urban population has increased 9.1% whereas the rural population has decreased by 9.0%. This figure clearly indicates the in-migration issues from rural to urban areas of India resulting problems like slum development, overcrowding and un-regulated housing issues. National Sample Survey Office's Report of 2007-08 shows that 35.4% of urban population are migrants. Unavailability of employment opportunities, proper educational infrastructures, and commercial aspects are some of the prime reasons for such rural-urban migration.

The Government of India, in various periods of times, have implemented various policies to curb the rural –urban migration. The first one was the formation of National Capital Region (NCR) basically to restrict the population growth of the capital city, New Delhi. The concept started in 1992, with the delineation of parts of some states around the capital city. The thrust was to develop some core cities of the surrounding states to restrict the in-migration to the capital city. As a result, peripheral townships grew up and people started moving there. Initially it was a successful attempt but gradually the upcoming peripheral towns started acting as 'growth-poles' and again faced the issues of in-migration from neighbouring rural areas. This kind of unregulated growth is resulting issues like increasing traffic volume, human density and pollution.

In 2003, President of India came with an initiative of Provision of Urban Amenities to Rural Areas ('PURA'). The initiative focuses on identification of clusters with growth potential and connects them among themselves to provide a better infrastructure. Creating connectivity of road transport, electronic connectivity, knowledge sharing and development of commerce was the prime concern. The implementation process involved Public Private Partnership (PPP) and Local (village) Self-governments ('Gram Panchayats') and private sector partners were given the power to finalize the schemes. As the scheme was "open-ended, without specific guidelines and had no in-built business plan", (according to a report by the National Institute of Rural Development), the program was shelved.

In September 2015, Government of India re-lunched the *PURA* concept with some changes as 'Shyama Prasad Mukherji Rurban Mission' (SPMRM). The prime concern is to create "rurban" clusters in rural areas having latent potential of growth over next three years. Various other Government initiatives and schemes will be integrated to take care of respective aspects of SPMRM. It is expected that, it should come with an impressive result as it is a cooperative federalism integrating both state and central Government. It also focuses on integrated skill development programs promoting PPP model of village

development rather than only private sector participation. But as some critical analyses say, it may create issues of increasing inequality resentment among the villages. Also problems like slow process of land acquisition, rural-rural migration may create some worse scenarios slowing down the process.

The present paper focuses on the aspects of these three schemes analysing the SPMRM scheme from a critic's point of view and discusses about its future outcome. Planning is a dynamic process and the past experiences may help the planners to come up with a more viable, practicable and implementable modus operandi for an integrated development that would restrict the rural urban migration in India.

Introduction

India is a vast country with an area of about 3.288 million Km² with a population of about 1.221 billion as per Census 2011 which included 0.37 billion urban population and 0.83 billion rural population. As per 1951 census, the population of India was 0.36 billion of which urban population was 17%. The urban population is expected to jump to 42% in 2025 (Razi, 2014). As compared to the previous census record of 2001, the urban population has increased 9.1% whereas the rural population has decreased by 9.0%. Approximately 55 percent of the households in rural areas had migrated for employment related reasons. (Razi, 2014).

This figure clearly indicates the in-migration issues from rural to urban areas of India resulting problems like slum development, overcrowding and un-regulated housing issues. National Sample Survey Office's Report of 2007-08 shows that 35.4% of urban population are migrants (Migration in India 2007-2008, 2010). Unavailability of employment opportunities, proper educational infrastructures, and commercial aspects are some of the prime reasons for such rural-urban migration.

The other factors for urban rural migration are:

Climate changes -- where people migrate to other places to save themselves from the harsh extremities of weather, like droughts, desertification, sea level rise, and disruption of seasonal weather patterns such as monsoons (Wikipedia¹, 2016) Improvement in communication and transport facilities, Employment (Kumar, 2014); Rural poverty & starvation, low agricultural productivity, Landlessness, poor educational and health care etc. (Mohapatra, 2014).

The Government of India, in various periods of times, has implemented various schemes to curb the rural –urban migration. The most common of them are:

- 1) National Capital Region (NCR).
- 2) Provision of Urban Amenities to Rural Area (PURA)

3) Shyama Prasad Mukherji Rurban Mission (SPMRM)

Each of these schemes addressed to the causal factors of immigration in India and has strived for a suitable solution to stop this. But, the schemes (especially NCR & PURA) were found not to be appropriate for the whole country and hence had to be modified or abandoned. The following sections focus on these schemes in detail.

National Capital Region (NCR)

India got independence in the year of 1947. At that time, the population of the capital city of Delhi was about 0.0017 billion which increased to 0.0026 billion in 1962 (when the 1st master plan of Delhi was prepared and planning of Delhi in regional context was emphasized), and in 1991 census, it was 0.0094 billion. The increment of this population was largely due to immigration from the surrounding rural areas. The Constitution (Sixty-ninth Amendment) Act, 1991 declared the Union Territory of Delhi to be formally known as the National Capital Territory of Delhi. The National Capital Region (NCR) is the designation for a conurbation or metropolitan area comprising of the entire National Capital Territory of Delhi, including New Delhi and urban areas surrounding it in neighbouring states of Haryana, Uttar Pradesh and Rajasthan. The NCR currently includes 19 districts spread across three states and the National Capital Territory of Delhi. Along with Delhi, the total area under the NCR now constitutes 45,887 sq km. Delhi alone accounts for 4.4 per cent of the population of the region (The Indian Express, 2014).



Source: Mohan M, Kandya A and Battiprolu A 2011

It was thought to establish some 'counter magnet towns' to stop the immigration to the city of Delhi. The criteria for selecting counter magnet towns are: that they should not be within approximately 250 kilometres from Delhi, should have their own established roots and

potential of growth and should not be centres of religious, strategic or environmental importance.

The following 'elements' were identified in the concept of NCR (Government of India, 1985).

- 1) Allocation of land for various land-uses
- 2) Proposals for major urban settlement patterns
- 3) Provision of suitable economic base for future growth
- 4) Proposals for transport and communication serving the NCR
- 5) Provision for drainage and drinking water
- 6) Identification of "Priority areas" for immediate development
- 7) Any other matter for "growth and balanced development" of the region.

The 'counter magnet towns' developed rapidly; and as a result, people started moving there. With time, and globalization being a part of 'development', Delhi was the focal point of migration. Several companies set their base in Delhi. Multi National Companies and Government Offices were established in plenty in and around Delhi. NCR towns are flooded with Business Process Outsourcing centres, centres for Information Technology Enabled Services, Information Technology Services, Service Industries, Manufacturing Companies etc. Renowned companies, made these towns as their business base and this led to the fame of the NCR towns, which spread like a wild fire. The fame on the other hand, led to more companies coming in to these towns. (Focusdelhi.com, 2016)

People from Delhi started moving to areas like Gurgaon, Noida and new hotspots like Greater Noida, Manesar, Rai (Sonepat), Vaishali, Indrapuram (Gaziabad) because of variety of reasons like infrastructure development (Yamuna expressway, International F1 Track, Good roads, Shopping centres), availability of jobs (now people travel from Delhi to Noida & Gurgaon for work), good public transportation after metro.

By 1991, Delhi was also developing along with the 'counter magnet cities' and in a book authored by National Capital Region Planning Board (1996), the following were observed. (Some information has been modified as per the present data available).

1. More than 0.3 million people commute to Delhi everyday from the NCR, adding to the day time floating population and other connected problems.
2. The neighbouring states of Uttar Pradesh, Haryana and Rajasthan account for over 70 per cent of the migration to Delhi. This large scale migration is basically in search of employment opportunities and consequent family movement. The large scale movement to Delhi can be attributed to the substantial growth of industries, specially small and medium scale and expansion of trade and commerce, buffeted by growth

imbalance in the National Capital Region, mostly due to absence of co-ordinated growth concept.

3. Delhi's water supply requirement was estimated at 2950 million litres per day (MLD), against which only 2120 MLD was available in 1991 and this quantum was further reduced during peak summer season and often aggravated by erratic flow of water supply from Haryana and Uttar Pradesh.
4. The pattern of population and activity growth from 1951 to 1991 had led to serious environment decay. Both air and water in Delhi are highly polluted and causative factors are traced to urban uses, such as industry, transportation, commerce, housing etc. (For example, the Biochemical Oxygen Demand load discharged into the Yamuna amount to 443 tonnes/day by a Report of Central Pollution Control Board (Water Quality Status of Yamuna River (1999 – 2005), 2006). As a result water quality is even unsuitable for use by animals.
5. The World Health Organization has classified Delhi among the ten most polluted cities. It is estimated that 2500 MT of pollutants are emitted everyday in the atmosphere of Delhi. Vehicular sources contribute 64 percent, thermal power plants 16 percent, industries 13 percent and domestic sources 7 per cent to the total pollution. Recent studies show that Delhi ranks First in a list of cities by PM 2.5 annual mean concentration measurement whose measurement is greater than or equal to the Air Quality Guideline (AQG) of 10 as documented by the World Health Organization covering the period from 2008 to 2013, with the majority of values for the years 2011 and 2012. (Wikipedia², 2016)
6. The aim of the National Capital Region Planning Board is not to shift population from one place to another, nor yet to arbitrarily shift economic activities in an arbitrary manner. The changes were sought to be carried out with democratic popular participation, within the ambits of synchronized policy structures and keeping in view the natural growth in the National Capital Region and drawing upon the experiences in other parts of the world, particularly in highly developed urban centres with similar human problems.

In the Regional Plan of 2001, it was also observed that NCR, with more than 100 urban centres and endowed with ecologically sensitive natural features such as ridge, wetlands, sanctuaries etc. needs to be planned in a way to achieve an environmentally sustainable pattern of urban development through a rational land use pattern and conservation (Anon, 2016). This environment issue was not a part of the original concept of NCR.

NCR's connectivity is limited and focal to Delhi, thus acting as a constraint to tourism growth in the region. There is only one major domestic and international airport at New Delhi,

restricting the air access within the region. It was also observed that NCR is not linked very well with an intra-regional road network. Currently, national and state highways serve as the major road connections within the NCR, but there are several lags in last-mile connectivity, which can stall the tourism potential in the region.

Though the concept of NCR started with a noble cause, but in time the developed peripheral towns (counter magnets) started acting as 'growth-poles' and again faced the issues of in-migration from neighbouring rural and urban areas. Not only rural migrants from peripheral area but also technologically qualified people from other urban area of the country found their jobs in NCR. This resulted in another dimension of migration. This kind of unregulated growth is resulting issues like increasing traffic volume, human density and pollution. Thus; this model is found not suitable for implementation in other metropolitan cities of India.

Provision of Urban Amenities to Rural Area (PURA)

It was understood by Government of India that strengthening the villages would stop immigration to the urban areas. It was declared by the then President of India, Dr. A.P.J. Kalam, on the eve of Republic Day, 2003. It stressed upon "empowering the rural people." This empowerment was envisaged in establishing "connectivity" in rural areas. This includes "Physical connectivity", "electronic connectivity" and "knowledge connectivity", thus reinforcing the rural habitat and providing modern economic linkages. It is essential that PURA has to become a business proposition to be run by small scale industrialists, entrepreneurs, and societal establishments" (Excerpts from speech of President of India, 2003). Government's support was envisaged to be in the form of empowering such management agencies, providing initial economic support and finding the right type of management structure and leaders to manage and maintain.

The pilot phases of PURA was implemented from 2004-05 till 2006-07 over 7 states for provision of transport facilities, power, electronic facilities, knowledge dissipating establishments, connectivity of markets and provision of drinking water and health facilities. It was observed in the pilot phases that with the lack of business plans and with conventional mode of scheme delivery, there was less participation of private partners. Further, as the concept was largely infrastructure centric and site selection did not factor growth potential, it could not attract private entrepreneurs for any 'profitable' economic activity. There was also lack of institutional structure with dedicated professionals and no convergence with other schemes of Rural Development or other Government. Departments (Scheme for Provision of Urban Amenities in Rural Areas (PURA), 2011)

After appraising the pilot phase, Planning Commission advised in 2007 that PURA may be re-designed as a demand-driven program through Public Private Partnership (PPP) mode

between village administration ('Gram Panchayats') and private sector partners. The cabinet approved restructured PURA scheme in January 2010, which was notified and re-launched in April 2010. The implementation was funded by Ministry of Rural Developments along with other Central Government schemes. PURA was conceived as a 'business plan' and not an activity of 'Corporate Social Responsibility'. The private partners were supposed to 'earn' from the projects. The provision and improvement of the physical infrastructure (like water and sewerage, village streets, drainage, solid waste management, skill development, development of economic activity, village street lighting, telecommunication, electricity etc) were to be provided by various Govt. schemes and the revenue earning projects (like village linked tourism, integrated rural hub, rural market, agriculture based service centres and any other economy based projects) were to be taken up by private partners.

The following are the major emphasis of PURA scheme:

1. The Government agencies of various levels of administration were incorporated to be involved in the scheme. (Panchayati Raj Institutions, District Administration, State Government and Central Government)
2. Leveraging public funds with private capital and management for creation and maintenance of rural infrastructure.
3. Operation and management of assets and services for 10 years.
4. Private developers have flexibility in choosing PURA project area and revenue generating projects as add-ons.
5. For the public amenities, Gram Panchayats / State Governments are to provide lands free of cost.
6. Concessionaires would have the right to collect user charges from the users of the add-on facilities.
7. Transformation of several schemes into a single project, to be implemented as per set standards in a defined timeframe, with the requirements of each scheme being kept intact.
8. Combining livelihoods creation with infrastructure development.
9. Enforcement of standards of service delivery in rural areas almost at par with those obtaining in urban areas.
10. Enforcement of service standards through a legally binding arrangement.

Even after re-launching of PURA scheme, the following are observed which swerve the scheme from its intended objectives:

1. The reformed PURA Scheme was giving stress on development of physical infrastructure rather than focusing on 'knowledge connectivity', which was one of the

preliminary concepts of empowering the rural population to impede rural-urban migration.

2. In the PPP mode of execution, private developers were provided well developed physical infrastructure to settle their business initiatives rather than involving them in the physical development process.
3. For development of public amenities and infrastructure, lands were provided free of cost, which was again criticized for giving undue leverage to the private entrepreneurs by spending public money.
4. The scheme was “open-ended, without specific guidelines and had no in-built business plan, according to a report by the National Institute of Rural Development”. (Pandey, n.d.)

With the new (present) government coming in force in 2014, the Prime Minister of India has launched the Shyama Prasad Mukherji Rurban Mission (SPMRM) in 2015 to mitigate the gaps in PURA scheme and bring in the concept of “smart villages”.

Shyama Prasad Mukherji Rurban Mission (SPMRM)

It has been observed that large parts of rural areas in the country are not stand-alone settlements but part of a cluster of contiguous settlements, or which are relatively proximate to each other, with a population of 25000 to 50000 in plain and coastal areas and 5000 to 15000 in desert, hilly or tribal areas. These clusters typically illustrate potential for growth, have economic drivers and derive location-wise and competitive advantages. As far as practicable, clusters of village would follow administrative convergence units of Gram Panchayats and shall be within a single block, “*tehsil*”, for administrative convenience. These clusters once developed can then be classified as ‘Rurban’.

Hence taking cognizance of this, the Government of India, has proposed the Shyama Prasad Mukherji Rurban Mission (SPMRM), aimed at developing such rural areas by provisioning of economic, social and physical infrastructure facilities over next three years. The vision of this mission is: “*Development of a cluster of villages that preserve and nurture the essence of rural community life with focus on equity and inclusiveness without compromising with the facilities perceived to be essentially urban in nature, thus creating a cluster of “Rurban villages”*” (National Rurban Mission ,NRRUM, Ministry of Rural Development, 2016).

The Rurban clusters would be developed by provisioning of training linked to economic activities, developing skills & local entrepreneurship and by providing necessary infrastructure amenities.

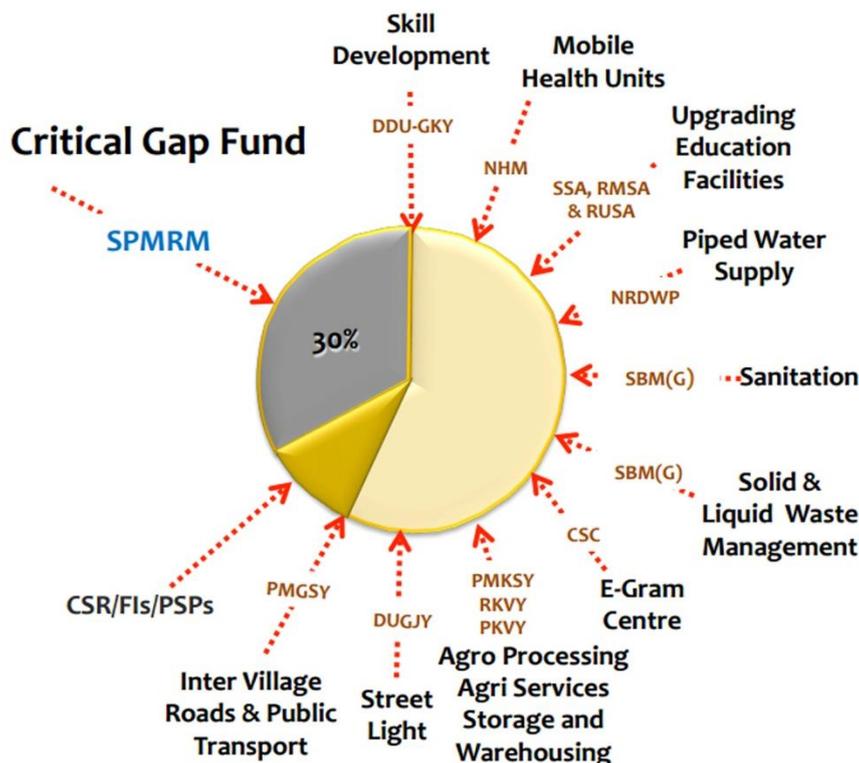
The following components are envisaged as desirable in each cluster:

- (i) Skill development training linked to economic activities
- (ii) Agro Processing, Agro Services, Storage and Warehousing.
- (iii) Fully equipped mobile health unit.
- (iv) Upgrading school /higher education facilities.
- (v) Sanitation
- (vi) Provision of piped water supply.
- (vii) Solid and liquid waste management.
- (viii) Village streets and drains.
- (ix) Street lights
- (x) Inter-village road connectivity.
- (xi) Public transport.
- (xii) LPG gas connections
- (xiii) Digital Literacy
- (xiv) Citizen Service Centres- for electronic delivery of citizen centric services/e-gram connectivity

Components pertaining to agriculture and allied activities would be required to be given special emphasis while developing these clusters. In order to achieve the above envisaged outcome, under National Rurban Mission (NRuM), the State Government shall identify existing Central Sector, Centrally Sponsored and State Government Schemes relevant for the development of the cluster and will integrate their implementation in an integrated and time bound manner.

Under the NRuM framework, Government of India shall provide Critical Gap Funding (CGF) to the clusters to supplement the shortfall in funding available through various Government schemes in achieving the outcomes desired for the cluster. The major outcomes of this scheme envisages at:

- Bridging the rural-urban divide-viz: economic, technological and those related to facilities and services.
- Stimulating local economic development with emphasis on reduction of poverty and unemployment in rural areas.
- Spreading development in the region.
- Attracting investment in rural areas.



DDU-GKY	Deendayal Upadhyaya Grameen Kaushalya Yojana
NHM	National Health Mission
SSA, RMSA & RUSA	Sarva Shiksha Abhiyan, Rashtriya Madhyamik Shiksha Abhiyan, Rashtriya Uchchattar Shiksha Abhiyan
NRDWP	National Rural Drinking Water Program
SBM (G)	Swachh Bharat Mission(Grameen)
CSC	Citizen Service Centre (under Digital India Mission)
PMKSY	Pradhan Mantri Krishi Sinchayee Yojana
RKVY	Rashtriya Krishi Vikas Yojana
PKVY	Paramparagat Krishi Vikas Yojana
DUGJY	Deendayal Upadhyaya Gram Jyoti Yojana
PMGSY	Pradhan Mantri Gram Sadak Yojana
CSR	Corporate Social Responsibilities
FIs	Financial Institutions
PSPs	Public Sector Participations

Source: (National Rurban Mission ,NRRUM, Ministry of Rural Development, 2016)

SPMRM also focuses on integrated skill development programs promoting PPP model of village development rather than only private sector participation. Similar to PURA concept, the overall institutional framework is designed to work from cluster, district, state and national levels in that order. Various states of India are asked to identify these potential clusters and this scheme is still at a very nascent stage.

Conclusion

India is a country, where profession is still hereditary and the social classification is also dependent on traditional professional practices. All the schemes discussed above, overlooked the social requirements of the villagers and lay stressed upon providing urban amenities to the rural areas. This, in time, converted the rural areas into semi-urban/ urban areas, which again, in turn, started acting as “growth poles” for migration of people from adjoining rural areas to semi-urban areas and from semi-urban areas to urban areas.

Development like these created inequality in quality of life (QOL) and created a pseudo impression of better quality of life in urban areas among the migrating population. The major 'pull factor' for this migration is the search for a better QOL and the 'push factor' being slow rate of economic development, lack of social and physical infrastructure and resentment of the rural folk. Thus, in reality NCR and PURA didn't help in reducing migration.

SPMRM started to fill the gap of these issues but as some critical analyses say, it may create issues of increasing inequality resentment among the villages. Also problems like slow process of land acquisition, rural-rural migration may create some worse scenarios slowing down the process.

SPMRM is scheduled to be a 'three year process' and making of Development Project Reports (DPRs), channelizing and funnelling all government schemes to mobilized funds in a synchronized manner and also initiating the participation of private entrepreneurs is a difficult task in three years of time frame; more so as this scheme has to be initiated by the government. Time will only prove how successful SPMRM becomes in restricting the rural-urban migration.

For India, it is envisaged that villages are to be developed as per the need of the villages. The social customs and behavioural norms of the villagers are to be understood for their aspirations of a better QOL. This could be achieved by providing the 'knowledge connectivity' to the rural population as required by the villagers for betterment of their traditional profession and job satisfaction.. Economic inequality could only be resolved by providing better jobs, and offering affordable physical and social infrastructure facilities. This will offer them with a better QOL with 'fresh air' and 'fresh food' (as advocated by Sir Ebenezer Howard in his 'Garden City Concept' of 1898 (Howard and Osborn, 1965)).

In this world of globalization, the methods and schemes implemented for restricting rural-urban migration and their subsequent results may be studied and suitable long term schemes may be adopted for India. Planning is a dynamic process and the past experiences may help the planners to come up with a more viable, practicable and implementable modus operandi for an integrated development that would restrict the rural urban migration in India.

References

- Anon , (2016). [online] Available at:
http://ncrpb.nic.in/pdf_files/18modified_ch14environment.pdf [Accessed 8 May 2016].
- Focusdelhi.com. (2016). *NCR, National Capital Region*. [online] Available at:
<http://www.focusdelhi.com/ncr/> [Accessed 10 May 2016].
- Government of India, (1985). *The National Capital Region Planning Board Act*. New Delhi: The Gazette of India Extraordinary Part-II Section I, p.6.

Howard, E. and Osborn, F. (1965). *Garden cities of to-morrow*. Cambridge, Mass.: M.I.T. Press. Census 2011

Kumar, P. (2014). Consequences of Rural Migration. *Kurukshetra- A Journal on Rural Development*, 62(11), pp.7-10.

Migration in India 2007-2008. (2010). NSS Report No. 533 (64/10.2/2). [online] New Delhi: Ministry of Statistics & Programme Implementation Government of India, p.H-i. Available at: http://www.mospi.nic.in/Mospi_New/upload/533_final.pdf [Accessed 28 May 2016].

Mohan M, Kandya A and Battiprolu A; 2011; Urban Heat Island Effect over National Capital Region of India: A study using the Temperature Trends, *Journal of Environmental Protection*, Vol 2, pp. 465-472

Mohapatra, A K. (2014). Rural-Urban Migration in India- A Critical Review. *Kurukshetra- A Journal on Rural Development*, 62(11), pp.18-21.

National Capital Region Growth and Development. (1999). New Delhi: HAR-ANAND Publications PVT LTD, pp.10-15.

National Rurban Mission ,NRRUM, Ministry of Rural Development. (2016) [online] Available at: <http://rurban.gov.in/download/modules/FOI.pdf>. [Accessed 10 May 2016].

Pandey, D. (n.d.). Revisiting PURA. *AIRO International Journal*, 6, p.2.

Razi, S. (2014). Rural Distress and Rural Migration. *Kurukshetra- A Journal on Rural Development*, 62(11), pp.3-6.

Scheme for Provision of Urban Amenities in Rural Areas (PURA). (2011). Final Report of Working Group. [online] New Delhi: Ministry of Rural Development, p.6. Available at: http://planningcommission.gov.in/aboutus/committee/wrkgrp12/rd/wgrep_pura.pdf [Accessed 18 May 2016].

The Indian Express. (2014). *NCR expands, planning lags*. [online] Available at: <http://indianexpress.com/article/business/business-others/ncr-expands-planning-lags/#sthash.LNtTvwEF.xsoJccdh.dpuf> [Accessed 15 May 2016].

Water Quality Status of Yamuna River (1999 – 2005). (2006). Assessment and Development of River Basin Series: ADSORBS/41/2006-07. Delhi: Central Pollution Control Board, p.3.

Wikipedia¹, (2016). *Environmental Migrant* [online] Available at: https://en.wikipedia.org/wiki/Environmental_migrant [Accessed 18 May 2016].

Wikipedia². (2016). *List of most polluted cities in the world by particulate matter concentration*. [online] Available at: https://en.wikipedia.org/wiki/List_of_most_polluted_cities_in_the_world_by_particulate_matter_concentration [Accessed 19 May 2016].

Urban development versus rural development and ruralism in South Africa and Zimbabwe. What the people really want

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Robert Chambers pointed the world to the injustice of the urban bias. Development is often equated with urbanization, industry and technology. It appears then development theory has also neglected the question of rural development, with the assumption that for development to be achieved within rural settlements, they must be modernized and urbanized. Countries such as South Africa and Zimbabwe have adopted development policies that promote development in the sense of modernization, as opposed to development in a holistic manner. This paper therefore profiles two communities Empa, in Limpopo South Africa and Tsholothso in Zimbabwe. Limpopo follows an urban development paradigm whereas Tsholothso follows a rural development approach. What emerges is that both communities view development differently, with both arguing that urban development is not always development and not what the people want. Ultimately, the paper concludes by proposing a harmonious rural development model that recognizes the unique and specific needs of rural populations and economies, without compromising the rurality of such settlements through imposing urban and technological development.

1. Urban vs. rural development

The concept of development has, over the years, been narrowed down to the idea of massive urbanisation and commercialisation of spaces. This may be the result of the history of development having occurred through modernization. Willis (2011:2) states that for many people, ideas of development are linked to modernity. Modernization can be seen as the general mechanism by which the social transformation from agricultural dominance to domination by trade and industry takes place, and the permanent continuation of this process (Charlton & Andras, 2003). This is when the traditional sense and function of society is taken over by massive industrialisation, thus society abandoning traditional and primary activities of society.

As seen in the industrial revolution of the eighteenth century in Europe, the abandonment of traditional society, rural society, led to this industrialization (and thus modernization) to be seen as the optimal form of socio-economic development and prosperity. The less developed countries such as countries in Africa and Asia, which industrialised a little later than Europe, wanted to follow suit. In the 1950s industrialization was seen as key to progress for the underdeveloped countries, (Chambers, 1997:16). 'They (the civil servants) want to modernise fast; they rightly observe that rich nations are non-agricultural and that their own agriculture is poor; and they wrongly conclude that rapid industrialization at the expense of agriculture can produce rapid development' (Lipton, 1978: 65). As a result they want rural administration and development. They believe that it is more difficult to plan for thousands of small farms than for a few big urban firms and that planning has little scope for changing rural life.

This has not only resulted in commercialisation of rural spaces and settlements, but also great rural depopulation and rural urban migration rates. This because, development and innovation has now been centralized and concentrated within non-rural settings. Where people found better living conditions, with economic opportunities, employment, access to better housing. In his book, Chambers (1983: 4), Chambers notes the extremes of differences in rural livelihoods to those of urban livelihoods. He deems this phenomenon as the "urban bias". In comparing the differences he states that, "At one end there coexist rich, urban, industrialised, high status cores, and at the other, poor, rural, agricultural and low status peripheries." Therefore, in light of this, this study shall look at the development quest, in view of establishing development methods that seek to retain the rural nature of rural settlements. One that will not impose the ideals of modernisation in the pursuit of rural development.

The negligence of rural development, particularly amongst developing nations is much evident than it ever was before. The focus and concentration of development investment on urban centres is evident in the socio-economic gap between rural and urban. Thus creation regional development inequalities. Where extremes of poverty and massive consumption coexist. The core problems of widespread poverty, growing inequality, rapid population growth, and rising unemployment all find their origins in the stagnation and often retrogression of economic life in rural areas" (Todaro 1997: 296). Rural areas have continuously been put at the bottom of the development hierarchy, when any consideration is given at all, the assumption is always that rural areas must be urbanised in order to be developed. Therefore, in light of this, this study mainly aims to develop a rural development model that pursues rural development without imposing the ideals of modernism on rural settlements, but instead, embraces ruralism, thus putting the needs specific to rural populations first, before those assumed by urbanist and modernist development practitioners.

2. Study area

The study was conducted in Qunu (Empa), Eastern Cape, South Africa, and Tsholotsho, (Hwange), Zimbabwe. Qunu is located in the Eastern Cape Province of South Africa. It is largely known for being home to the First President of South Africa, Mr Nelson Mandela. Qunu is located about 37km South West of Mthatha. It lies on the N1 between Mthatha and East London. Qunu was chosen specifically as a rural area within South Africa that possesses immense potential for liveable rural settlements. It lies along the main route between two major urban centres, which would mean better accessibility. It was also chosen because of its historic context, and thus tourism potential, however, it is chosen specifically because of the possibility of looking at these potentials being utilized without compromising the rurality of the settlement.

The specific model of development chosen for Qunu was the construction of a shopping mall within the Qunu area. The idea is modernist in nature. The mall was constructed with the hope of bringing services, particularly commercial services to the area, whilst providing possible employment opportunities for local residents. A private developer constructed it, and an interview was held with the investor responsible. The outcomes of the survey with local residents, as well as the specific interviews will be discussed in chapter four.

Tsholotsho is a rural district located in central western Zimbabwe; it lies south west of Harare and 98km northwest of Bulawayo. The name Tsholotsho was derived from the San word "Holohou", which means, "the head of an elephant. The area comprises of numerous villages and borders the south of Hwange National Park. Tsholotsho is made up of 22 Wards, each ward consisting of at least six villages. The area has a "Growth Point", which serves as a service centre for commercial, municipal and health services.

The development approach in this area is that of using nature based entities to pursue development. The entity being Hwange National Park (wild life to be specific). To do this, the area adopted what is known as the CAMPFIRE (Community Areas Management Programme for Indigenous Resources) project. The project emerged in the mid-1980s, with the recognition that as long as wildlife remained the property of the state no one would invest in it as a resource. CAMPFIRE includes all natural resources, but its focus has been wildlife management in communal areas particularly those adjacent to national parks, where people and animals compete for resources. CAMPFIRE begins when a rural community, through its elected representative body, the Rural District Council, asks the government's wildlife department to grant them the legal authority to manage its wildlife resources and demonstrate its capacity to do so. CAMPFIRE makes wildlife valuable to local communities because it is an economically and ecologically sound land use (Tsholotsho Rural District Council, n.d).

3. Methodology

The study employed a mixed methods case study approach. This was necessary so as to elicit responses that determine the development trajectory of the two study areas. Similarly the interpretive research designs and the descriptive explorative design was selected because it was meant to elicit response that subjectively describe the developmental paths in both Empa and Tsholotsho. In addition the two designs are appropriate because the paradigms are concerned with understanding the world as it is from the subjective experience of individuals. The designs employ meaning (versus measurement) oriented methodologies, such as interviewing or participant observation, and rely on a subjective relationship between the researcher and subjects.

To collect data questionnaires, interviews and observations where utilized. These techniques sought to elicit responses on rural development models, modernization and the urban biases in the study areas. To encourage participation and an in-depth response, a focus group discussion was organized where respondents engaged with themselves and the researcher on the issues of rural development, modernization and the urbanism. Observation as a technique was also used to note and observe the development in the study areas as well as during the focus group studies. Lastly interviews with key informant such as administrators and politicians where also conducted.

Data analysis of the questionnaires was carried out in Microsoft excel where all data was captured, cleaned and summarized. After cleaning descriptive statistical analysis was conducted to provide a general view of the development trajectories in Empa and Tsholotsho. The analysis focused on the demographic composition, level of basic services, the local authorities management approaches, how the residents viewed development and their opinion on the overall development trajectory in Empa and Tsholotsho. Qualitative

analysis on these issues was also done using Atlas TI to identify the main themes raised by the residents.

Lastly the study period focused on the development trajectories post independence, that is; from 1980 for Tsholotsho, and 1994 for Empa

4. Results and discussions

The Empa findings are presented first followed by Tsholotsho. A general discussion then follows and lastly the conclusion is presented

4.1 Empa trajectory

The findings indicate that, 30% of the respondents had no access to water. It is often reported that, one in three people (in Sub-saran Africa have access to proper water facilities, this is not a surprising reflection. This remains a negative reflection. Conversely, there was a general reflection that the respondents have access to basic education, hence the 100% reflection of accessibility of schools. This reflection also isn't surprising, as the United Nations grants that primary school enrolment in Sub-Saharan Africa improved from 52% to 80% between 1990 and 2015. On its own, South Africa emphasizes this in its basic human rights as stipulated in the 1996 constitution. Hence there is not much of a difference compared to urban areas

Regarding modernisation, and particularly the impact of modernising Empa, through building a shopping complex the responses where interesting. The basic idea behind the initiation of the complex was to create an entity that would bring about employment opportunities, as well as to promote Empa, Qunu as a Tourist destination. Views from the residents in relation to this idea, is that although employment has been created as a result of the mall development this has not been permanent and created few opportunities. As a result over 80% of the residents are employed outside the Empa, Qunu area. Therefore this shows that modernisation does not necessary bring about employment, nor urbanisation equating to employment opportunities.

The most notable impact of the mall in the area is that of the availability and provision of commercial services. Respondents noted that they no longer needed to travel to Umthatha or Viedgesville for services such as automated teller machines (ATMs) (although they noted that they wished that it was not just ATMs, but complete banking branches), hardware stores, salons, and supermarkets. However, the mall developer noted that there are challenges in sustaining the entity, particularly because of infrastructural issues such as road networks' condition, as well as telecommunication connections. Hence modern developments are not the panacea to solving rural poverty and development. Similarly it was also noted that development of the mall was ill conceived as the surrounding area lacks the population and financial muscle to sustain the mall. Hence the development is bound to fail further supporting the notion that modernisation does not always equate to development. Perhaps development of rural focused approaches such as supporting smallholder farmers or the arts industry could have worked. Therefore this requires a policy shift, which does not impose urbanisation or urbanism on residents

Interestingly enough the residents in Empa agree that it is a liveable area because of their traditional connection to the area. Despite this 73% of the respondents wish that Empa, Qunu would be a city. With the recent talks of the area being turned into a city because of its

historical significance, those who anticipate this believe that the urbanization of the area would imply better lives for them. This is because of the assumption that, the urbanization of the area would bring employment prospects, better infrastructure and services available to them. Yet the mall development has not brought about much change.

4.2 *Tsholotsho trajectory*

With regards to access to basic services, all the respondents in the survey expressed that there was a viable number of schools in the area. However the respondents noted that state of the roads where in appalling condition, which led to poor public transport operation in the area. One has to also note the impact on Tsholotsho from the Hwange National Park, and its CAMPFIRE project involvement. Most of the respondents noted the advantage of having the park with reference to the CAMPFIRE project. These advantages including building of schools from the CAMPFIRE project funds as well as improved knowledge on wildlife management.

Furthermore unlike the Empa case the CAMPFIRE project is about natural resources management, with the aim of empowering and benefiting local residents, in terms of how these natural resources are used, and in this case, it is the wildlife in the surrounding the area. The project runs on hunting programs that generate incomes and redistribution of revenues amongst local residents. What also stood out from observation of the committee meeting was learning that the whole process of the CAMPFIRE project aims to largely involve women in the development processes of their community. They placed special emphasis on women being elected as part of the elected committee. Consequently CAMPFIRES notion of development is rural-based and it notes that for development to occur one does not have to be urban or modernise. This is attested by 60% of the respondents saying that Tsholotsho was a liveable environment, because they had access to land, and water, schools and health facilities. With such services, however, they also expressed that they wished water was available at shorter distances or more boreholes were provided. Interestingly the majority of the respondents (87%) argued that Tsholotsho should be turned into a city. This was largely supported by their general belief that a city would result in better living conditions, employment opportunities, better facilities etc. which again, shows their association of development with modernization and urbanism. Nevertheless when asked what needs to be developed in the area most residents pointed out there is need the need for improved farming infrastructure management of natural resources and an expanded farming market for the community as a possible development prospect.

5. Conclusions

From the study it emerges that in Africa and developing countries there is the common assumption that urbanisation and modernisation equates to development. This permeates through policy and this has resulted in underdevelopment of rural areas as demonstrated in the Empa, case. Interestingly it is a often perceived that urbanisation often leads to development even when evidence suggest otherwise. Interestingly enough in both Empa and Tsholotsho testify that their rural way of life is sufficient yet they still yearn for urbanisation. Perhaps it is because of the common rhetoric which presents urbanisation as superior to rural development. The time is now for governments to realise that rural development should be pursued and not forgotten at the expense of urban development. After al not everyone wants to be urbanised as the people in Tsholotsho testify. What should be pursued is perhaps a middle ground policy that seeks to maintain rural development and only to

modernise where necessary. This is even more pressing given issues of climate change and sustainable development. It is high time peoples perceptions matter. For example people in the Western Cape in the Wine lands region, South Africa have rejected mining developments and opted to keep their communities agricultural. Hence what the people want as a development paradigm should preside rather than imposing urban development.

References

- Akgün, A.A., Baycan, T. and Nijkamp, P., 2015. Rethinking on sustainable rural development. *European Planning Studies*, 23(4), pp.678-692.
- Bealer, R. C., Willits, F. K., & Kuvlesky, W. P. (1965). THE MEANING OF RURALITY IN AMERICAN-SOCIETY-SOME IMPLICATIONS OF ALTERNATIVE DEFINITIONS. *Rural sociology*, 30(3), 255-266.
- Berry, K.A., Markee, N.L., Fowler, N. and Giewat, G.R., 2000. Interpreting what is rural and urban for western US counties. *The Professional Geographer*, 52(1), pp. 93-105.
- Barbbie, M. 2010. *Research Methodological Foundations*. Canada: Nelson Education Ltd
- Bryman. A. and Bell, E. (2008). *Business research methods*. New York: Oxford University Press.
- Bueno, R.D.A., 2009. Globalisation, Economic Policy and Rural Development in Europe. *Romanian Journal of Political Science*, 9(1).
- Cant, M. (2011). *Marketing Research*. Claremont: New Africa Education.
- Chambers, R. (1997). *Whose reality counts?: putting the first last*. Intermediate Technology Publications Ltd (ITP).
- Charlton, B., & Andras, P. (2003). *The modernization imperative* (Vol. 8). Imprint Academic.
- Chari, S., & Corbridge, S. (2007). *The development reader*. Routledge.
- Churchill G.A. and Brown, D. (2006). *Marketing Research: Methodological Foundations*. 5th Ed. United States: Saunders College.
- Collins, H. (2011) "Creative Research: The Theory and Practice of Research for the Creative Industries" AVA Publications
- Converse, Jean M. and Presser, S. 2006. *Survey Questions: Handcrafting the Standardized Questionnaire*. Sage University Paper series on Quantitative Applications in the Social Sciences, 07-063, Beverly Hills: Sage Publications.
- Cooper, M. Donald, R. Pamela, R. (2006) *Business Research Methods*. (9th Edition) Boston: Irwin, McGraw-Hill
- Crowther, D. & Lancaster, G. (2008) "Research Methods: A Concise Introduction to Research in Management and Business Consultancy" Butterworth-Heinemann
- De Lisle, J., 2011. The benefits and challenges of mixing methods and methodologies: Lessons learnt from implementing qualitatively led mixed methods research designs in Trinidad and Tobago.

Delost, M.E. and Nadder, T.S., 2013. Guidelines for Initiating a Research Agenda: Research Design and Dissemination of Results. *Clinical laboratory science: journal of the American Society for Medical Technology*, 27(4), pp. 237-244.

Du Pisani, J.A., 2006. Sustainable development—historical roots of the concept. *Environmental Sciences*, 3(2), pp. 83-96.

Flora, C. B., Flora, J. L., Spears, J. D., & Swanson, L. E. (1992). *Rural communities: legacy and change*. Westview Press.

Harmse, A., 2010. Node Selection for the integrated sustainable rural development programme in South Africa. *Development Southern Africa*, 27(3), pp. 429-445.

Schneider, L. (2004). Freedom and unfreedom in rural development: Julius Nyerere, ujamaavijijini, and villagization. *Canadian Journal of African Studies/La Revue canadienne des études africaines*, 38(2), 344-392.

Shafeek, S. (2009). Enhancing the Strategy for Developing Small Growth Potential Firms in the Eastern Cape. *Journal of African Research in Business Management*, 4(4), 27-56.

Singh, K. (2009). *Rural development: principles, policies and management*. Sage Publications.

Tustin, D.H., Ligthelm, A.A., Martins, J.H. And Van Wyk, H.D.J. 2005. *Marketing Research in practise*. Pretoria: University of South Africa

Wilson, V. (2010). *Marketing Research in practise*. Pretoria: Van Schaik

Zindiye, L (2008) "Rigour", "Ethical integrity" or "Artistry"? Reflexively reviewing criteria for evaluating qualitative research. *British Journal of Occupational Therapy* 69 (7) 319-26

Willis, K., 2011. *Theories and practices of development*. Taylor & Francis.

Zikhali, P., 2010. *Livelihoods after Land Reform in Zimbabwe*.

Planning for a Sustainable Metropolitan Region in Brazil and North America: Challenges and Strategies

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Abstract

The rapid transformation of urban areas fosters the need for new insights into effective regional governance and sustainable planning. Brazilian and American federalist structures offer a variety of institutional and legal frameworks for metropolitan planning and management to address problems and provide services. The variety of their legal and political structures, major metropolitan planning and public engagement efforts, and potential implementation strategies reveal learning opportunities for future planning endeavors. This paper provides an overview of metropolitan growth, governance and planning in two major metropolitan areas: Belo Horizonte, Minas Gerais and Portland, Oregon; discusses concepts of sustainability at the metropolitan scale; and determines the best practice tools and policies used in Brazil and North America to promote sustainability and create the cities we need.

Introduction

The exponential growth of global populations and the continued migration from rural to urban areas have profound impacts on functional urban areas (also referred to as metropolitan areas, metropolitan regions, city-regions, or extended urban areas). Technology and the globalized nature of growth patterns in urban areas impact economic development, service provision, agricultural production, environmental quality, residential sprawl, real estate speculation, human well-being, and ecological sustainability. Metropolitan areas around the world are experiencing the large-scale expansion of their urban peripheries, engendering low density suburban sprawl in the case of North America or a checkered pattern of informal occupations and luxury gated communities as in Brazil and other Latin American countries. In both cases, the clear dichotomies that once defined the urban and the rural have dissipated, giving way to a scattered urbanism with ill-defined borders. Growing consumption patterns continue to extend human impact far beyond traditional political boundaries and deeper into the hinterlands, as activities like mining and resource extraction expand to support industrial production and urban living.

More than ever, regional planners must be able to adapt to changing conditions. Globalization has transformed the role of government from centralized authority to actor among many actors influencing urban development. Governments now compete for, partner with, and act alongside large corporations that operate in global networks within the margins of their own functional networks (Castells, 1996). Beyond the environmental and climatic impacts of these patterns, and despite the unequivocal primacy of the global market on urban spatial structure, government goals and policies established through collaboration and adaptive planning have unquestionably important roles to play in labor markets and social well-being. Although metropolitan areas have grown enormously in size and complexity since the industrial revolution, many still lack mechanisms – either through forms of regional government or through regionally-oriented horizontal cooperation of local governments – for addressing the multidisciplinary issues related to urban development (Wheeler, 2008).

These growth trends, along with the accompanying challenge of managing urban services and development in a host of political environments, foster the need for innovative planning methods and reaffirm the need to align the urban institutional system with the economic, social, and environmental spatial structure of urban areas. Integrated urban planning of

certain growth functions can promote efficient and equitable delivery of services and infrastructure, share public costs, “promote economic prosperity, social cohesion and environmental sustainability,” and “strengthen pluralist democracy, ensuring equal opportunity for the full participation of all individuals in the economy and society and for maintaining confidence and trust in public institutions” (OECD, 2016). In metropolitan areas with diverse spatial and governing structures, governments have found innovative solutions to transcend such boundaries through a variety of planning strategies. These places have experienced a range of successes in sustainable planning using policy tools like mandates from state or federal authority, and strategies like building consensus and constructing shared vision through robust public participation in the planning process.

Recently, there has been a resurgence of interest in metropolitan regions among planners and academics, many of whom have dedicated great attention to understanding effective forms of metropolitan governance (Soria & Valenzuela, 2013; Heinelt & Kubler, 2005; Costa et al, 2014; Compans, 2015; Alexander, 2010). A smaller body of literature, however, is dedicated to understanding the best practices in the metropolitan *plan* process and plan document itself. ‘Planning’ and ‘management’ each refer to distinct time horizons and activities. Planning is, in many ways, preparation for future management (Souza, 2010). This paper, therefore, concerns itself with the plan, in terms of the planning process and the final outcome and utility of the plan document as a tool for promoting sustainable growth. The paper provides an overview of metropolitan growth, governance, and planning in two major metropolitan areas: Belo Horizonte, Minas Gerais, Brazil and Portland, Oregon, U.S.A.; discusses concepts of sustainability at the metropolitan scale; and proposes best practice tools and policies for metropolitan planning that promote sustainable development. Finally, the paper examines Brazil’s recently adopted Statute of the Metropolis and proposes additional opportunities for research and practice, including the foundation of a plan quality evaluation.

Urban spatial structure and urbanization can be measured in a host of ways, including residential and job densities, monocentric and polycentric growth, and the connection between land use and transportation. Spatial structure impacts social and environmental measures such as motor vehicle usage, walkability, housing integration, open space and ecosystem preservation, cost-effective infrastructure and service provision, and the enhancement of sense of place (Wheeler, 2008). While spatial structure is influenced primarily by market forces, government policies impact the sustainability of urban spaces from social, environmental, economic, and participatory perspectives (Wheeler, 2000).

Cities did not become the primary target of sustainability efforts until the 1990s, when “sustainable city” programs began blossoming around the world (Berke, 2002). Sustainable development as a holistic and long-term approach now represents a new planning paradigm (Wheeler, 2000; Berke, 2000; Beatley and Manning, 1997). To address the growth of unsustainable development patterns – namely uncontrolled outward growth – and create more inclusive and environmentally responsible communities, planners began to promote the idea of compact development, in what eventually became known as *smart growth* planning (Smart Growth Online, 2016). Other organizations and coalitions began working to promote sustainable development, such as the Congress for New Urbanism, founded in 1993, and Smart Growth America, founded in 2002. The United States Environmental Protection Agency launched its smart growth program in 1995.

Ten principles guide the smart growth movement: (1) Mix land uses; (2) Promote compact development; (3) Create a range of housing opportunities and choices; (4) Create walkable neighborhoods; (5) Foster distinctive, attractive communities with a strong sense of place; (6) Preserve open space, farmland, natural beauty, and critical environmental areas; (7)

Strengthen and direct development towards existing communities; (8) Provide a variety of transportation choices; (9) Make development decisions predictable, fair, and cost effective; (10) Encourage community and stakeholder collaboration in development decisions (Smart Growth Online, 2016). Many of these principles overlap with the United Nations 2030 Sustainable Development Goal Targets for making cities inclusive, safe, resilient, and sustainable, especially within an international development setting (United Nations, 2016). These principles have found their way into local and regional plans around the world.

Planning vs. Management

Understanding the governance structures and relationships between various actors and growth machines is an early step in developing a long-term implementation plan for a metropolitan area. Planning on a functional urban scale requires government, and to that extent the problems of managing urban growth relate directly to questions of governmental structure, fragmentation, and cooperation. Jurisdictional fragmentation of urban areas can undermine the ability to think regionally, limit regional initiatives between local governments, foster turf warfare, and embolden higher-level government bodies already unwilling to support attempts at metropolitan coordination (Wheeler, 2000). Between the 1960s and 1980s, efforts were made to better align administrative territories and the ‘functional’ metropolis in order to improve land use and transportation planning and management through the metropolitan model (Rao 2007). According to C. Lefebvre (1998) this metropolitan model of government includes four basic characteristics: (1) Strong political legitimacy; (2) Meaningful autonomy; (3) Wide-ranging jurisdiction; and (4) Relevant territorial cover. A two-tier metropolitan government is one optional form of this model, combining metropolitan-initiated land use and infrastructure planning with local government implementation of zoning and small-scale infrastructure and services. While this structure sets the stage for influential metropolitan-scale policies, in many places it remains politically infeasible, and alternative or modified forms of governance structures are established. In countries like the United States and Brazil, where decentralized control of land use, or municipal autonomy, are treasured prerogatives, the metropolitan model is not likely to prevail (Mondale & Fulton, 2003). The only example of a successful centralized metropolitan government in the United States is Portland.

Rarely do planning case studies compare the planning experiences of two metropolitan areas within entirely different socio-economic and political contexts. Yet this comparison can yield a host of planning strategies and reveal the universality and transferability of certain planning concepts. Table 1 below illustrates a number of similarities and differences between Brazilian and American cities in terms of the key challenges they face, demonstrating that cities in both countries must address many of the same obstacles at the regional scale.

U.S.A	Both	Brazil
<ul style="list-style-type: none"> • Automobile dependence • High per capita carbon footprint • High per capita expenditures on infrastructure • Strong property rights and NIMBY movement • Variety of natural hazards 	<ul style="list-style-type: none"> • Rapid outward growth • Noncontiguous growth • Geographic isolation of rich and poor • Increasing land consumption per capita • Income inequality • Gentrification of centralized neighborhoods • Spatial inequities 	<ul style="list-style-type: none"> • Informal settlements / Precarious housing • Rapid expansion of gated communities • Highly degraded watersheds • Strong monocentric urban structures • Growing automobile use

Table 1: Overarching urban challenges in Brazilian and American metropolitan areas

Portland Metro and the Metropolitan Region of Belo Horizonte (RMBH) have been chosen because of their uniquely progressive planning experiences, both in terms of their metropolitan planning processes and their institutional construction. These experiences provide learning opportunities primarily from their successes, but also from failures and ongoing evolution. In the United States, Portland is hailed for its success in managing urban growth and curbing sprawl by means of a strongly regulated Urban Growth Boundary (UGB), encouraging higher-density development, infill development and redevelopment, and relatively high proportion of public and bicycle commuters. In Brazil, the recently adopted Master Plan for Integrated Development in Belo Horizonte provided the nation with a key example of metropolitan planning, both for its public engagement strategy and its growth management strategy that encourages development within transit-oriented development nodes. In spite of their emphasis on sustainable development, they are not intended to represent the broader experience of metropolitan planning in the United States and Brazil. Below are descriptions of the institutional planning contexts in Portland and Belo Horizonte.

Institutional Context: Belo Horizonte, Brazil

In Brazil, the Federal Constitution of 1988 delegates the power of planning and land use regulation to highly autonomous municipalities, with the master plan, or *Plano Diretor*, being the fundamental political and legal instrument for urban development and expansion. However, the law also includes limits on municipalities when land use conflicts with the public interest of the *metropolitan region* (RM), a legal interpretation reaffirmed by the recently adopted Statute of the Metropolis (Costa & Marguti, 2014). This interpretation extends to zoning and subdivision regulation as well, wherein metropolitan regional agencies may require metropolitan-level review of zoning and subdivision applications.

The constitution makes RMs entities of the state, and establishes the shared responsibility of growth management between the municipality and the state. This structure allows for a wide variety of metropolitan management and governance models between the states, despite their lack of political, electoral, or jurisdictional power and representatives elected directly by the people. Following the adoption of the Constitution, states failed for years to incorporate metropolitan regions into their constitutions. The fight to maintain municipal autonomy prevented strong RM institutions. On the other hand, some states adopted legislation anticipating metropolitan growth (Souza, 2010). For example, the state of Santa Catarina defined *areas of metropolitan expansion* and the state of Minas Gerais defined the *metropolitan collar*.

Metropolitan planning in Brazil was born during the country's military dictatorship, which lasted from 1964 to 1985. In Minas Gerais, one of the initial regional planning efforts occurred in 1969 with the Preliminary Plan of Integrated Development for Belo Horizonte and Nearby Municipalities in the *Grande Belo Horizonte*. In 1973, *Federal Law 14* established, along with others throughout the country, RMBH. In 1974, the autonomous agency of Metropolitan Regional Planning of Belo Horizonte (Plambel) was established, and would later become an entity of the state government under the State Secretary of Regional Development and Urban Policy (Sedru).

Much like in the United States, finding sustainable solutions has depended upon coordinated consensus planning and voluntary associations of local government. One example is Granbel. Founded in 1975 as a forum for debates and policy decision, Granbel is an association of the 34 municipalities of the RMBH. The general assembly comprises representatives from each of the municipalities. Each municipality contributes to the Fund of Participating Municipalities (Estatuto da Granbel, 2011). Granbel has been effective in

distributing information and incentivizing the absorption of supra-local priorities within *planos diretores*.

The Metropolitan Regional Development Agency (Agência RMBH) was created in 2009, with the objective of regulating the urban metropolitan region, including the municipalities located in its *metropolitan collar*. Agência RMBH regulates metropolitan-level land use through the issuance of guidelines and grants. Additionally, the Agência RMBH may exercise police power to control the region's urban expansion. In the state of Minas Gerais, metropolitan land use regulation is considered a function of public interest recommended by law (State Law 89/2006). In order to reduce or eliminate conflicting and potentially detrimental decisions made by individual municipalities, this law mandates that public institutions act to resolve municipal conflicts and promote environmental protection. Agência RMBH provides technical support to municipalities revising their plans to be compatible with the Master Plan of Integrated Development (PDDI) and Metropolitan Macrozonning, as well as administrative review of zoning and subdivision applications. Because Brazilian law stipulates the revision of municipal comprehensive plans every ten years in municipalities within metropolitan regions, this serves as an opportunity to satisfy the requirement.

Institutional Context: Portland, United States

In the United States, early experiments in institutional reform of the functional urban area foreshadowed the challenges involved in establishing strong, consolidated metropolitan governments. During the urban growth of the industrial revolution, the general strategy of American cities to provide services was to expand municipal borders by annexing land around them. Eventually, single-purpose regional districts were created to handle water, sewer, and park needs. During the early twentieth century, the Regional Planning Association of America (RPAA) pushed the metropolitan-scale approach to planning and management, advocating the need to plan comprehensively. In the 1950s, the need for coordinated regional governance became recognized as key to providing adequate services and promoting equitable urban development (Goldman & Deakin, 2000). This recognition manifested itself in a wave of experiments in regional government creation and consolidation: city-county consolidations, creation of councils of government (COGs), strengthening of metropolitan planning organizations (MPOs), and two-tier metropolitan government structures like Minneapolis-St. Paul and Portland (Wheeler, 2000).

While land use and housing policy typically lack regional coordination, transportation is coordinated through MPOs, which were originally designed to respond to federal mandates and distribute federal funds. Although MPOs gained additional transportation responsibilities under subsequent legislation such as the federal government's Clean Air Act Amendments of 1977, land use and housing responsibilities decreased and federal funding for comprehensive planning disappeared. Other obstacles to comprehensive planning at the metropolitan level exist as well; Goldman & Deakin (2000) suggest, for instance, that "the lack of representativeness of MPO boards may pose a real obstacle to their ability to acquire strong powers for regional governance." In rare cases, states afford additional authority to MPOs, including the right to mandate transportation-land use coordination, management of an urban growth boundary, distribution of affordable housing, or operation of public transportation services.

While the 1980s witnessed a worldwide decline in metropolitan planning and the weakening of COGs, the 1990s saw a revival of interest with the growing popularity of smart growth and urban sustainability. The 1991 federal Intermodal Surface Transportation Efficiency Act (ISTEA) pushed for more progressive regional transportation planning that considered multimodal options and empowered MPOs with project prioritization (Goldman & Deakin,

2000). ISTEA responded to a growing call for devolution of transportation planning from the state and federal level to local and metropolitan level, expanded federal funds available for regional planning, and increased the responsibilities of MPOs.

In Oregon, the nineteen statewide planning goals and guidelines adopted in 1973 set the course for regional planning in the Portland metropolitan region and served as the foundation for a strong, statewide program. Its goals encompassed land use, transportation, housing, natural resources, energy, air, water and land quality, and citizen involvement. A Metropolitan Service District (Metro) was created by the Oregon state legislature in 1977, originally as the consolidation of a regional planning council, a Metro service council responsible for solid waste disposal, and the administration of a regional zoo (Metro). In 1990 it was given additional responsibilities for various facilities (e.g. stadium, exhibition center), and in 1994 several regional parks, cemeteries and marine facilities were incorporated into its jurisdiction. Local governments in the area (three counties and 25 cities/townships) have created a coordinating group (FOCUS) to help develop joint recommendation to the Metro Council, and a regional planning advisory committee has local government representation. Most notably, the Portland Metro holds the authority to levy property, sales, and income taxes, and issue Metro bonds.

In 1992, the Greater Portland Region's voters adopted a Charter for Metro, which was later amended in 2000. The Metro Charter established Metro's primary responsibility as "planning and policy-making to preserve and enhance the quality of life and the environment for ourselves and future generations" (Metro Charter). The Charter provided Metro with jurisdiction over matters of metropolitan concern and required the adoption of a Regional Framework Plan. Local land use plans within Metro's boundaries now must be consistent with Metro's adopted Urban Growth Management Functional Plans and the Regional Framework Plan, as per Metro's Charter and state law. Similar to Granbel in the RMBH, the Charter establishes the basis for regional planning coordination with the formation of the Metro Policy Advisory Committee (MPAC), a committee of local government representatives and citizens that advises the Metro Council on policy issues. It also creates a citizens' advisory committee – Metro Committee for Citizen Involvement (MCCI). Unlike RMBH and other regions in Brazil and the United States with councils made up of representatives from each municipality, Portland's publicly-elected Metro council members do not actively advocate for the interests of any one city or town, which can conflict with the interests of individual cities and towns in the region. This tension helps to explain why Metro's institutional framework has not been copied in many other places.

Planning for Sustainability in Belo Horizonte

RMBH's recent planning initiatives, in spite of continued challenges, serves as one of Brazil's foremost metropolitan planning examples. Half of country's metropolitan regions do not have and are not currently working on integrated plans at the metropolitan level (CITATION). The fundamental planning initiative at the metropolitan level was carried out through the Master Plan of Integrated Development, PDDI, of RMBH, which established guidelines, policies, programs, and projects. In 2009, Sedru developed a contract to work with the Federal University of Minas Gerais (UFMG), under the coordination of the Center for Regional Planning and Development (CEDEPLAR) and other collaborating universities, to develop the PDDI. By outsourcing the work to universities, the scope of discussion could be amplified and diversified. The plan was realized by a massive team of students, professors, city planners, consultants, and a total of 3,000 members of the public (Plano Diretor de Desenvolvimento Integrado, 2011). The final plan document consists of six volumes. Within the six volumes are: (1) the proposed territorial restructuring; (2) policies within the plan's four growth themes: accessibility, security, urbanity, and sustainability; and the (3) proposed

institutional restructuring. Because of the infancy of progressive metropolitan planning in the country, one goal of the PDDI was to establish and set a precedence for an ongoing planning process.

Macro zoning, part of the PDDI public policy of territorial organization, began in December 2013 through a contract between Agência RMBH and CEDEPLAR. The proposal is founded on the Zones of Metropolitan Interest, territories legally established by the state of Minas Gerais in 2012 (PL no 3078/2012) that trump local interest and create cohesive land use regulation at the metropolitan level. Responsibility for the management of these areas is shared between the state and the municipalities. This law adds a tool to the planning toolbox at the metropolitan level – one which ordinarily exists only at the municipal level. The law intends to strengthen the metropolitan arrangement of decision-makers through the Metropolitan Assembly, Deliberative Council of Metropolitan Development, Secretary for Metropolitan Management, and Agência RMBH.

Planning for Sustainability in Portland

Adopted by the Metro Council in 1995, the 2040 Growth Concept reflects the region's 50-year comprehensive plan for sustainable communities as required by the Metro Charter. In the Portland metropolitan region, the comprehensive regional plan for sustainable development is a combination of Oregon state statutes, the charter that establishes Metro, and the plans that have been adopted by Metro to satisfy the requirements and fulfill the investments called for in the regional plan. The plans include the 2040 Growth Concept, the Regional Framework Plan, the Urban Growth Management Functional Plan, regional transportation plans (adopted in 2010), the Metropolitan Greenspaces Master Plan (adopted in 1992), the Regional Water Supply Plan, and the Community Investment Strategy (adopted in 2010). These documents are implemented collectively through partnerships between Metro, local jurisdictions, community-based organizations, nonprofit agencies and private sector stakeholders. Additionally, there are 28 local comprehensive plans within Metro adopted by the 25 cities and three counties that are consistent with and carry out the policy requirements set forth in the statewide planning goals, guidelines, and the Metro plans.

The 2040 Growth Concept serves as a guide to manage the growth of the region. Development of the 2040 Growth Concept was based on thorough analysis of scenarios that tested alternative land use and infrastructure investments. The final growth concept selected draws from the best features of three scenarios, and forms the basis for the region's planning decisions by targeting areas of economic development, public infrastructure, and community development investment for the advancement of sustainability.

The Regional Framework Plan, adopted by Metro Council in 1997, includes adopted policies that model the six desired outcomes for a successful region, as endorsed by city and county elected officials and approved by the Metro Council. The policies are used by Metro to guide the region's decisions regarding land use, transportation, environmental quality, housing, economic development, and capital improvements. Among other objectives, they articulate mass transit systems; provide processes for management of the urban growth boundary; describe tools used to protect lands outside the urban growth boundary for farm, natural resource, future urban or other uses; and stipulate housing densities in municipalities. The most recently adopted plan creates a regional system of urban and rural reserves, sufficient to accommodate 50 years of growth while protecting agricultural land, forestland, and other natural features.

The Urban Growth Management Functional Plan, adopted by the Metro Council in 1996 and updated regularly with the support of the region's local governments, contains the

requirement that local comprehensive plans be consistent with 14 directives. Such directives translate the 2040 vision into requirements for city and county planning, zoning ordinances, and enforcement actions for implementing the growth concept, and all are consistent with the policies in the Regional Framework Plan. The directives also establish specific minimum requirements on such topics as establishment and amendment of the urban growth boundary, establishment of minimum densities, preservation of industrial lands for industrial purposes, emphasis on development of centers and corridors, provision of affordable housing, and limits on encroachment into significant natural areas. Recently added to the functional plan is Title 14, the plan for a regional system of urban and rural reserves as described under the Regional Framework Plan.

The plans propose spatial planning frameworks using similar approaches that reflect the earlier discussed principles of smart growth, though statutory authority influences the tools available for each. Images 1 and 2 show the key policy maps for RMBH and Portland. Macro zoning in RMBH (Image 1) illustrates Areas of Metropolitan Interest, specifically related to environmental protection, high density mixed use development, heavy industry, and special overlay zones. These zones are connected to development policies and mandates requiring permit review. Metro Manages the urban growth boundary; zoning at the municipal level; providing legally binding mandates of compliance, as well as recommendations. The 2040 Growth Concept map (Image 2) encourages development in downtowns, main streets and employment centers linked with rail and bus transit networks to help minimize the expansion of the urban growth boundary and protect the region's farms and forestland. Both maps connect to policies outlined at the metropolitan level that must be carried out through local planning initiatives. The 2040 Growth Concept map specifies the following guiding growth objectives:

- *A hierarchy of mixed-use, pedestrian friendly centers that are well connected by high capacity transit and corridors*
- *A multi-modal transportation system that ensures continued mobility of more people and goods throughout the region, consistent with transportation policies*
- *Coordination of land uses and the transportation system, to embrace the region's existing locational advantage as a relatively uncongested hub for trade*
- *A jobs-housing balance in centers and a jobs-housing balance by regional sub areas to account for the housing and employment outside of the Centers*
- *An urban to rural transition to reduce sprawl, keeping a clear distinction between urban and rural lands and balancing re-development*
- *Separation of urbanizable land from rural land by the UGB for the region's 20-year projected need for urban land*
- *Rural reserves that are intended to assure that Metro and neighboring cities remain separate*

The below growth principles outlined in the PDDI are remarkably similar, with many overlapping themes.

- *Integrate land use and transportation planning*
- *Support development within a network of transit-oriented development nodes*
- *Create new development centers to enhance access to goods and services*
- *Ensure the fair and public use of property that benefits from public investments*
- *Promote public accessibility of cultural and environmental resources*
- *Guarantee the protection and restoration of streams and lakes*
- *Guarantee the allocation of industrial land within growth areas*
- *Promote mixed-use infill development, green infrastructure, and public space*
- *Protect natural ecosystems, environmental resources, and farmland*
- *Contain development along the urban periphery and protect open space*
- *Reduce spatial inequities where possible*

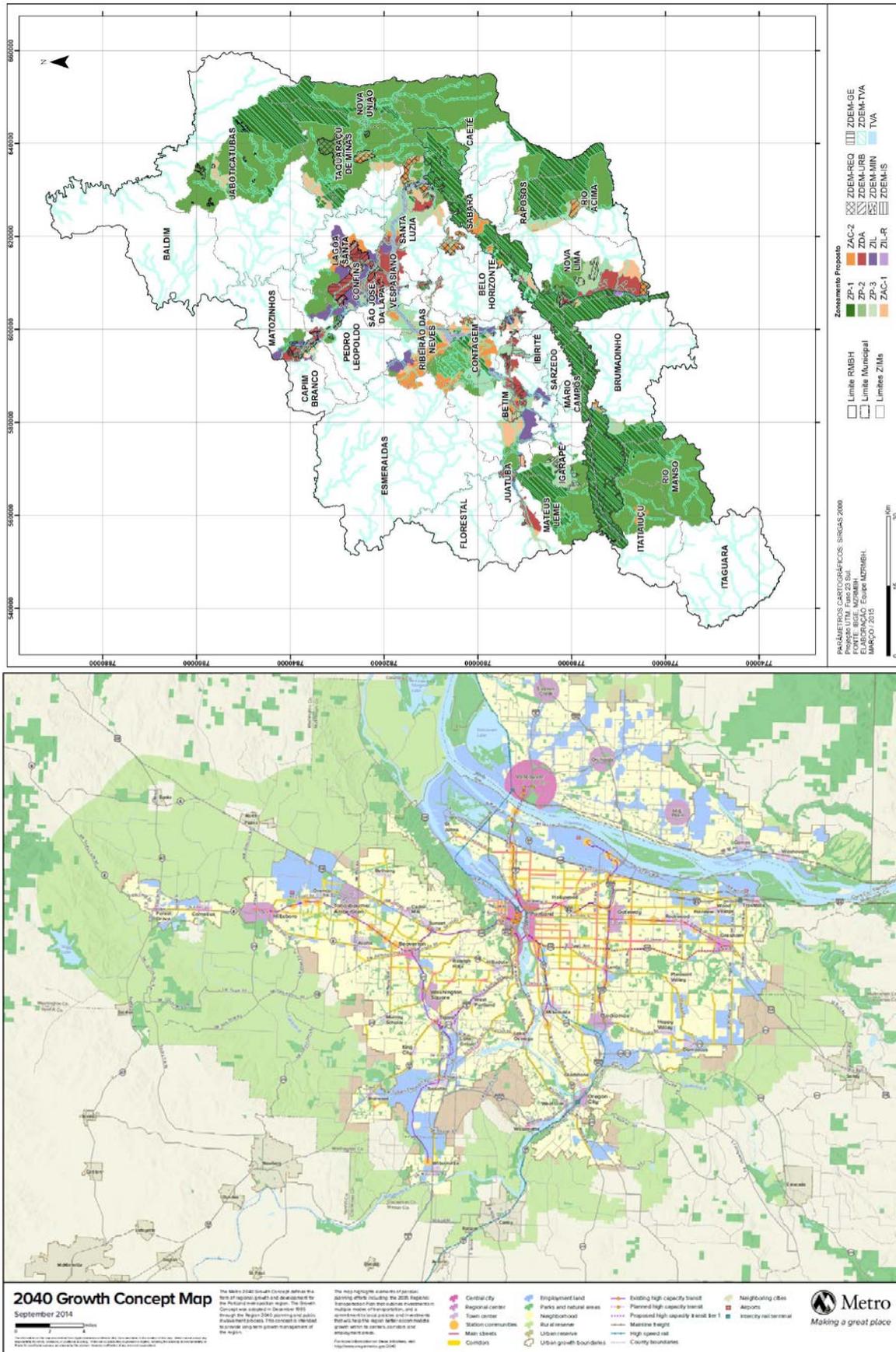


Image 1: RMBH Map of Macrozoning shows Zones of Metropolitan Interest; Image 2: Metro 2040 Growth Concept maps shows the UGB and a network of urban growth nodes

Both plans illustrate the objective of sustainable development in long-term planning at the metropolitan level, and a near-consensus of the strategies used to achieve that outcome. While, Portland has statutory authority for a highly effective growth management tool, the UGB, other areas achieve such management through the use of other mechanisms.

Looking Ahead at Brazilian Metropolitan Planning Lessons Future Research

The upward and outward explosion of metropolitan populations is creating more demand for stable economies, inclusive housing, efficient transportation, and ecosystem conservation. This paper does not intend to suggest that solutions from one place always apply to another, recognizing the uniqueness of each metropolitan area's social, spatial, and institutional composition. Based on an analysis of the strengths and weaknesses of the Portland and Belo Horizonte examples, some of the following lessons can be extracted:

- Empower regions with statutory authority
- Establish dedicated funding sources for planning and incentives
- Use scenario planning to help current residents visualize alternative futures for better, more informed, and long-term decision-making
- Create vision documents to help generate consensus
- Concentrate growth within coordinated transit-oriented nodes – balancing jobs and housing reduces vehicular travel, increases transit use
- Institute Urban Growth Boundaries coordinated at the regional scale in order to avoid
- Institute a plan monitoring system and plan quality analysis
- Build off of and support citizen-led social movements

Cross-sectoral and intergovernmental coordination and cooperation should be supplemented with explicit mandates from higher level governments. There should be a system of monitoring, evaluation, and accountability in place, and a system of incentives and disincentives for individual and institutional actors (Berke et al, 2006). No matter the institutional framework of the region, a metropolitan-level institution – from a strong central government to a weaker planning agency – can foster a regional perspective, coordinate efficient and equitable delivery of services, and encourage or mandate action at the local level. Coordinated spatial planning that shapes urban form and coordinates land use and environmental, housing, and transportation planning is one way of accomplishing that.

Following the adoption of the PDDI and Macrozonning, the Brazilian government adopted the Statute of the Metropolis to provide tools for shared planning and management of services. The Statute (Federal Law 13.089), approved in 2015, mandates that all metropolitan regions in Brazil must develop Integrated Plans for Urban Development (PDU) within three years (Moura & Hoshina, 2016). The law establishes that a minimum required planning scope be addressed, and requires that upon approval of the plan by the state government, municipalities within the metropolitan region review their comprehensive plans and revise them for consistency with the new direction set forth by the metropolitan plan. The law further requires compensation for environmental services and public participation in the planning process. Such scheme of metropolitan planning and management therefore embodies the principles of cooperation between levels of government and involves partnerships between non-profits, businesses, and local governments to help integrate and implement public policies. The Statute also makes clear that the key goal of metropolitan planning is to achieve sustainable, functional urban areas. Looking ahead, further development of plan analyses and best practices in sustainable metropolitan planning ought to be considered.

In order to devise new planning methods and approaches, planners and policymakers must be aware of a variety of perspectives that weigh in on the best practices in metropolitan

planning (Godschalk & Rouse, 2015). Several plan evaluation studies have established the need of incorporating evaluation systems in planning (Soria & Valenzuela, 2013; Baer, 1997; Oliveira and Pinho, 2009; Berke et al., 2006). Evaluations help to improve the planning process by measuring practices, implementation, and planning outcomes, and legitimizing the planning process for the public by contributing to accountability. Despite the value of planning evaluations, they are rarely conducted at the metropolitan level beyond methods for measuring municipal compliance. Because of the dynamic nature of metropolitan spaces, metropolitan planning has a greater degree of uncertainty than a municipality, and an effective evaluation system could have the benefit of detecting potential conflicts, changes, and points of improvement.

This article provides a review of trends in metropolitan spatial structure, governance structures in metropolitan areas, and planning opportunities. By comparing two examples of metropolitan plans – from different hemispheres, but each considered exemplary cases from their respective countries – the article discusses learning opportunities and effective practices. Future research should expand the scope to a comprehensive set of metropolitan plans and create a standardized metropolitan plan evaluation to measure plan sustainability.

References

- Alexander, L. The Promise and Perils of “New Regionalist” Approaches to Sustainable Communities. *Fordham Urban Law Journal*. Volume 38. Issue 3. The Berkeley Electronic Press, 2010.
- Baer, W. (1997) General plan evaluation criteria, *Journal of the American Planning Association*, 63(3), pp. 329–344.
- Beatley, T. Manning, K. *The Ecology of Place: Planning for Environment, Economy, and Community*. Island Press: 1997
- Berke, P. Does sustainable development offer a new direction for planning? Challenges for the twenty-first century, *Journal of Planning Literature*, 17(1), pp. 21-36. 2002
- Berke, P. & Godshalk, D. (2009) Searching for the good plan. A meta-analysis of plan quality studies, *Journal of Planning Literature*, 23(3), pp. 227–240.
- Berke, P., Backhurst, M., Day, M., Ericksen, N., Laurian, L., Crawford, J. & Dixon, J. (2006) What makes plan implementation successful? An evaluation of local plans and implementation practices in New Zealand, *Environment and Planning B: Planning & Design*, 33(4), pp. 581–600.
- Castells, Manuel. *The Rise of the Network Society (The Information Age: Economy, Society and Culture, Volume 1)*. Malden, MA: Blackwell Publishers, Inc., 1996
- Cervero, R.; Duncan, M. Which Reduces Vehicle Travel More: Jobs-Housing Balance or Retail-Housing Mixing? *Journal of the American Planning Association*. Vol. 72, Iss. 4, 2006
- Compans, R. Metropolitan Ungovernability. *R.B. Estudos Urbanos E Regionais V.17, N.2, 2015, p.11-24*
- Costa, H. Metropolitan Planning and Urban Politics in a Context of Disperse Urbanization: Notes From Belo Horizonte, Brazil. 15th International Planning History Society Conference. 2012
- Costa, M.; Barbara Marguti. *Funções Publicas de Interesse Comum nas Metrôpoles Brasileiras: transportes, saneamento básico e uso do solo. Serie Rede Ipea, Volume 2. Brasilia, 2014*
- Costa, M.; Igor Pantoja, Barbara Marguti. *Relatos e Estudos de Case da Gestão Metropolitana no Brasil. Volume 3. IPEA: Rio de Janeiro, 2014.*
- Godschalk, D.; Rouse, D. *Sustaining Places: Best Practices for Comprehensive Plans*. 2015.
- Goldman, T.; Deakin, E. Regionalism Through Partnerships? Metropolitan Planning Since ISTE. *Berkeley Planning Journal*, 14(1), 2000
- Granbel - Associação Dos Municípios Da RMBH - Estatuto. *Granbel.com.br*. N.p., 2016. Web. 1 June 2016.
- Heinelt, H.; Kubler, D. *Metropolitan Governance: Capacity, democracy and the dynamics of place*. New York, NY: Taylor and Francis Group, 2005.
- Lefevre, C. *Metropolitan Government and Governance in Western Countries: A Critical Review*. Blackwell Publishers: Oxford, United Kingdom, 1998.
- Margerum, R.; Brody, S.; Parker, R.; McEwen, G. *Regional Transportation and Land Use Decision Making in Metropolitan Regions: Findings from four case studies*. 2011

Mendonca, J.G. Governança local e regulação urbana no contexto metropolitano: reflexões a partir do caso belo-horizontino. IN Costa, G.M.; Mendonca, J.G. Planejamento urbano no Brasil: trajetórias, avanços e perspectivas. Belo Horizonte: Editora C/Arte, 2008.

Metro Charter: 2015 Available at: <

<http://www.oregonmetro.gov/sites/default/files/Metro%20Charter%202015.pdf>> Accessed on: 15 may. 2016

Mondale, T; Fulton, W. Managing Metropolitan Growth: Reflections on the Twin Cities Experience. The Brookings Institution Center on Urban and Metropolitan Policy: 2003 Available at: <
http://www.brookings.edu/~/media/research/files/reports/2003/9/metropolitanpolicy-mondale/200309_fulton.pdf>. Accessed on: 28 mar. 2016.

Moura, R; Hoshina, A. Estatuto da Metr pole: enfim, aprovado! Mas o que oferece   metropoliza o brasileira? Rio de Janeiro: Observat rio das Metr poles, 2015.

Observat rio das Metr poles. Unidades territoriais urbanas no Brasil: regi es metropolitanas, regi es integradas de desenvolvimento econ mico e aglomera es urbanas em 2015. Rio de Janeiro: Observat rio das Metr poles, 2015.

OECD. Oecd.org. N.p., 2016. Web. 1 June 2016.

Plano Diretor de Desenvolvimento Integrado da Regi o Metropolitana de Belo Horizonte: Propostas de Pol ticas Setoriais, Projetos e Investimentos Priorit rios. Volumes 1-6, 2011

Rao, N. Cities in Transition. New York, NY: Taylor & Francis e-Library, 2007.

Rothblatt, D. North American Metropolitan Planning: Canadian and U.S. Perspectives. Journal of the American Planning Association, 60:4, 501-520. 1994

Smart Growth Online. Smartgrowth.org N.p., 2016. Web 1 June 2016

Soria, J.; Valenzuela, L. A Method for the Evaluation of Metropolitan Planning: Application to the Context in Spain, European Planning Studies, 21:6, 2013. 944-966

Souza, M. Mudar a Cidade: Uma Introdu o Cr tica ao Planejamento e a Gest o Urbanos. 6^a Edi o. Rio de Janeiro, RJ: Bertrand Brasil, 2010.

UFMG/Pucminas/UEMG. Plano Diretor de Desenvolvimento Integrado da Regi o Metropolitana de Belo Horizonte, Sumario Executivo. Belo Horizonte, 2011.

Sustainable Development Goals - United Nations. United Nations Sustainable Development. N.p., 2016. Web. 1 June 2016.

Wheeler, S. Planning for Metropolitan Sustainability. Journal of Planning Education and Research 2000, 20: 133

The National Spatial Economic Opportunity Atlas (NSEOA): A tool for trans-disciplinary rural and urban development planning.

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Abstract *South Africa's National Development Plan (NDP) emphasizes the need to transform our national space economy. Achieving this requires an in-depth understanding of the localities of resource and infrastructure endowments, opportunities, needs, current and potential economic activity, and government initiatives. To address these needs and provide the information and data to inform planning, the Department of Rural Development and Land Reform has developed an electronic spatial economic opportunity atlas. The Atlas will also provide a vital tool for all spheres of governance to undertake the activities and produce the plans that are required by the Spatial Planning and Land Use Management Act 16 of 2013 (SPLUMA). These spatial planning systems include the National, Provincial, regional, and Municipal Spatial Development Frameworks, and will play an important role in achieving the requirement outlined in Section 9.2 of the SPLUMA which require national government to improve the capacity of provinces and municipalities to implement effective spatial planning and land use management.*

1. Introduction

The Department of Rural Development and Land Reform have begun a process to develop a Spatial Economic Opportunity Atlas for South Africa, which will highlight the role and relative importance that different places throughout the country play in contributing towards the economy. It will provide information on both the current status quo as well as the potential, and will form an important informational basis for the development of the National Spatial Development Framework (NSDF), required by the National Development Plan (NDP). The Atlas itself will assist municipalities particularly in their compliance with the requirements for the SPLUMA.

The Atlas will collate existing base information and analyses of growth sectors, threats, opportunities and weaknesses in the South African spatial economy and will present these in an easy to use electronic and internet based system, which will allow for scenario modelling and trend analysis. It is envisaged that the Atlas will also become a portal that will link other relevant economic and spatial information, legislation, policies, plans and relevant initiatives occurring in South Africa.

This initiative recognises the existence of other similar atlases but an area where the Atlas aims to differentiate itself from other economic knowledge products will be its coverage of previously neglected small towns, rural and homeland areas, as well as the bigger, more developed parts of the country.

2. Policy Framework

2.1 Rationale for the development of the Atlas, Benefits and Opportunities

One of the primary aims of the Atlas is to provide the base information for the development of the NSDF, identified in both the NDP and the SPLUMA to address spatial inefficiencies and inequalities, identify areas of opportunity and ensure proactive management of natural resources and ecosystems.

2.1.1 Towards the Development of the NSDF

The NDP emphasises the need to transform our national space economy. Achieving this will require an in-depth understanding of the localities of resource and infrastructure endowments, opportunities and needs and current and potential economic activity. The Atlas will provide the information and data to inform this.

The functions that the NDP lists for the NSDF are indicative of the information that the Atlas will need to provide:

- ✓ For the NSDF to tackle spatial divisions, it will need to be informed about current spatial patterns of access and deprivation.
- ✓ To unlock development potential it will need information on areas that are, and are not, growing economically, which lack infrastructure, skills, innovation or governance capacity. These will demonstrate where investment in economic and social infrastructure and institutional support should be targeted.
- ✓ To guide and inform infrastructure investment and prioritisation, the Atlas will inform the NSDF by providing information on the location of current infrastructure as well as an understanding of where new infrastructure should be developed.
- ✓ To manage contemporary economic and demographic shifts, the Atlas will provide the NSDF with information on economic dynamics, including where there is potential to concentrate activity whilst balancing the need to avoid congestion.
- ✓ To allow the NSDF to facilitate the coordination between government and other agents, the Atlas will provide a common reference point for uniform geo-spatial information.

2.1.2 Implementing SPLUMA

The Atlas will also provide a vital tool for all spheres of governance to undertake the activities and produce the plans that are outlined in SPLUMA and will play an important role in achieving the requirement outlined in s. 9 ss. 2 of the Act which requires National Government to improve the capacity of provinces and municipalities to implement effective spatial planning.

The Atlas will be an important resource for all spheres of government in their development of Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs) in providing multi-sectoral spatial development information including information on previously disadvantaged areas, rural areas and areas under traditional leadership, identifying historical spatial imbalances in development and providing direction for strategic developments,

infrastructure investment and priority areas for investment in land development (SPLUMA 2013, s. 12).

Towards these, the Atlas will play a major role in enriching plans so that the principles of spatial justice, spatial sustainability, efficiency, spatial resilience, and good administration outlined in SPLUMA can be reached:

- **Spatial Justice:** The Atlas will identify areas of poverty and deprivation as noted in s. 7, ss. a.ii of SPLUMA, and provide data informing how they can be appropriately addressed (SPLUMA s. 7, ss a. iv);
- **Spatial Sustainability:** The Atlas will identify prime and unique agricultural land as required in s 7 ss. b of SPLUMA; environmentally sensitive land; and inform decisions on sustainability;
- **Efficiency:** Through identifying existing resources and infrastructure, the Atlas will allow for their optimal use (SPLUMA s. 7 ss. c.i) and will inform and speed-up decision making to minimise any negative impacts of development.
- **Good Administration:** By providing shared information in a transparent form for all spheres of government to use in their planning and analysis, the Atlas will contribute towards principles of integration and good administration.

3. Towards realising economic opportunity

Although 'economic opportunity' is a widely used term, its meaning is not always clear and in different contexts it may have different meanings. Basically however, identifying an opportunity is about identifying the set of circumstances that makes it possible to achieve a particular goal.

The important thing however is to recognise that opportunity means different things to different people and different sectors. There is no one set of favourable circumstances, but instead a infinite series of combinations of circumstances which would represent different opportunities to different people at different times. A further important factor is, given a set of favourable circumstances, there are again, infinite ways in which we can make use of them to different ends.

3.1 *Understanding the type of Economic Opportunity to be identified*

A key issue then is understanding what we are trying to achieve. What sort of opportunities should the Atlas identify? Here the NDP (Department: The Presidency, 2011) provides guidance, and lists the key elements that must be achieved in transforming the economy: "South Africa needs an economy that is more inclusive, more dynamic and in which the fruits of growth are shared equitably. In 2030, the economy should be close to full employment, equip people with the skills they need, ensure that ownership of production is more diverse and able to grow rapidly, and provide the resources to pay for investment in human and physical capital" (NDP Department: The Presidency, 2011)

The NDP recognises that this should be done through a focus on the following:

- Increasing exports, focusing on those areas where South Africa already has endowments and comparative advantage, such as mining, construction, mid-skill manufacturing, agriculture and agro-processing, higher education, tourism and business services.

- A more efficient and competitive infrastructure. Infrastructure to facilitate economic activity that is conducive to growth and job creation. An approach will be developed to strengthen key services such as commercial transport, energy, telecommunications and water, while ensuring their long-term affordability and sustainability.
- Reducing the cost of living for low-income and working-class households. Inequality and poverty can be addressed by raising incomes through productivity growth and reducing the cost of living. A commitment to a minimum living standard will ensure that all households can meaningfully participate in the economy. The costs of food, commuter transport and housing must be reduced, while raising the quality of free or low-cost education and health care.
- Reduced cost of regulatory compliance, especially for small- and medium-sized firms.
- A larger, more effective innovation system, closely aligned with firms that operate in sectors consistent with the growth strategy.
- Support for small businesses through better coordination of relevant agencies, development finance institutions, and public and private incubators.
- An expanded skills base through better education and vocational training.
- Strengthened financial services to bring down their cost and improve access for small- and medium-sized businesses.
- A commitment to public and private procurement approaches that stimulate domestic industry and job creation.
- A higher rate of investment, with public sector investment crowding in private investment. This will depend on partnerships with the private sector, policy certainty and building confidence in the long-term growth of the economy.
- A labour market that is more responsive to economic opportunity. This requires lifelong learning and career advancement; stabilising the labour environment; strengthening dispute resolution institutions; reviewing regulations and standards for small and medium enterprises; addressing public sector labour relations; strengthening the application of minimum standards among employers, recruitment agencies and brokers; strengthening active labour market policies and labour matching; and enabling skilled immigration.
- Enhanced commercial diplomatic services to support the expansion of South Africa's global market share.

4. Spatial Planning and Economics

It is pertinent to consider the question of how spatial planning and land use planning in South Africa can and do (or do not) support and encourage a vibrant local economy.

The approach followed a case study on a spatial development framework to illustrate a variety of plans in relation to the economy, and finally a summary of issues.

4.1 Municipal Spatial Development Frameworks – Illustrative Case Studies

A case study of iLembe SDF is set out below, with a view to determining the influence these plans have on economic development in the municipality concerned, and how it may inform investors and other role players. These issues are important in the development of the Atlas in that they provide valuable information on the type of information and focus the Atlas should include to better inform the economic imperatives of SDF's.

A number of questions can be posed:

- ✓ In what way do the plans give direction to economic development?
- ✓ Do the plans present opportunities for development?
- ✓ Do they indicate where and what new significant infrastructure may be developed in the near future?
- ✓ Is there an indication of where markets are located, and what thresholds are suggested?
- ✓ Is there evidence of an integrated approach, involving different line function departments?

4.1.1 Ilembe District Municipality Spatial Development Framework

The iLembe District Municipality Spatial Development Framework Review (2015) presents a high level overview of the district municipality providing socio-economic data such as levels of income and education, which do not appear to inform the SDF proposals in any way.

The economic analysis of the district is thin, and very generalised. For example, there is an assumption that the industrial complex of Isithebe (which was originally conceived as a “border industry”, typically separated from the main urban centres to achieve the aims of apartheid), will continue to grow in its relatively isolated location in the north of the district. The prospects of its growth or decline, and which sectors it is intended, or likely, to serve are not discussed. There is a note towards the end of the report calling for increased incentives. The “industrial development” depicted in the diagram below includes a number of smaller areas of “proposed additional sites”. Firstly, it is not clear what the envelope shapes are intended to depict, and secondly there is no discussion in the document about the proposed location, size or function of the proposed new industrial sites, nor how they will relate to other urban areas, or supporting facilities. Also, there is no indication of linkages to residential areas.

The SDF states that the District is envisaged to attract investment for industrial development through the promotion of spatially defined industrial clusters. Ballito will be a site for light industry, KwaDukuza will support medium sized industries and Mandeni and Isithebe will cater specifically for heavy industries. Together they will form a thriving manufacturing inland corridor. It is reordered in the iLembe District Spatial Economic Development Strategy 2013, that excess demand will be catered for westwards along the R614 and R74. Light manufacturing will also occur as value adding to the reconstructed agricultural activity in the hinterland“ (iLembe SDF, 2015).

It would be important in the SDF to indicate how this should be achieved, and what conditions need to be met for these ideas to materialise.

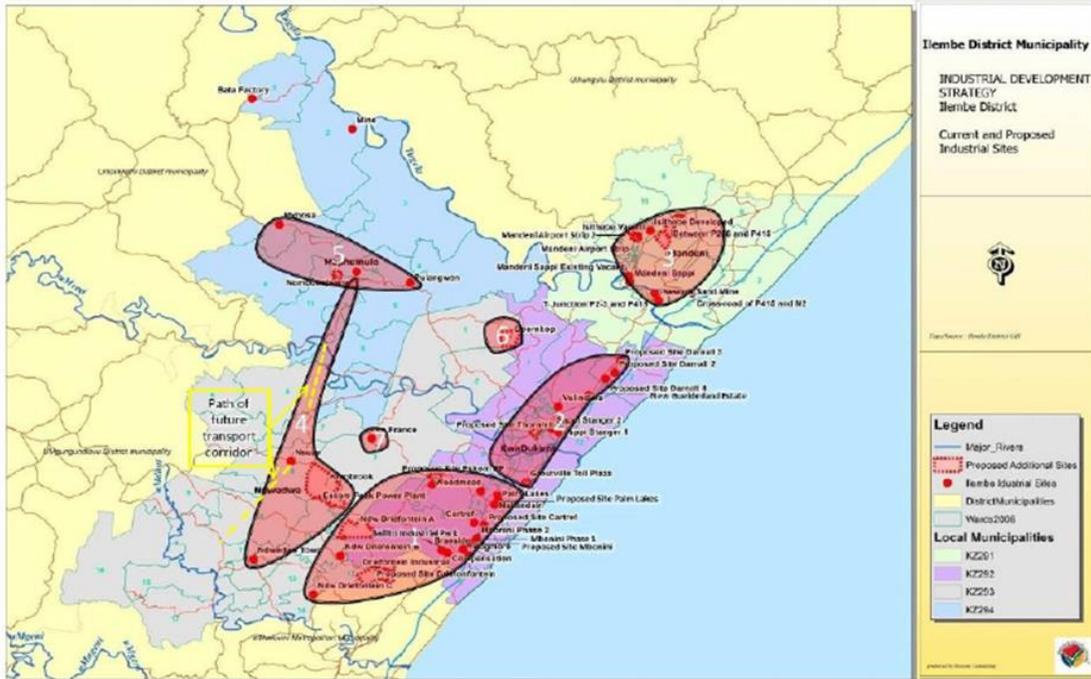


Figure 1: Ilembe Industrial Development (Source: Ilembe SDF Review 2015)

The SDF states that “apart from the identified nodes, the SDF must further identify strategic investment areas which are areas that are not necessarily nodes but do possess unique characteristics and may be used as positive spin-offs. The strategic investment areas may be industrial areas such as iSithebe and Sundimbili, tourism areas, manufacturing focused regions. These are also areas that need to be prioritised in terms of infrastructure and investment” (Ilembe SDF, 2015).

In the “Economic” map shown below in figure 2, areas where certain economic activities and sectors are expected to be established (or, possibly – are being directed to establish here?). The light green denotes “Agriculture Investment Areas”, and the darker green denotes “Commercial Agriculture Zone”. It is not clear what the distinction between these two is meant to be, nor what the purpose of this distinction may be.

“Tourism”, shown in a hatch overlay, and located between the national freeway and the coast all the way from the district’s southern boundary to its boundary with uThungulu District Municipality. This is a somewhat simplistic rendition of tourism potential.

Likewise, the “Green Economy” zone, generally located in the western part of the Municipality, and covering both the green and white shades on the map, do little to indicate what is intended.

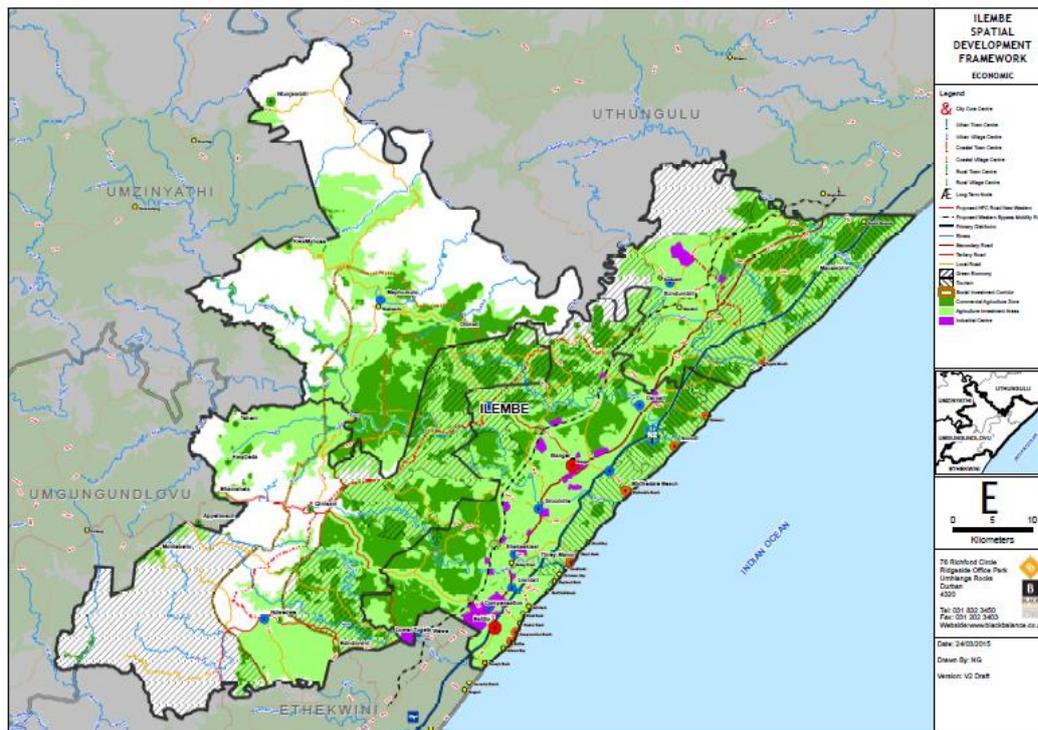


Figure 2: Ilembe Economy (Source: Ilembe SDF Review 2015)

In a generalised manner, the Ilembe SDF sets out its plan for economic development as follows:

“Spatial Economic Development – identifying and mapping out key strategic regions for various economic sectors such as tourism, agriculture and mining will begin inform the strategies for each of those regions required to unlock the potential of the identified economic sectors. Determining the economic drivers has been based on an analysis of the existing economic make-up of Ilembe, in terms of both existing economic activity and the economic potential development of Ilembe’s context – the Province of KwaZulu-Natal, South Africa and by implication the District’s place and possibilities in southern Africa and the world. The term “economic drivers” refers to the standard economic sectors as commonly understood and also to the clustering of a range of sectors, sub-sectors or value-chains.

In the analysis to date, three key economic drivers have been identified as follows:

1. Agriculture:
 - Identification and secure of high potential agricultural land in traditional council areas
 - Establishing agri-hubs in appropriate locations throughout the District
 - Facilitating market production
2. Tourism:
 - Wildlife routes, incorporating the mass ecotourism destinations as well as coastal routes.
 - Angling Route, incorporating top recreational fishing spots e.g. and other popular fishing destinations.
 - Zulu Cultural Heritage Route, incorporating Kwadukuza and Mandeni specifically.
3. Industrial Sector:
 - The municipality should provide incentives for industrial development in terms of availability of land.

- Should declare Isithebe as an Industrial Development Zone and develop a marketing strategy to attract potential manufacturing/ industry into the area.
- Utilise natural resources for industry such as indigenous wood for furniture and provide support to local entrepreneurs first as well as monitor BEE components at district and local level (iLembe SDF, 2015).
-

The concluding spatial framework shown below in figure 3 does little to guide either public or private investors. There is a proposed western bypass “mobility” road, running parallel to, and lying west of the R102. This has not been discussed or motivated in the report, nor how it will influence spatial structure or development. The blue and yellow colouring denotes the anticipated or planned massive spread of “urban village” and “rural village” respectively. The “priority infrastructure routing” shown in shaded tone along the main movement routes throughout the District sheds little light on the priorities for development, and may easily interpreted as maintenance requirements for the District.

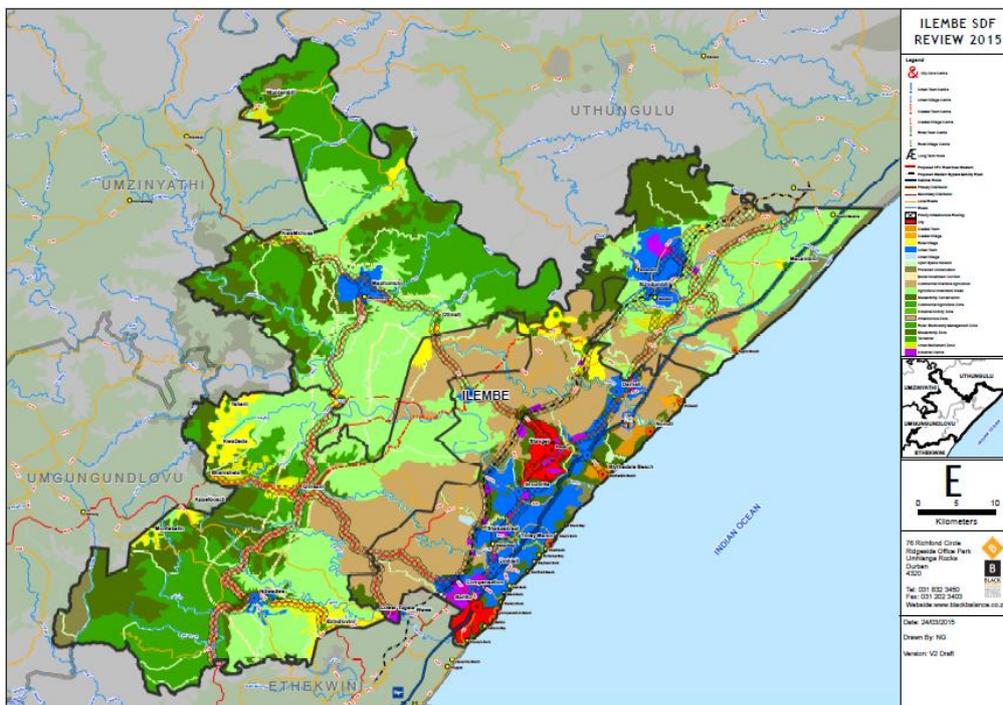


Figure 3: Ilembe Spatial Development Framework (Source: Ilembe SDF Review 2015)

In summary, this SDF does little more than depict the status quo, except for the massive anticipated urban growth along the coast, and to a lesser extent along parts of the district’s western boundary. In the demographic projections to 2030 and 2050 presented in the report, it would appear that the population in the District could be expected grow by approximately one fifth of its present size by 2030. There appears to be a mismatch between these figures and the size of urban expansion shown here.

5. Overview of factors to be included in the Atlas

South Africa’s economy has a marked duality, with a sophisticated financial and industrial economy having grown alongside an underdeveloped informal economy.

For the purposes of the Atlas, the following factors have been identified to be included in the Atlas

1. Economic and Financial Factors
2. Governance
3. Human/ Social factors
4. Capital resources – Infrastructure
5. Environmental factors – climate change, global warming, water shortages
6. output)
7. Critical cluster and sectoral data (ei, Mining, Agriculture, Tourism, etc)

Mapping the factors and identifying the sectoral opportunities, overlaid by the state of the natural assets may provide a clearer indication of the potential for economic opportunity in specific areas.

6. Focus on the needs of future Atlas users

It is envisaged that the Atlas will be used by users as identified in diagram 1 below.

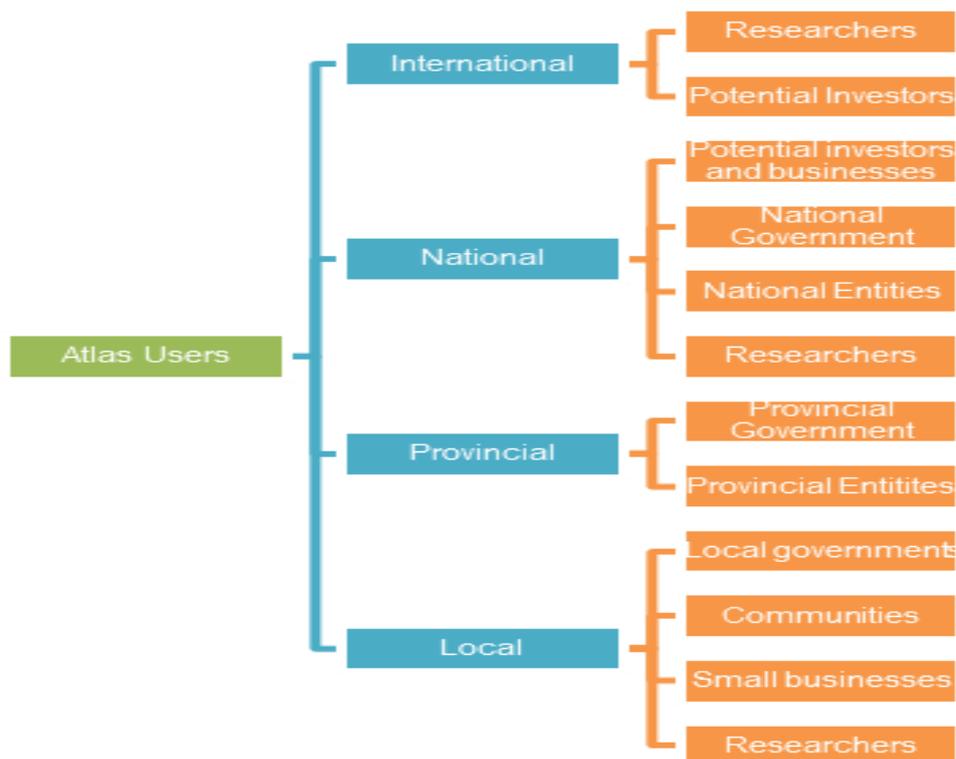


Diagram 1. Atlas Users (Source: Author)

7. Conclusion

The National Spatial Economic Opportunity Atlas will be developed on the backdrop of the National Development Plan which emphasizes the need to transform the complex and disjointed spatial patterns inherited from South Africa's past spatial planning systems and identify and capitalize on economic opportunity to encourage economic growth that will result in the development of disadvantaged communities. The main aim of the Atlas is to ensure the implementation of the Spatial Planning and Land Use and Management Act 13 of 2015 by supporting the development of the National, Provincial, Regional and Municipal Spatial Development Frameworks. The Ilembe SDF case study clearly demonstrates the lack of effective direction in the identification of economic opportunities in the area which do very little to guide potential public or private investment. Therefore, the Atlas will not only provide the status quo of such areas but assist the municipalities and a variety of other users to identify areas of economic potential in urban and rural areas for development. Key to this is ensuring that the Atlas spatially illustrates context, status quo, spatial priorities, trends and opportunities.

Therefore it is essential that the Atlas is a valuable product, it will be closely tailored to the needs of its users, will be technically robust, its data will be accurate and up to date and the broader system sustainability will be considered during the development of the system.

Mfanafuthi Gama, Enkosi Mpondo, Sue Bannister The National Spatial Economic Opportunity Atlas (NSEOA): A tool for trans-disciplinary rural and urban development planning '52nd ISOCARP Congress 2016'

References:

Department: The Presidency, 2011 *National Development Plan*, National Planning Commission, South Africa.

Ilembe District Municipality Spatial Development Framework Review, 2015.

South African Government, 2013, *Spatial Planning and Land Use Management Act 16 of 2013*, South Africa.

Peri-urbanities as incubators of sustainable Land use Planning and Development frameworks for the Third Space -: periences in Domboshava, imbabwe

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Abstract

Peri-urban areas represent spaces with mixed land uses that exude competing interests and conflicting characteristics as the two extreme experiences; rural and urban are brought together. Yet, the peri-urban space also presents opportunities for sustainable physical, socio-economic and environmental development of both rural and urban areas. Paradoxically, scholarship has so far not managed to provide solid and informative policy and legislative frameworks that are tailored for peri-urban areas hence there is still dependence on loose and contradictory instruments that only work in purely urban and rural areas. This work focuses on possibilities of developing and applying frameworks that are tailored to the uniqueness of peri-urbanity and cease the usage and reliance of those that are not currently applicable and ineffective, using Domboshava as the case of study. Interviews with key informants that work for relevant national and local governments in Zimbabwe, Harare city Council and relevant Rural District Council were conducted to gather information that relate to the current policies and legislative instruments that are in use for the development of Domboshava particularly land use planning and management for human settlements and industrial business purposes. This work managed to highlight the fragmented and uncoordinated nature of frameworks and authorities that are shaping the spatial development of Domboshava currently. There is need for integrated frameworks that facilitate sustainable development of peri-urban areas and in turn linking strategically and influencing the development of rural and urban areas that adjoin them.

ey ords: Peri-urban, sustainability, rural-urban development, policy frameworks, Domboshava, Zimbabwe

Setting the scene: The case for appropriate frameworks for peri-urbanity

Since time immemorial, the phenomenon of migration has been the dominant driver of incessant political, economic and demographic transformations of both rural and urban spaces and this has particularly been the case in the Sub-Saharan African region (Wehrmann, 2008). Although several positive benefits such as improved levels and rates of urbanisation that have in some cases resulted spin offs such as the creation of meaningful social services and high quality economic development opportunities; there have also been direct and indirect negative consequences of migration that among others include change in

land use and alteration of land rights (Quan and Payne, 2008). The uncontrolled movement of people within regions and across regions overtime has also led to either massive alterations of governance structures and institutions or lack of the necessary changes of the same.

In the Zimbabwean context, migration, particularly circular migration has led not only to the development of strong and sustained urban-rural linkages, but also the creation of peri-urban settlements juxtaposed nearby cities. Such settlements have become theatres of competition not only for access, but also for control over resources such as land, forests, and water. This is a common scenario in countries or societies that have dominant rural populations that still depend on agriculture as the economic mainstay, but still rely on urban economies to support their activities. In and around Harare, the capital city of the Zimbabwe, there are ostensibly strong spatial and economic linkages that play out within the urban, peri-urban, and rural communities. Rapid urbanisation that has been witnessed within the city over a period extending half a century has largely led to encroachment to neighbouring rural areas situated in the urban peripheries of which Domboshava communal lands is one of them. The boundary between Domboshava and Harare separates the two settlements in spatial terms only, with other operations becoming seamless, thus Domboshava has become a development node that has been transformed to a vibrant peri-urban area.

Paradoxically, the rapid and large scale developmental changes that have ensued on these peri urban areas of Zimbabwe have given rise to the emergence of unplanned and uncoordinated physical developments of spaces as well as environmental degradation. Apparently, this reality emanates from the application of a cocktail of traditional and modern land-use access and development policy and legislative frameworks that always compete and conflict due to several developmental pressures. Sadly, scholarship has so far not managed to provide solid and informative policy and legislative frameworks that are tailored for peri-urban areas hence there is still dependence on loose and conflicting instruments that only work in purely urban and rural areas. This work focuses on developing and applying a sustainable land use planning development framework tailored to the uniqueness of peri-urbanity or the Third Space, and cease the usage and reliance on the regulative frameworks that are not currently applicable and ineffective. The paper utilises land and housing development experiences from Domboshava to highlight either the efficacy or weaknesses of relying on urban policy and legislative frameworks to inform the transformations of peri-urban areas, thus leading to the development of a unique and applicable framework.

Characterising the Triple Spaces - Urbanity, Peri-urbanity and Rurality

The three spaces; urban, peri-urban and rural are distinct places with some common characteristics. The three spaces are defined using the levels of development and dominance of certain activities. Whilst rural areas are dominated by agricultural activities with very low population densities and people live in communal ways (Cousins1990; Marimira, 2010; Chimhowu and Woodhouse, 2010; Matondi and Dekker, 2011); urban areas on the other hand are characterised by massively built up spaces with high infrastructure investments and population densities that rely on modern manufacturing and processing economic activities (Tacoli, 2008). Bridging the two 'extreme' spaces (rural and urban) are peri-urban areas that represent a fusion of rurality and urbanity (Sadiki and Ramutsindela,

2002), spaces that have come to be known as 'rurban' – since they are neither rural nor urban, spatially (Vanempten 2009).

In physical terms, the peri-urban zones appear as disorderly frontiers of urban expansion with housing construction moving ahead of infrastructure for service provision as building codes are usually ignored (Berry, 2011). Peri-urban areas can be described as zones experiencing different kinds of transformations, pressures, densities, and people of diverse backgrounds and social statuses (Wehrmann, 2008; Berry, 2011; Mabin, 2012). Peri-urban contexts by nature are characterized by heterogeneity in terms of population dynamics, kinds of land tenure, kinds of land use, uncoordinated and unplanned settlements, as well as survival strategies (Simone, 2004; Wehrmann, 2008; Mabin, 2012; Watson, 2012). Thus, peri-urban interfaces present unique social, economic, environmental, and institutional characteristics that vary from context to context (Narain and Niscal, 2007). In many countries of the world, peri-urban areas are characterized by diversity of local populations, and unregulated planning. Often, absence of workable spatial development frameworks interferes with sustainable rural-urban development of peri-urban zones. As a result, peri-urban areas display a plurality of meanings, activities and processes due to increased urbanization, and invasion of the peri-urban zones for different land use purposes. This puts insurmountable pressure on existing spatial development frameworks, and has become a key urban and regional planning issue.

Circular migration and the case for rural-urban linkages

It has been observed that migrants engage in reverse of the orthodox and conventional rural-urban movements to more of an eccentric circular migration where they move from urban to rural areas in the process contributing to the endless movement of goods and services between and within the rural and urban spaces (Gough *et al.*, 2010; Potts, 2011, 2012). Circular migration is a coping strategy in response to externally induced shocks (Kinsey, 2010), and it is vital in creating strong linkages for households as people drift into zones of comparative advantage (Bekker 2002). People move continually from urban to rural areas and vice versa in an attempt to tap resources from either region (Lynch, 2005; Gough *et al.*, 2010; Potts, 2011). Consequently, rural and urban have in reality become a continuum sustained by rural-urban linkages (movement of people, goods, and services) and not necessarily a dichotomy (Gough *et al.*, 2010). There is therefore a symbiotic relationship that exists between the rural and urban settlements despite their separation in physical terms. This in turn has led to massive incoming and uneven urbanisation in the periphery that in turn have triggered land speculation and the emergence of informal and often illegal activities in peri-urban spaces (Allen, 2003; Kinsey 2010; Tacoli, 1998).

Like in most rural communities of sub-Saharan Africa, extensive linkages between rural and urban areas are evident in Zimbabwe. Often, these rural-urban linkages in Zimbabwe are complex than usually perceived as people continue to straddle the rural-urban divide for livelihoods purposes. The continuous straddling of the urban-rural divide has led to the development of peri-urbanities. In Zimbabwe, this is more pronounced between Harare and adjacent rural areas leading to the setting in of the phenomenon of peri-urbanity (Potts 2011; 2012; Hungwe, 2014).

Operationalising the study

The continuous application of a cocktail of urban development frameworks to influence transformations on peri-urban areas resulting in mismatches calls for a search for policy and legislative instruments that are correctly tailored and appropriate for harmonious development of these spaces. This paper therefore unpacks the emerging development patterns and processes within the peri-urban spaces in Zimbabwe using the case of Domboshava, a communal area that is situated 20km on the outskirts of Harare, the capital city. The work focuses on possibilities of developing and applying frameworks that are tailored to the uniqueness of peri-urbanity and cease the usage and reliance of those that are not currently applicable and ineffective. It also proposes a model that aids the formulation and use of appropriate policy frameworks that are tailored for the development of peri-urban spaces. The work starts by investigating approaches to dealing with spatial changes in Domboshava peri-urban communal area. It goes on to describe the pressures that impact peri-urban areas due to circular migration and other forces. It then establishes the role of local authorities on addressing these spatial and economic development changes in peri-urban communal areas.

Residents of Domboshava community were interviewed to gather their experiences with land access and use. Efforts were made to reach out to the indigenous people that have always lived in Domboshava and the 'new settlers' that came from neighbouring fully fledged cities such as Harare, and other places elsewhere in Zimbabwe and beyond. A total of 41 households from four villages of Domboshava (Zimbiru, Mungate, Murape, and Chogugudza) were studied to generate data pertaining to land access by 'new settlers' mainly for settlement and business development purposes. Interviews conducted targeted heads of households, as well as key informants from the national and local governments in Zimbabwe. Seven experts comprising officials from the Harare City Council and physical planners from the local authority (Goromonzi Rural District Council), the Ward Councillor as a political appointee, and traditional leaders were purposively selected and studied to provide information that relate to the current policies, legislative and regulatory instruments that are currently in use for the development of Domboshava particularly access to land and land use planning and management of human settlements and industrial business purposes. Observations of human settlements, land use change, and impacts of urban expansion and industrial business developments that are taking place within Domboshava were also made to understand the nature and extent of juxtaposition of modern and traditional developments within the peri urban area.

Theoretical Framework –The 'Living' customary Land Tenure System

Land tenure in rural areas as well as peri-urban settings is mostly defined by traditions and customs, that albeit are dynamic, thus always changing to accommodate new circumstances; thus the coinage of a 'living' customary land tenure system (Claassens, 2008; Ranger, 2000; Mnisi, 2010). The 'living' customary law is informal, unofficial, eccentric uncodified and foreign (Claassens, 2008). The law provides for land rights in communal areas within the context, conditions, and circumstances in which local community residents live. It is far from being a series of precise rules, but an outcome from local negotiations (Delville, 2000; Peters, 2004; Peters, 2007). This law is also shaped by local systems and practices within local customs and traditions (Bennett, 2008). The 'living' customary land

tenure system demonstrates considerable flexibility, negotiability, and adaptability within the surrounding changing circumstances (Hilhorst, 2000; Delville, 2000; Quan, 2000, Peters, 2004; Peters, 2007; Oomen, 2005 in Sjaastad and Cousins, 2008). Importantly, the 'living' customary law encompasses the resources that people use to argue their claims to land tenure rights, and these range from custom, statutory law, constitutional principles, development as a desired goal, and even the Bible (Oomen, 2005 in Sjaastad and Cousins, 2008:8). It has the ability to adapt to change within the local conditions responding to new needs and opportunities (Peters, 2004; Hilhorst 2000; Quan, 2000). The 'living' customary law provides an opportunity to develop a new dispensation of a unique system of land tenure that is suited for peri-urban areas (Okoth-Ogendo, 2008). Simply put, the 'living' customary law represents the 'formalization of the informal' customary land tenure and its crystallisation into an informative and sustainable land use planning and development framework. Given the ambiguities and complexities that characterize the 'living' customary land tenure system and its lack of reference points within the codified statutes in Zimbabwe, Spatial development frameworks need to ground their basis in land laws that demonstrate the social order as well as the socially determined procedures in accessing land rights amid ever-changing political, social, demographic, and economic processes in peri-urban areas. This greatly informs the development, adoption and implementation of appropriate Spatial development frameworks within peri-urban areas around Harare and within the country as a whole.

Peri-urbanity in Domboshava – Regulatory framework, Land use planning and development eperiences

Over the last decades, the influence of urban development in Zimbabwe has been shifting to communal areas situated in peri-urban zones (Marongwe, 2003; Chirisa, 2010a; Chirisa, 2010b). The physical expansion of Harare for example has had a huge impact on adjacent peri-urban areas (Chideme, 2010). Crossing the urban-rural divide has been a necessary precursor for survival strategies of many households that live in Harare (Chirisa, 2008). This has been the case for Domboshava, a communal area located in the north eastern part of Harare, in Goromonzi District, Mashonaland East Province of Zimbabwe. A boundary between Domboshava and Harare separates the two settlements in spatial terms, but the movement of goods and services between these settlements is endless.

Generally, the regulatory frameworks on land and settlement in Zimbabwe are very formal and are clearly categorized as either rural or urban. However, the situation for peri-urban areas is different as the regulatory framework is neither the rural nor urban, but a combination of both in an uncoordinated way. Implementation of the land use planning in urban areas is regulated by master and local plans. Land in urban areas of Zimbabwe is administered through the Urban Councils Act. Land thus assumes clear zoning of land uses such as residential, institutional, commercial, industrial, community uses, and vacant land; and is titled. On the other hand, land administration in rural areas is regulated by Rural District Councils. A plethora of statutory instruments such as the Communal Lands Act, the Traditional Leaders Act, and the Rural District Council Act are used to administer rural areas. Land use in rural areas legally translates into arable, residential, and grazing, and is untitled as the title is held by the state. Under these circumstances, residents of communal areas

can only claim land use rights since ownership and control over land rests on the discretion of the state (Matondi and Dekker, 2011).

Land in rural areas of Zimbabwe is further administered under both communal and customary land tenure systems. This regulatory framework further provides for access and use of land parcels to residents in communal areas as individuals and as collectives. The system of customary land tenure defines the conditions on which land can be accessed, held, and used in most rural areas. Under the system of customary land tenure, land administration is under the custody of traditional leaders and Rural District Councils on behalf of the state. This further creates competition in land administration as both the traditional leaders and the Rural District Councils hold important roles in land administration of Zimbabwe. Often, these institutions on land administration compete rather than complement each. However, both urban and rural areas in Zimbabwe are further regulated by the Regional Town and Country Planning Act and other sector policies and legislative framework on infrastructure development, economic and social development, and environmental planning. Although this regulatory framework is formal, it is multiple, complex and often overlapping. Yet, land use planning in peri-urban zones is ordinarily neglected by the formal regulatory framework, and tends to adopt a contextual model in response to the prevailing circumstances.

Domboshava has become a development node for other communal areas in Goromonzi District due to its proximity to Harare. As one of Harare's urban frontiers located on the edge of the city, many people live in Domboshava on a permanent basis while commuting to Harare for work, goods and services on a daily basis (see Hungwe, 2014). These circumstances are redefining new frontiers and centralities in spatial forms of burgeoning cities such as Harare because we approach cities from outside and not from within (see Mabin, 2012). As one of Harare's peripherals, Domboshava is rapidly accumulating urban population from Harare and other places elsewhere. People living in Domboshava have a foot in both rural and urban worlds (see Narain and Nischal, 2007). Since the periphery and the city are strongly connected in dynamic ways, emerging experiences from the new linkages in the urban frontiers are many. As such, the connections between communal areas situated in the urban periphery such as Domboshava, and the urban areas such as Harare also point to the development of the new politics of movement of people from both regions through circular migration. This observation is supported by other scholars who posit that, people are always on the move from worse-off to better-off regions in search for survival and maintaining social and kin networks (Bekker, 2002; Tacoli, 2008). These are integral social obligations necessary for continual investment in social capital.

Customary land tenure system in Domboshava has evolved and adapted over time to allow for a range of land transactions with outsiders. Land laws recognize the official rules and customary procedures at the same time. However, these laws are static and often represent an 'outdated' version of custom. It is therefore critical that the land laws be adjusted and adapted to suit the changing realities and circumstances in communal areas situated in peri-urban zones. The status quo in Domboshava is building on long-standing ideas and

practices about procedures for obtaining membership within a land-holding group, as well as strong family and individual rights within the overall system of communal land tenure. This peri-urban communal area has witnessed unprecedented levels of land transactions in the form of the sale or exchange of land to prospective buyers and developers for various land use purposes (Hungwe, 2014). Seeking land in communal areas situated at the edge of cities is viewed as a way of gaining access to land without cost of official registration and other procedures on the formal land market (Mamdani, 1987:358) in (Chimhowu and Woodhouse, 2006). The trend is towards privatization and individualization of land use and ownership rights (Benjaminsen and Lund, 2003). The emergence of easily accessible land in the Dombosahva peri-urban area has thus created space for different forms of land transactions. Dynamics of land transactions vary depending on the circumstances that surround them. Land transactions in Domboshava take form of direct land sales, renting, land grabs and inheritance (Hungwe, 2014). Land speculation and illegal land exchanges are common and exacerbated by the failure of urban planners to curb the practice, but urban poverty and failure to provide adequate housing and the absence of effective and efficient regulatory framework on these issues (Chirisa, 2009; Gumbo and Geyer, 2011).

Peri-urbanities – Towards the ‘Hybrid’ Sustainable Land use Planning and Development Frameworks

This work managed to highlight the fragmented and uncoordinated nature of frameworks and authorities that are shaping the spatial development of Domboshava currently, as well as the dire consequences and outcomes of such approaches. This is because there exists a parallel system of land administration in communal areas situated in the peri-urban zone of metropolitan cities. Struggles on land administration in communal areas clearly exist. Under these circumstances, the critical question that needs clarity is on ‘who’ has authority over land (Cousins, 2008). Love (2008) views these struggles in terms of whose voices are heard, and whose are silenced. Berry (2002) relates the struggles to who should have access to land rights and the terms of reference on which the rights are exercised. In order to inform the future development, adoption and implementation of appropriate Spatial development frameworks within peri-urban areas around Harare and within the country, the concept of land tenure in peri-urban communal areas of Zimbabwe must be (re)conceptualized within the domain of the ‘living’ customary law.

Paradoxically, the land development frameworks that characterize most peri-urban communal areas of Zimbabwe such as Domboshava in their combination depict a system that suggests the possibility of devising a hybrid land use planning and development framework. Part of what is happening in Domboshava as a result of sustained rural-urban linkages is not only altering the boundaries of this communal area in spatial and territorial form, but in institutional terms as well. This scenario presents major transformation of this locale not only physically but institutionally because the communal area has turned peri-urban, yet rural development frameworks still apply. The role of rural-urban and urban-rural linkages cannot be undermined as Domboshava has gone through considerable transformation from rural to peri-urban. Thus, developing a hybrid land use planning and development framework from the ‘living’ customary land tenure system is important and relevant as it allows the conceptualization and detailed analysis of land use and Spatial development frameworks within social systems that are characterized by a diversity of actors and institutions in land administration. In this case, both voices that are traditional and

formalised modern systems count as they are accorded the space they deserve. Thus, a hybrid customary land tenure system that allows tensions and conflicts between different actors with varying degrees and sources of power to be recognized is necessary, because it presents a greater degree of individualization of land rights than the 'official' customary land tenure system which provides for traditional leaders, the state and in some cases heads of households. Processes that regulate land use in Domboshava as a selected case study illustrate the flexibility of the hybrid customary land tenure system with regards land administration in the peri-urban zones.

In addition, proximity of communal areas to burgeoning cities generates a diversity of forces that engender migration circular migration. Straddling abstractions that separate the rural and urban areas is rather a continuous process that implies a reverse orthodox of the rural-urban movement to urban-rural movement while people continue to tap resources from better regions. Research evidence indicates that sustained movement of people and goods between Domboshava and Harare seem to proliferate in rural zones closer to the urban boundaries (see Hungwe, 2014). Willingness by the state to protect interests of both original inhabitants of rural areas situated in the cities' peripheries, and those of 'new settlers' – the migrants - is critical because land under the system of customary land tenure in peri-urban areas such as Domboshava is under siege from overlapping institutions and administrative structures often applied selectively and contingently. This can only come about through possible new land tenure arrangements, secured land rights through titles, while legally recognizing these land rights under the system of customary land tenure at the same time - an idea that has not been previously developed in Zimbabwe. Legitimation of land rights for both tribal and migrant households is potently needed. In the peri-urban communal area of Domboshava, a new model would recognize the existence of a parallel system of land administration under the 'living' customary land tenure system. Such a legally recognized 'living' customary system of land tenure that is responsive to local conditions and changes, as well as capable of harnessing peri-urban challenges is urgently needed (see Mnisi, 2003; Peters, 2004; Claassens, 2008).

The dilemma in the Domboshava case rests on maintaining customary land rights of tribal members - who have autochthonous rights to land as a result of their tribal status - while at the same time safeguarding their interests and those of migrants without upsetting or rendering these categories of households insecure and more vulnerable. Migrants in some cases have been vulnerable because of prior displacements through operation urban clean ups applied in cities, and the Fast Track Land Reform Programme experienced in adjacent commercial farms (see Tibaijuka, 2005; Kamete and Lindell, 2010; Cliffe *et al.*, 2011). The challenge is thus to "square the circle" in recognizing land rights within accountable local institutions, while at the same time avoiding entrenching inequitable power relations and social differential outcomes (see Cousins, 2008). The resultant dilemmas are therefore not only about the importance of maintaining traditional aspects of rural tribal culture, but also about balancing and maintaining the interests of migrants who settled in Domboshava. Both categories of households seek to survive within a peri-urban context. This would provide a balance between the rural and the peri-urban nature of this communal area. Thus, a process that compromises and reconciles the diverse interests while at the same time guards against the extinction of tribal land rights, those of migrants, children, and women - the 'living' customary land tenure - is critical. The 'living' customary land tenure system is however far

from being problem free. The practice is capable of generating tensions and conflicts amongst a range of actors as evidenced by the findings of this research. These dilemmas arise from the tension particularly between the official rules and the customary procedures. A hybrid model on land administration that legalizes settlement and land through land holding titles for both original inhabitants is at the core of a sustainable land use planning and sustainable spatial development third space – the peri-urban – such as Domboshava.

Development frameworks for the Third Space

Policies on land use and land administration in peri-urban areas need to focus on appropriate planning, building, development and management of human settlements and appropriate peri-urban industrial business, by so doing addressing spatial patterns of social and economic inequality and their potential integration within peri urban areas. Applying the unified policies tailored to promote uniform and compatible planning and development of peri-urban areas in other settings in developing countries will go a long way to tame fragmented subdivision of rural land for uncoordinated pockets of urbanity. Integrated frameworks will attract more innovative investment employment opportunities within peri urban areas, thus promoting sustainable development of peri-urban areas and in turn linking strategically and influencing the development of rural and urban areas that adjoin them.

Conclusion

Urbanization and migration forces in sub-Saharan Africa have far-reaching consequences on land and settlement issues in peri-urban zones of cities. In Zimbabwe, urbanization of cities and migration of people between the cities and rural areas leads to the development of peri-urban spaces, as well as the proliferation of individualized land transactions. Through the case study of the peri-urban communal area of Domboshava, situated outside Harare the capital city of Zimbabwe, these challenges have been researched. Although the case of Domboshava has unique features, given the patterns of migration and urbanization, cities elsewhere in Zimbabwe may not be able to withstand such forces. Accordingly, the experience of Domboshava is likely to reflect circumstances in other rural areas situated on the periphery of cities. This paper therefore is important not only for Domboshava, but to other peri-urban communal areas in Zimbabwe. These findings are valid and can generate learning experiences for other peri-urban communal areas of Zimbabwe as most of what was happening in Domboshava is not a result of the internal organization of this particular peri-urban communal area, but spill-overs of national events as well the location of Domboshava in proximity to Harare. Given the inevitability of Domboshava's incorporation into the greater Harare zone with time, spatial development in the interim could address the needs of tribal members that would like to maintain some form of peasant agriculture as they are used to this way of life. The goals can be achieved through contextualizing these research findings within the differing situations of cities and their peripheries in Zimbabwe.

References

- Allen, A. 2003. Environmental Planning and Management of the peri-urban interface: perspectives on an emerging field. *Environment Urbanization*, 15(1):135-148.
- Allen, A. 2010. Neither rural nor urban: Service delivery options that work for the peri-urban poor, in Khurian, M. & McCarney, P. (eds.). *Peri-urban water and sanitation services: Policy, planning and method*. London: Springer Science. 27-62.

- Bekker, S. & Fourchard, L. 2013. *Politics and Policies. Governing cities in Africa*. HSRC Press: Cape Town.
- Bekker, S. & Leilde, A. 2003. 'Residents' perceptions of developmental local government: Exit, voice, and loyalty in South African towns. *Politeia*, 22(1):144-165.
- Bekker, S. & Therborn, G. 2012. *Capital cities in Africa*. Cape Town: HSRC Press.
- Bekker, S. 2002. Diminishing returns: Circulatory migration linking Cape Town to the Eastern Cape. *SA Journal of Demography*, 8(1):1-9.
- Benjaminsen, T.A. & Lund, C. 2003. *Securing land rights in Africa*. London: Frank Cass.
- Bennett, T. 2008. Official vs "living" customary law: Dilemmas of description and recognition, in Claassens, A. & Cousins, B. (eds.). *Land, power and custom. Controversies generated by South Africa's Communal Land Rights Act*. Cape Town: UCT Press. 138-154.
- Berry, S. 2002. *Debating the land question in Africa*. Johns Hopkins University: Society for Comparative Study of Society and History.
- Berry, S. 2011. Questions of ownership: Proprietorship and control in a changing rural terrain. A case study from Ghana. Unpublished paper.
- Chideme, M. 2010. City of Harare boundaries extended. The Herald Online, 13 July: 2010.
- Chimhowu, A. & Woodhouse, P. 2006. Customary vs. Private property rights? Dynamics and trajectories of vernacular land markets in Sub-Saharan Africa. *Journal of African Agrarian Change*, 6(3):346-371.
- Chimhowu, A. & Woodhouse, P. 2010. Forbidden but not suppressed: A vernacular land market in Svosve communal lands, Zimbabwe. *Africa*, 80(1):14-22.
- Chirisa, I. 2008. Population growth and rapid urbanization in Africa: Implications for sustainability. *Journal of Sustainable Development in Africa*, 10(2):361-394.
- Chirisa, I. 2009. Informality, deceit and the conscience: A survey of ethical dilemmas in Harare. *Journal of Sustainable Development in Africa*, 11(2):257-280.
- Chirisa, I. 2010a. Peri-urban dynamics and regional planning in Africa: Implications for building healthy cities. *Journal of African Studies and Development*, 2(2):015-0126.
- Chirisa, I. 2010b. An analysis of the environmental stewardship concept and its applicability in peri-urban towns. Lessons from Epworth in Zimbabwe. *Journal of Sustainable Development in Africa*, 12(4):41-57.
- Claassens, A. 2008. Customary law and zones of chiefly sovereignty: the impact of government policy on whose voices prevail in the making and changing of customary law, in Claassens, A. & Cousins, B. (eds). *Land, power and custom. Controversies generated by South Africa's Communal Land Rights Act*. Cape Town: UCT Press. 353-382.
- Cliffe, L. Alexander, J.; Cousins, B. & Gaidzanwa, R. 2011. An overview of the Fast Track Land Reform in Zimbabwe. Editorial Introduction. *The Journal of Peasant Studies*, 38(5):907-938.
- Cousins, B. 1990. Property rights and power in Zimbabwe's communal lands: Implications for agrarian reform in the 1990s. Paper delivered at a conference on Land Policy in Zimbabwe After "Lancaster". 13-15 February, University of Zimbabwe.
- Cousins, B. 2008. Contextualising the controversies: Dilemmas of communal tenure reform in post-apartheid South Africa, in Claassens, A. & Cousins, B. (eds.). *Land, power and custom. Controversies generated by South Africa's Communal Land Rights Act*. Cape Town: UCT Press. 3-31.
- Cousins, B. 2009. Potential and pitfalls of 'communal' land tenure reform: experience in Africa and implications for South Africa. Unpublished paper delivered at the World Bank conference on Land governance in support of the MDGs: Responding to new challenges. 9-10 March, Washington D.C.
- Gough, K.V., Agergaard, J., Fold, N. & Moller-Jansen, L. 2010. *Rural-urban dynamics. Livelihood, mobility and markets in African and Asian frontiers*. London: Routledge.
- Government of Zimbabwe. 1998. Traditional Leaders Act Chapter 29:17 of 1998. Harare: Government Printer.
- Government of Zimbabwe. 2000. Rural District Councils Act Chapter 29:13 2000. Harare: Government Printer.
- Government of Zimbabwe. 2001. Regional, Town and Country Planning Act Chapter 29:12

2001. Harare: Government Printer. Government of Zimbabwe. 2002. Communal Lands Act Chapter 20:04 of 2002. Harare: Government Printer.
- Government of Zimbabwe. 2005. The Urban Councils Act Chapter 29:15 of 2005. Harare: Government Printer.
- Gumbo, T. & Geyer, M. 2011. 'Picking up the pieces': Reconstruction of the informal economic sector in Bulawayo, Zimbabwe. *Town and Regional Planning*, (59):53-64.
- Hungwe, E. 2014. Land transactions and rural development policy in the Domboshava peri-urban communal area of Zimbabwe. Available online [Stellenbosch University <http://scholar.sun.ac.za>]
- Kamete, A.Y. & Lindell, I. 2010. The politics of "non-planning" interventions in African cities: Unraveling the international and local dimensions in Harare and Maputo. *Journal of Southern African Studies*, 36(4):889-912.
- Kinsey, B.H. 2010. Who went where..., and why: Patterns and consequences of displacement in rural Zimbabwe after Feb 2000. *Journal of Southern African Studies*, 36(2):339-361.
- Love, J. 2008. Forward, in Claassens, A. & Cousins, B. (eds.). *Land, power and custom. Controversies generated by South Africa's Communal land Rights Act*. Cape Town: UCT Press. xii-xv.
- Lynch, K. 2005. *Rural-urban interaction in the developing world*. London: Routledge.
- Mabin, A. 2012. Peripheries, suburbanisms and change in African cities. Unpublished paper delivered at the International Workshop on Changing Socio-Spatial Configurations of Inclusion and Exclusion: Planning and Counter Planning in the African City. 7-8 March 2012, Uppsala.
- Marimira, S.C. 2010. *Livelihoods after land reform in Zimbabwe. Working paper 6. Institutions, leadership and service delivery in new resettlement areas of Zimbabwe*. United Kingdom: Institute of Development Studies.
- Marongwe, N. 2003. The fast track resettlement and urban development nexus: The case of Harare. Unpublished conference paper delivered at the Symposium on Delivering Land and Securing Rural Livelihoods: Post-Independence Land Reform and Resettlement in Zimbabwe. 26 - 28 March, Mont Clair.
- Matondi, P.B. & Dekker, M. 2011. *Land rights and tenure security in Zimbabwe's post Fast Track Land Reform Programme. A synthesis report for LandAc*. Harare: Ruzivo Trust.
- Mnisi, S. 2010. *Reconciling living customary law and democratic decentralization to ensure women's land rights security. Policy Brief 32*. Western Cape: PLAAS.
- Munzwa, K.M. & Jonga, W. 2010. Urban development in Zimbabwe: A human perspective. *Theoretical and Empirical Researches in Urban Management*, 5(14):120-146.
- Mutizwa-Mangiza, N.D. & Helmsing, A.H.J. 1991. *Rural development and planning in Zimbabwe*. Brookfield: Avebury.
- Mutizwa-Mangiza, N.D. 1986. Urban centers in Zimbabwe: Inter-censal changes, 1962-1982. *Geography*, 71(2):148-150.
- Narain, V. & Nischal, S. 2007. The peri-urban interface in Shahpur Khurd and Karnera, India. *Environment and Urbanization*, 19(1):261-273.
- Okoth-Ogendo, H. 2008. The nature of land rights under indigenous law in Africa, in Claassens, A. & Cousins, B. (eds.). *Land, power and custom. Controversies generated by South Africa's Communal land Rights Act*. Cape Town: UCT Press. 95-108.
- Peters, P.E. 2004. Inequality and social conflict over land in Africa. *Journal of Agrarian Change*, 4(3):269-314. Peters, P.E. 2007. *Challenges in land tenure and land reform in Africa: An anthropological perspective. CID Working Paper No. 141*. USA: Harvard University.
- Potts, D. 2011. *Circular migration in Zimbabwe contemporary Sub-Saharan Africa*. Cape Town: James Currey.
- Potts, D. 2012. *Whatever happened to Africa's rapid urbanization? Counter points*. London: Africa Research Institute.
- Quan, J. & Payne, G. 2008. *Secure land rights for all*. Nairobi: Global Land Tool Network/UN-HABITAT

Quan, J. & Payne, G. 2008. *Secure land rights for all*. Nairobi: Global Land Tool Network/UN-HABITAT

Quan, J. 2000. Land tenure, economic growth and poverty in sub-Saharan Africa, in Toulmin, C. & Quan, J. (eds.). *Evolving land rights, policy and tenure in Africa*. United Kingdom: IIED Bookshop. 31-50.

Sadiki, P. & Ramutsindela, M. 2002. Peri-urban transformation in South Africa: Experience from Limpopo province. *GeoJournal*, (57):75-81.

Tacoli, C. 2008. *The links between rural and urban development in Africa and Asia*. IIED.

Vanempen, E. 2009. *Fragmented and dispersed: Designing Brussels rurban landscape, in The new urban uestion: urbanism beyond neo-liberalism*. Amsterdam: International Forum on Urbanism.

The Dynamics of Rurbanisation – A Case of Bhopal District of India

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Short Abstract

A village does not exist in a vacuum detached from the proximate town(s) along its respective administrative boundaries. Villages and towns cannot be seen simply as dichotomous entities. They are intimately interlinked. What ought to unfold is the dynamics of rural transformation by identifying the transformational path.

1. Introduction

Neither a town nor a village exists in a vacuum detached from the proximate settlements along their respective revenue or administrative boundaries. On the contrary, they feed each other. Since the dawn of Industrial Revolution and the concomitant tertiarization of the economy, the urban centres around the world have been witnessing unprecedented growth drawing upon the resources (both men and materials) from their rural counterpart. The influence of urban centres on its rural settings has been so prominent in India that even the anonymity that an urban area provides can be an attraction to many wish-to-migrate rural aspirants. As the prime mover of national economy contributing more than sixty percent of India's GDP, urban centres in India owe a lot to their rural counterparts in view of the synergistic role played by the latter for the development of the former. Such reciprocity between the town and rural areas around it can be evidenced and one can perhaps call the rural neighbourhoods around a town as the 'economic footprint' of the town (Choudhury, 2007).

The dynamics of rural-urban continuum has been debated from various perspectives. Although there is a perceptible distinction between a village and a city in terms of cultural ethos, livelihood and life style, villages and towns cannot be seen simply as dichotomous entities. They are intimately interlinked.

Rurbanization is a process of rural transformation. It is a third world phenomenon observed across countries in Asia, Africa, and Latin America. These countries are largely rural oriented, driven by an agrarian economy and shaped by agrarian social relations. Rurbanization is the upshot of rural development policies followed by these countries after their liberation from colonial rule. Such policies were based on mediated responses to modernization.

The issue therefore ultimately converges towards finding the transformational path of a rural settlement and examines how far the urban impetus has been responsible for this transformation. The present study is an endeavour to investigate the extent of such rurbanisation around the city of Bhopal, the capital of Madhya Pradesh, a State under the Indian union.

1.1 *Objectives and Methodology*

There is no denying fact that the villages adjacent to Bhopal are spatially and socio-economically transforming with the passage of time. This degree of transformation however decreases as one moves away from the municipal limit of Bhopal city. Since there is an inverse relationship between the degree of transformation in a village and its distance from the nearest urban area, the present study shall consider two rural settlements around Bhopal located at two discrete distance gradient. The present paper would therefore attempt to answer the following queries:

- Are there any perceptible improvements in the spatial and socio-economic scenario of rural neighbourhoods around Bhopal?
- Has there been any role of Bhopal in these transformations of the rural settlements?
- What are the factors behind this rural transformation?

The functional and spatial transformation of rural areas around a city is an important area of research whereby one can measure the impact of the city on the spatio-economic and socio-cultural landscape of surrounding rural areas. The city cannot accommodate the population implosion and economic growth as a result of which the spill-over effect are being borne by the settlements in the rural periphery which accommodate some of the urban economic functions at a cheaper cost than the city. The rural settlements on the periphery in turn depend upon the city for several specialized functions (Biswas, 2005). This dynamics of rural urban interdependence leads to rural transformation which can also be termed as rurbanisation.

The main objectives of the present study are; i) to identify and examine the drivers of rurbanisation, ii) to study the spatio-economic and socio-demographic profile of the case study areas (two villages around Bhopal city), iii) to examine the nature of functional relationship between the case study areas and Bhopal city, and iv) to examine the impact of Bhopal city on the transformational journey of the case study areas.

In order to carry out the study, following methodological sequence has been followed:

- Examination of the spatial (built-up), demographic (population density, literacy rate, gender gap in literacy, sex ratio, etc.) and economic profile (occupational pattern through WFPR, main non-farm workers, rural-urban mobility) of the case study areas around Bhopal city over the intercensal period
- Documentation and examination of the behavioural changes, such as, switch over to LPG as cooking fuel, provision of sanitary latrine, mobile telephony, institutional birth and subscription of newspaper, occurring to the rural households of the case study areas
- Testing the rural urban linkage through various tools (e.g. Harris Todaro equilibrium, graphical methods)

Both primary and secondary data shall be used for the present study. The case study areas (two villages) shall be so selected that their distance from the municipal limit of Bhopal city would be five and fifteen kilometers respectively. Different distances for the

case study areas have been considered to examine whether the impact of the town on the rurbanisation process differs across distance gradient.

2. Concepts

2.1 Rurban

Arthapedia defines 'rurban' (rural+urban) as a geographic territory which possesses the economic characteristics and lifestyles of an urban area while retaining its inherent rural features. Charles Galpin coined the term 'rurban' for the localities that tend to be both rural and urban as early as in 1915 (Wilkinson, 1991). Subsequently this new terminology was first used by land planning specialist in France in 1970s for zones generally without any pre-planning and having the characteristics of intensive agriculture, suburban living and industrialisation zones (Griffon 2002). Mandal (1989) described the rurban centres as large rural settlements and small towns with service facilities for surrounding hinterland. In Indian context, Chatterjee (2014) renamed the census towns (as defined by Census of India) as 'rurban' which are born out of large villages with predominant non-farm based economic activity where the socio cultural aspects are however still rural.

2.2 Rurbanisation

Rurbanization is a slow and invisible process of rural transformation. The magnitude of this transformation may be steady or uneven. Rurbanization process is highly affected by the geographical, political, environmental, and economic constraints and opportunities. Effective implementation of government schemes facilitates the process of rural transformation and thus a vigilant community is a prerequisite for successful rurbanisation process.

Rurbanization is not to be seen as a universal, unidirectional, and standard process of change. Its uniqueness lies in its contextuality, complexity, variety, flexibility, transformability and adaptability. By its very nature it poses difficulties in measurability, evaluation, and absolute value judgments. It can be perceived differently by different scholars, thus posing challenges for easy categorization. For example, while it is generally agreed that rurbanization is rural transformation towards an urban mode of livelihood although bereft of perceptible socio-cultural transformation, there are views that argue that rurbanization is the defacing of urban landscape by the cultural habits of rural migrants.

The process of transformation may be kick started by a small irrigation scheme or introduction of HYV seeds or a mere replication of good practices. At times, simultaneous actions by different actors may be synergized to reap the maximum benefits. Proximity to urban areas further accelerates the process of transformation. Rural urban linkages and their intensities impact the potential growth of the rural settlements.

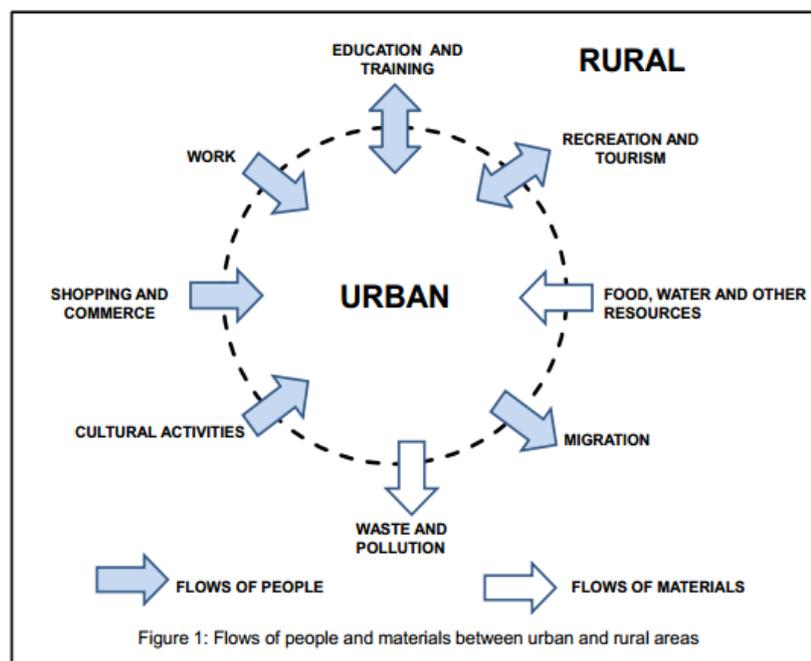
Impact of rurbanization can be observed at three levels - local, regional, and state level. Changes initiated at one level gets reflected in different spheres such as economic, social, political, environmental, and physical. Local economic changes appear to be the most significant. They are easy to identify, measure, and compare. Growth in agricultural production of a village is a good measure. Increased productivity, cropping intensity and cropping pattern coupled with availability of finance, technology, knowledge inputs, insurance facilities bring in economic fortune with or without the accompaniment of any socio

cultural change (Rurbanization, n.d.). But local economic change can only be sustained with the help of a host of socio-economic and physical infrastructures and services, e.g. literacy, availability of accessible and affordable health care facilities, participatory planning, availability of water, electricity, transport and communication facilities. Psychological effects of rurbanization processes are triggered by the ex-post physical, economic and social conditions. With the changes in popular perceptions and expectations come the changes in attitudes, views which open up the choices. Many a time psychological changes become the prime mover of rurbanization. A circular causality is set in motion and new lifestyles bring in new changes.

Rurbanization slows down the out migration rate to the urban centers thus slowing down the population growth rates in the latter. Rurbanization can also start the process of reverse migration too. Due to the revitalization of rural economy, people having their roots with such villages start re-establishing the links and eventually return to their original place of residence. Economic flow is thus affected by the process of rurbanization. Capital accumulation also picks at village level and both financial and information services like banking, internet, and insurance services start functioning at village level.

2.3 Rural-Urban Continuum

Urban and rural settlements are two sides of the same coin of social and economic system. Neither rural nor urban development can proceed in isolation. Urban growth translates into higher demand for agricultural production which is met by rural settlements. Towns of different orders support agricultural development by providing marketing and transportation facilities besides other agricultural inputs such as fertilizers, seeds, and machinery for farm consumption. Rural development thus promotes urban development. In fact there is a rural-urban continuum (Singh et al., 2008). Urban-rural linkages demonstrate a more complex and dynamic web of interdependencies which are shaping the fortunes of urban and rural settlements. For the first time since the Industrial Revolution, technological change is allowing rural areas to compete on an equal basis with towns and cities for employment. It is this recognition of the complexity of urban-rural relationships that has gained a new political salience both at national and regional levels. This focus on urban-rural continuum is justified by the visible and invisible flows of people, capital, goods, information and technology between urban and rural areas. Urban and rural areas are



interdependent and are connected economically, socially and physically through housing, employment, education, transport, tourism and resource use. Figure 1 illustrates the conceptual flows of people and materials between urban and rural areas (Bengs et al., 2006).

Mushi (2003) observes that rural-urban linkages can be divided into two broad categories: spatial and sectoral linkages. Spatial linkages include flows of agricultural commodities from rural to urban areas, and in the opposite direction flows of manufactured and imported goods from urban areas to rural areas. Sectoral linkages include forward and backward linkages between agriculture and manufacturing services, for instance, production of agricultural inputs such as fertilisers and farm implements in urban areas, and existence of processing industries in rural areas. Both types of linkages are influenced and often intensified by macro-level changes including structural adjustment and economic reforms that affect both rural and urban populations. Therefore, it can be summed-up that neither rural nor urban development can proceed in isolation.

2.4 *Rural Transformation*

Rural transformation is a process of comprehensive societal change whereby rural societies diversify their economies and reduce their reliance on agriculture and become dependent on distant places to trade and acquire goods, services, and ideas and become culturally more similar to large urban agglomerations. Rural transformation is the reorganization of society in a given space, rather than about a space that empties as people and economic activity move away. It is embedded within a wider process of structural change that involves the whole of a country and that sees a decline in the relative weight of agriculture in the overall economy, a corresponding increase in industry and services, migration of rural people to nearby urban areas. While regional and global forces drive this transformation, they are mediated by localized social structures and institutional frameworks. However rural transformation has different outcomes in terms of economic growth, social inclusion, and environmental sustainability both at inter country and intra country level (Berdegue et al., 2013).

Kumar et al. (2014) finds that there are multiple dimensions of rural transformation. The diversity of production and economic activities of the people results into income flows from diverse sources. The agrarian economy could not satisfy their aspirations for social and cultural mobility. The surplus they generated from agriculture thus goes into education, urban trade and other non-agricultural activities.

The land use pattern of rural area is basically agricultural in nature. Biswas (2005) observed that the proximity to metro city affects the land use pattern in two ways. Firstly, the conversion of land for industrial and commercial purposes and secondly, change in the cropping pattern within agricultural sector under the impact of the demand from the urban core. The distributional pattern and the types of services, the number and functional interrelationship of the service areas, the occupational structure and the functional segregation of land use in various rural settlements alter drastically due to their proximity to large cities. Kundu et al. (2002) also established the hypothesis that distance of a village from the nearest town has a systematic impact on its socio-economic characteristics. The present study considers rural transformation in terms of the spatio-economic and socio-demographic characteristics.

2.5 Drivers of Rural Transformation

Berdegue et al. (2013) identify three factors behind rural transformation. These are: i) diversification of rural economies ii) progressive globalization of agri-food systems and iii) urbanization of rural regions. Nathan et al. (2010) list the drivers of rural transformation as i) infrastructure: roads, electricity, irrigation; ii) technology: green revolution; iii) government policy: support to cereal production; iv) entrepreneurial farmers; v) mobilization for social and gender equality: influencing government allocations through electoral system; vi) migration: commuting, circular, permanent and vii) telecommunications. Gupta (2013) listed 30 indicators under the sub categories of i) demography, ii) social, iii) economic, iv) spatial, v) infrastructure: physical, social, vi) connectivity with town, vii) banking, viii) household assets, ix) administrative/governance.

The present study has taken the following indicators: (a) Demographic: population density and population growth rate, literacy rate and gender gap in literacy, sex ratio; (b) Economic: work force participation ratio (WFPR), percentage of non-farm workers, rural-urban mobility; (c) Spatial: built-up growth of village; (d) Infrastructural: percentage of households with LPG as fuel for cooking, percentage of households having latrine facilities, percentage of households having two wheelers; (e) Behavioural: mobile telephony, institutional birth and subscription of newspaper.

In keeping with the national and state (Madhya Pradesh) trend of falling agricultural share in the GDP and GSDP respectively, Bhopal district also represents the same scenario as evident from the district gross domestic product (DGDP) statistics for last couple of years. The share of agriculture in Bhopal's DGDP has been a mere four percent from 2007-08 till date.

3. Data Analysis and Findings

Two villages, namely, Lamba Kheda and Jetpura, of Bhopal district of the state of Madhya Pradesh, India have been considered to study the dynamics of rurbanisation. Out of two villages, Lamba Kheda is situated within five kilometers from the municipal limit of Bhopal city while Jetpura is located fifteen kilometres away from the municipal limit. Both the villages lie along the state highway (SH) number 18 of Huzur and Berasia sub-districts respectively of Bhopal district (Map 1). Discrete distances for the villages from municipal limit have been considered to examine the impact of Bhopal city on rural transformation that leads to rurbanisation.

3.1 *Description of study area* – Details of two villages are given below:

3.1.1 *Lamba Kheda village*

This village lies on SH-18 on the north of Bhopal city in the sub-district of Huzur of Bhopal district. It has an area of 5.4 square kilometer with a population of 3,908 persons as per Census of India 2011. This village is located within five kilometers from the municipal limit of Bhopal city. Its population growth rate during 1991-2001 and 2001-2011 decades was more than the average population growth rate of its sub-district, Huzur (Table 1). The literacy rate of this village is more than the district average as well as of the sub-district. Gender gap in literacy is also less as compared to the sub-district. The transformation of occupational

pattern is very clear in this village as observed from Table 1. The percentage of workers in non-farm sector has increased from 52.75 percent to 86.99 percent from 1991 to 2011. This shows a drastic change in the occupational pattern and economic transformation in this village. Spatially the built-up area of this village has grown 233 percent during 2002-2012. Among the amenities the percentage of households with LPG as fuel for cooking has been found to be 57.30 percent which is almost same to the overall percentage in the district. The percentage of household having latrine facilities is also more than the district average. The percentage of households having two wheelers was 48.90 percent in 2001 (Table 1).

3.1.2 Jetpura village

This village lies on SH-18 on the north of Bhopal city in the sub-district of Berasia of Bhopal district. It has an area of 2.96 square kilometer with a population of 838 persons as per Census of India 2011. This village is located within fifteen kilometers from the municipal limit of Bhopal city. Its population growth rate during 1991-2001 decade was more than the average population growth rate of its sub-district, Berasia (Table 1). However, it has declined during 2001-2011. The literacy rate of this village is more than the district rural average as well as of the sub-district. Gender gap in literacy is more as compared to the sub-district. The WFPR is much more than the district and sub-district average, because of the village having a large volume of female working population. The transformation of occupational pattern is low in this village as observed from Table 1. The percentage of workers in non-farm sector has increased from 6.90 percent to 12.60 percent only from 1991 to 2011. Most of the working population is engaged in agriculture sector. Spatially the built-up area of this village has grown 174 percent during 2002-2012. Among the amenities the percentage of households with LPG as fuel for cooking is found to be zero. The percentage of household having latrine facilities is similar to the sub-district average. The percentage of households having two wheelers was 22.30 percent in 2001 (Table 1).

3.2 Data analysis

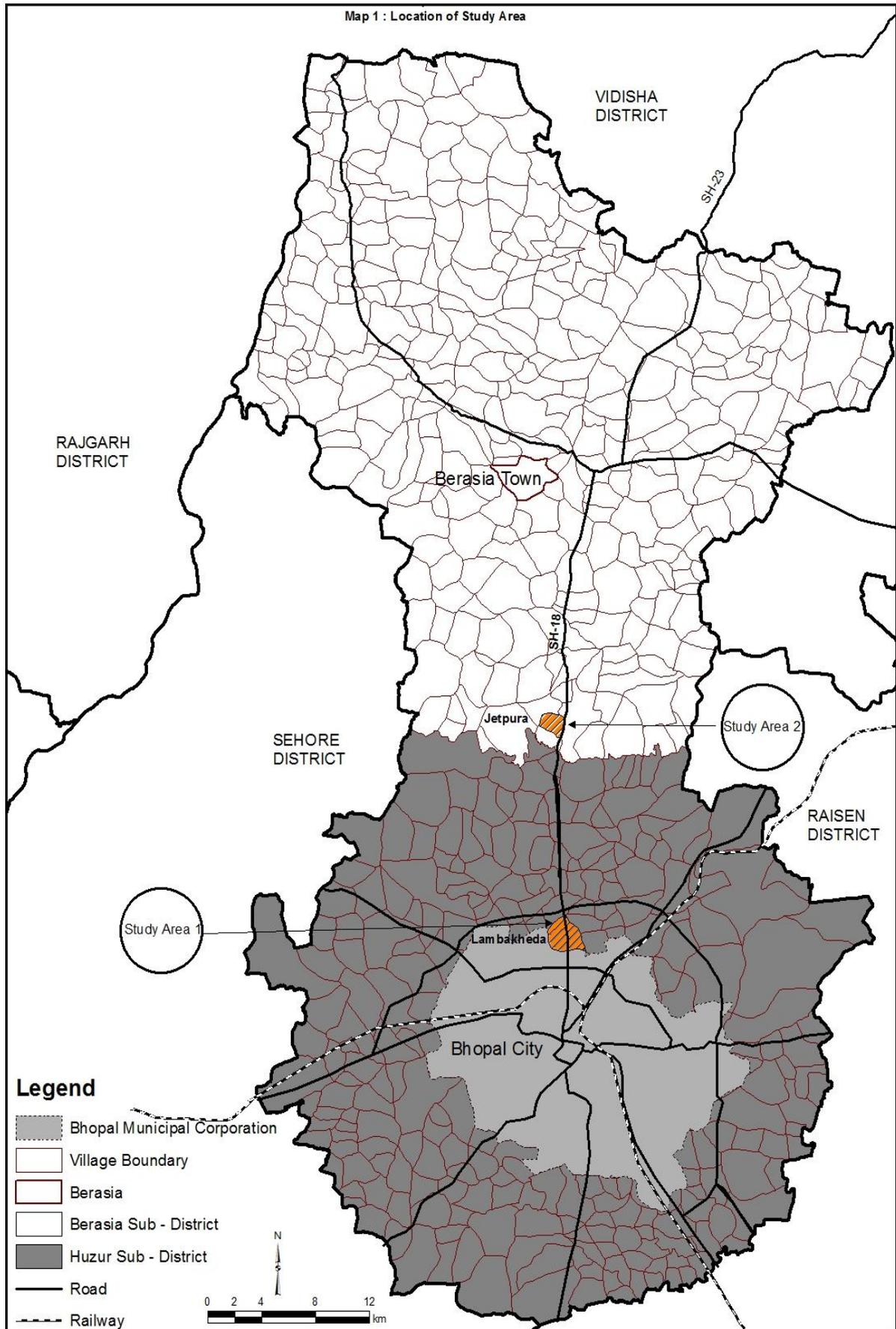
3.2.1 Increasing dependence on Bhopal city for livelihood

The present study has tested the existence of Harris Todaro disequilibrium in order to establish the dependence of the rural work force on Bhopal city for livelihood. Harirs-Todaro disequilibrium would occur when

$$L_f / L_f + L_i * W_f + L_i / L_f + L_i * W_i > W_A$$

where, L_f and L_i denote urban formal and informal sector employment respectively, W_f and W_i denote the wage for urban formal and urban informal sector respectively and W_A stands for agricultural wage. Given the data for Bhopal city and case study areas, it has been found that there is *Harris Todaro disequilibrium* which establishes the fact that the rural work force (particularly that of Lamba Kheda) heavily depends on Bhopal city for their livelihood. The values of corresponding variables for the aforesaid equation are tabulated below:

Name of the variable	Urban formal employment	Urban informal employment	Urban formal wage	Urban informal wage	Agricultural wage
Values of the variable	4,07,426	2,23,686	20,000	300	132



Source: Census of India, 2011

Table 1: Indicator wise data of study area villages

Sl. No.	Indicators	Bhopal District			Sub-districts (Rural)		Villages		Rank of two villages	
		Total	Urban	Rural	Huzur	Berasia	Lamba Kheda	Jetpura	Lamba Kheda	Jetpura
1.	Demographic									
	1. Area (sq. km)	2,772	350	2,422	1011	1411	5.40	2.96	1	2
	2. Population in thousand (2011)	2371.06	1917.05	454.01	221.42	232.59	3.91	0.84	1	2
	3. Density (per sq.km)	855	5,476	187	219	164	724	283	1	2
	4. Population Growth									
	1991-2001	36.41	37.19	33.29	38.89	28.61	104.91	32.50	1	2
	2001-2011	28.62	29.29	25.84	29.29	22.71	70.28	12.33	1	2
	5. Literacy Rate (2011)	80.37	83.41	66.91	69.79	64.11	81.38	72.47	1	2
	6. Gender gap in Literacy (2011)	10.84	9.14	20.20	17.64	22.92	11.26	25.20	1	2
	7. Sex Ratio (2011)	918	921	907	916	900	899	862	1	2
2.	Economic									
	1.WFPR (2011)	41.98	39.92	51.10	48.62	51.83	41.19	70.04	2	1
	2. Percentage of Non-Farm workers									
	1991	75.10	94.52	14.88	20.06	10.32	52.75	6.90	1	2
	2001	77.14	98.17	16.40	25.14	14.07	59.59	11.18	1	2
	2011	79.42	97.23	21.02	33.25	16.47	86.99	12.60	1	2
3.	Spatial									
	Built-up growth of Village (in %) 2002-2012						233	174	1	2
4.	Amenities (2011)									
	1. % of households with LPG as fuel for Cooking	57.70	68.9	8.90	16.50	1.80	57.30	0.00	1	2
	2. % of households having latrine facilities	72.20	21.50	83.90	34.00	16.20	73.50	15.30	1	2
5.	Household Assets (2011)									
	1. % of household having two wheelers						48.90	22.30	1	2

Source: Census of India, 2011, Google imageries of 2002 and 2012

3.2.2 Rurbanisation of case study areas (villages)

An attempt has been made to capture the rurbanisation process across the villages of Lamba Kheda and Jetpura over inter censal periods (Table 1). It has been observed from Table 1 that Lamba Kheda village ranked first in almost all the value of indicators except the WFPR. WFPR in Jetpura has been more than that of in Lamba Kheda. This shows an impact of Bhopal on its peripheral areas not only in occupational pattern, but also on density of population, literacy rate, spatial change and provision of amenities. It also establishes the fact that nearness to the city has a relatively much higher impact on the spatio-economic and socio-demographic transformation of the villages. It could be seen that Lamba Kheda outsmarts Jetpura in the transformational journey primarily due to its proximity to Bhopal city. Figure 2 also reveals the rural transformation due to distance gradient of some of the indicators, particularly, percentage of literates, growth of built-up areas, percentage of non-farm workers and provision of sanitary latrine. It shows that distance from city plays an important role in the transformation. Although it could be visually observed from Table 1 that Lamba Kheda village has vastly transformed as compared to Jetpura, rank correlation has been run on the rank differences across the variables of the two villages. The purpose behind the rank correlation is to establish the verity that improvement in one aspect of life and livelihood positively impacts other aspects and thus a cascading effect generates whereby each aspect mutually impacts one another. The Spearman rank correlation coefficient has been found to be 0.99 at 5 percent level of significance. It validates the argument that the demographic, spatial, economic and infrastructural factors in case of Lamba Kheda have not only vastly transformed positively, each one of the factors (and sub factors) have impacted the others and in turn got impacted by other factors.

Spearman rank correlation coefficient, $\rho = 1 - 6\sum d^2 / n(n^2 - 1)$ where d is the difference between the pair of ranks for each pair of observations and n is the number of paired observations.

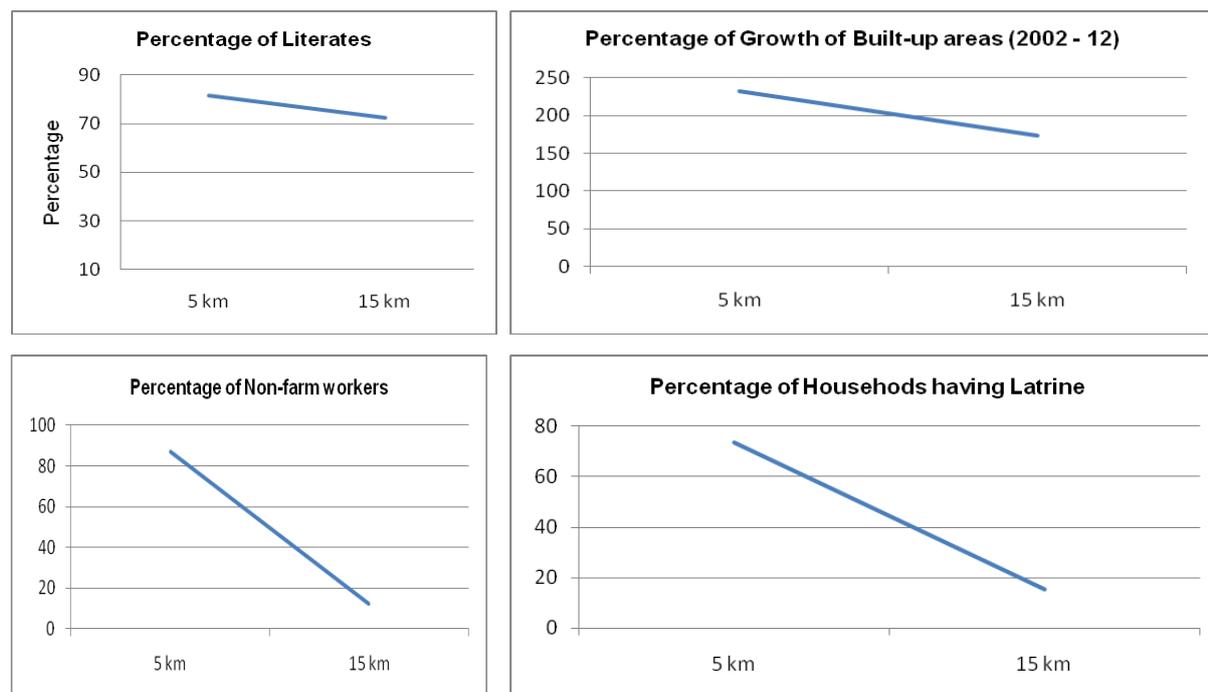
3.2.2 Primary survey of two villages

Primary survey and meeting with village elders and village council officials were conducted in both the villages to validate the findings derived from the data sets of Census of India. Another purpose behind carrying out the primary survey was also to notice and record the behavioural transformation across the two villages since Census of India does not record these behavioural information. The findings of the primary survey have been recorded in Table 2.

Table 2: Behavioural Transformation

Lamba Kheda	Jetpura
Subscription of newspapers by 95% household	Subscription of newspapers by 10% household
Hundred percent institutional birth	80% institutional birth
Zero open defecation	Increasing usage of toilets by younger population; open defecation still practiced by the older generations
Hundred percent household own mobile telephone	Hundred percent household own mobile telephone

Figure 2: Graphical Presentation of Rural Transformation on Distance Gradient



4. Conclusion

The fact that rurbanization has been faster in Lamba Kheda village has been due to its proximity to Bhopal city. The land acquisition by the government to set up institutions not only depleted the availability of arable land, it also changed the occupational pattern of the rural workforce whose land got acquired. Rural labour force, mostly unskilled, either got accommodated in the government institutions that came up or else in urban labour market as unskilled labour. Concomitant to the setting up of government institutions in agricultural land of Lamba Kheda with its spread effect has been the fast conversion of agricultural land to real estate. All these have been possible only because of low price of land, low wages and a lackadaisical local government in enforcing planning and environmental legislation. But such mushrooming of spatial transformation at Lamba Kheda could be seen as a deliberate attempt on the part of Bhopal city to dispose off its urban fat at the sink of its periphery. This is how Lamba Kheda, although appears to be rurbanising, turns out to be a degenerated periphery. However, Jetpura has been free from this type of transformation. An altogether different trajectory has been noticed behind Jetpura's rurbanisation. The occupational pattern of the village largely remains agrarian although the village has been seen to be transforming as evident from socio-demographic and spatio-economic indicators. Across all indicators in Table 1, we find a perceptible transformation in Jetpura. But unlike Jetpura, although Lamba Kheda has been experiencing a massive transformation across all the indicators, it unfortunately lands up into a degenerated periphery of Bhopal city.

Reference

- Bengs, Christer and Schmidt-Thome, Kaisa (ed.)(2006): ESPON (European Spatial Planning Observation Network) 1.1.2 Final Report on Urban Rural Relations in Europe, Centre for Urban and Regional Studies, Helsinki University of Technology
- Berdegué, Julio A, Tomás Rosada, and Anthony J. Bebbington (2013) : The Rural Transformation
- Biswas, Tapash (2005): Structural Transformation of the Villages in Delhi Metropolitan Region, Jawaharlal Nehru University, New Delhi, India, iussp2005.princeton.edu/papers/50822 accessed on 31 May, 2016
- Chatterjee, Sumana (2014): The 'Rurban' Society in India: new facets of Urbanism and its Challenges IOSR Journal Of Humanities And Social Science (IOSR-JHSS) Volume 19, Issue 8, Ver. I (Aug. 2014), PP 14-18
- Choudhury, Binayak (2007): Rural Urban Continuum – the Emerging Primacy of Guwahati City (mimeo).
- Griffon Michel (2002) The Dynamics of Future Development in Rural-Urban Zones: sustainable development for the “rurban” zones?
- Gupta, Anima (2013): Measuring Urbanization around a Regional Capital a case Bhopal District, School of Planning and Architecture, New Delhi
- Kumar, Ranjit., Uttam Deb, Cynthia Bantilan, N Nagaraj and M Bhattarai (2014): Economic growth and rural transformation in Eastern India: Strategies for Inclusive Growth,
- Kundu, Amitabh, Pradhan, Basanta and Subramania, A (2002): Dichotomy or Continuum Analysis of Impact of Urban Centres on Their Periphery, Economic and Political Weekly, December 14, 2002, New Delhi Pp 5039-5046.
- Mandal, R.B. (1989): Systems of Rural Settlements in Developing Countries, Concept Publishing Company, New Delhi
- Mushi, Nimrod Shitrael (2003): Regional Development Through Rural-Urban Linkages: The Dar-Es Salaam Impact Region, A PhD Thesis.
- Nathan, Dev, Reddy, D.N. and Sharma, Alakh (2010): Rural Transformation in India: An Overview, Institute for Human Development, New Delhi www.rimisp.org/wp-content/uploads/2010/.../PPT-Country-Overview-India-4.11.pdf accessed on 31 May, 2016
- Reddy DN, Reddy Amarender A, Nagaraj N and Bantilan C. (2014): Rural Non-Farm Employment and Rural Transformation in India: Working Paper Series No. 57. Patancheru 502 324, Telangana, India: International Crops Research Institute for the Semi-Arid Tropics. 28 pp.
- Rurbanization, (n.d.): <http://sdmahajan.tripod.com/rurbanization.htm> accessed on 2 June, 2016
- Singh, B.N. and Alam, Ashfaque (2008): Strengthening Rural-Urban Linkages in Decentralized Structure (mimeo).
- Wilkinson, Kenneth P. (1991): The Community in Rural America, Greenwood Press, London.
- www.statisticssolutions.com/manova-analysis-anova accessed on 6 June, 2016

Identifying and Characterizing Urban Fringe with Fractal Analysis on Akhan, Denizli, Turkey

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Abstract/Short abstract *Urban fringe transformation is more importante determining of urban boundaries and fractal geometry can be explained for. The inception of town growth set off urban fringe-belt developement (Whitehand J. W. R., 1967). Urban sprawl and density are spatial reflections is surfaced with increasing demand constrain of urban dynamics. Recent 30 years many study with the fractal aspects explained relations of urban boundraries and the fractal dimention (Longley and Batty 1989; Frankhauser 1997).*

A two-step method is proposed here: (1) Fractal dimention is applied to detect spatial discontinuity of study area via different human settlement area, (2) Detect changing of urban pattern

Akhan is 7 km far from the Denizli city an it is at the side of Denizli Afyon Road has a population about 5691 (2013). Towns' name came from the last caravansaray was built in 1253 years at the west of the Anatolia, by the governor of the Denizli; Şeyfettin Karasungur ibn Abdullah, Emir of Ladik (Yakar et al., 2009). Akhan was a village before the new metropolitan municipal law (6360 Büyükşehir Belediye Yasası). In 2012, is converted a neighborhood of Denizli is in southwestern industrial city, Aegean Region of Turkey, has a population of about 993.442 (2015).

The power of effecting transforming the spatial character of urban fabric by decision of centralized management can be read via different part of Akhan urban inner fringe belt of Denizli, first of three sample is the northernmost of the settlement, second area is the south side of the main transportation axe and third part of settlement is neighborhood of industrial area. We therefore measure the fractal dimention of space filling's urban fringe fabric. The method is tested on Turkish municipality cities to identify their morphological boundaries and to track boundary changes over space. Results obtained show that cities characterized by comparable may exhibit different urban fringe of Denizli or other municipality cities growth rapidly after new metropolitan municipal law.

1. Indroduction

Urban pattern is considered the composition of land coverage of settlement as solid mass (figure) to open voids (ground) by morphologically. Furthermore, urban pattern are including geographical feature and socio-cultural stratification. Morphology could be described with the simplest definition is "cognition of shape", more clearly, analysis of physical structures at different scales as well as patterns of movement, land use, occupation in process colligation elements of designating urban pattern. Urban morphology can be defined basicly focusing on the pysical forms of urban areas (Whitehand, 1967, 2001), detail analyzing human settlements' forms with its elements (Batty and Longley, 1987; Seto and Fragkias, 2005; Chen, 2011, 2013; Thomas, Frankhauser and Biernacki, 2008), historical development processes (Frankhauser, 1998; Erdoğan, 2015; Erdoğan and Çubukçu., 2012; 2014; Mcadams, 2007; Sun et al., 2007; Shen, 2002). concept of urban fringe belt is a teoretical framework to explain urban pysical form (Barke, 1974, 1976, 1982; Conzen, 1962, Conzen et al. 2012; Dollen, 1990; Gu, 2010; Whitehand,1967; Dukom, 2003, 2005; Kroph, 2009).

Urban sprawl has thus become a major contemporary problem for both scientists and decision makers for 21st century cause of constraint on natural resource. In this regard, "correct calculation of urban macroform" represents an important challenge. Urban fringe-belt is one of those approaches in urban morphology. Urban fringe belt is an important morphological concept of its potential as citywide planning during development processes which researched by urban planners and geographers in several decades (Barke; 1990; Conzen, 1962, 2009; Clark, 2009; Dukom, 2005; Rodrigo Cervantes, 1999; Vilagrasa, 1990; Whitehand, 1988, 1967; Whitehand and Morton, 2003)

Urban fringe belts are the outgrowth spontaneously of the central business district and usually the areas of importance as a buffer zone of heritage and ecological corridor, characterized by similar physical, occupational pattern, but different usage (Clark, 2009). Fringe belt is a morphological concept referred to the edge of the built-up areas which is the physical result of different morphological periods with combination of large numbers of separate decisions about individual sites (Whitehand, 1967; Conzen, 1962, 2009; Barke, 1974, 1982; Clark, 2009; Dollen, 1990; Kukina, 2008). With similar vein, using fringe belt processes is a helpful tool integrated into urban planning (Gu, 2010; Kropf, 2009; Whitehand and Morton, 2004; Whitehand, 2007, Whitehand et al., 2011).

The rapid pace of urbanization, urban governance and planning, the structure of urbanization, land use's speculation, non-existent land use planning, inadequate infrastructure, Socio-economic development, transportation models affect fringe areas (Clark, 2009; Gu, 2010). Urban fringe areas generally fall outside the urban governing boundaries (Clark, 2009). Conzen, (1969), describes three fringe belts in urban form: an inner, a middle and outer fringe belts at the present edge of the town.

Measurement of urban fractal dimension of boundaries have not related directly with urban fringe-belt phenomena (Batty and Longley, 1987; Besussi et al., 2010; Longley and Batty, 1989; Tannier et al., 2011; Tannier and Thomas, 2013). In other respects, urban researchers have been studying urban fringe belt concept since the last half of the century with different perspectives such as spatial, social, economical (Barke, 1974; Carter and Wheatley, 1979; Clark, 2009; Conzen, 1962, 2009; Whitehand and Morton, 2003; Kropf, 2009). Despite of these studies a few of researches on urban fringe belt context has been undertaken in Turkey (Ünlü, 2013; Hazar and Kubat, 2015) none of them relevant fractal dimension. This paper describes the development and characteristics of one of the fringe areas' locations in the urban fabric in Denizli, Akhan. Its' importance, effects on city's development and potentials are searched by the reviewing of the previous studies and determinations and comparisons of different residential patterns of Akhan urban fabric. In this process, physical reflections of the formation and change of urbanized area. In the first section; the purpose and describing urban fringe area. The second section; content and the method of the study were defined the inner fringe belt and fractal dimension. Last section, a general assessment and command were made for the results of the research.

2. Methodology

Denizli is in southwestern Turkey, in the country's Aegean Region has a population of about 993.442 (2015), attracts many visitors with ancient ruined city of Hierapolis, the city of Laodicea on the Lycus, the ancient metropolis of Phrygia and the nearby thermal hillside of Pamukkale (Figure 1).



Figure 1: Denizli Turkey

Akhan is 7 km far from the Denizli city and it is at the side of Denizli Afyon Road has a population about 5691 (2013) (Figure 2).



Figure 2: Akhan district in Denizli

Towns' name came from the last caravansaray was built in 1253 years at the west of the Anatolia, by the governor of the Denizli; Şeyfettin Karasungur ibn Abdullah, Emir of Ladik (Yakar et al., 2009). (Figure 3). Akhan was a village before the new metropolitan municipal law (6360 Büyükşehir Belediye Yasası) in 2012, is converted a neighborhood of Denizli is in southwestern industrial city.



Figure 3: Akhan caravansaray

This study has two steps aim to identify the power of effecting transforming the spatial character of urban fabric by decision of centralized management can be read via different part of Akhan urban settlement. First; selected three different part of urban fabric: (1) the northernmost of the settlement, (2) the south side of the main transportation axe and (3) east neighborhood of industrial area. Second; Fractalyse have been used to measure the fractal dimension of space filling's urban fringe fabric.

3. Measurement and analysis

The box counting method is comparable method to the perimeter measuring method which is used for the coastlines and urban morphology. The basic procedure of box counting method is to systematically is covering the image with a grid, and then count how many boxes of the grid are covering part of the image. Then doing the same thing using smaller boxes.

Using the box counting method, fractal dimension is again the slope of the line when is plotted the value of $\log(N)$ on the Y-axis against the value of $\log(r)$ on the X-axis (Equation 2.1). Estimation of fractal dimension D is The slope of the line , $\log(n(s))$ and $\log(1/s)$ (Shen, 2002).

$$D = \log(N) / \log(r) \quad (\text{Equation 2.1})$$

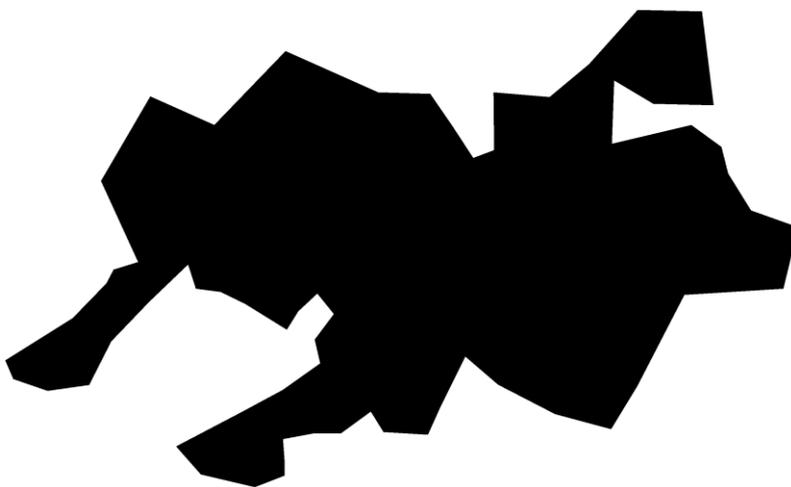
Fractal dimensions range between 1 and 2 which corresponds to the range between a line that is straight (Mandelbrot, 1977). A steeper slope means that the dimation is near 2 is more "fractally", that is, it gains in complexity as the box size decreases means urban morphology is compact. A flatter, lower-valued slope, is near 1, means that the object is closer to a straight-line, less "fractally," means urban morphology is sprawl.

In this study urban settlement is extracted in line according to the digital satellite maps of different pattern of Akhan and urban boundaries of Ahkan human settlement areas with the aid of Fractalyse and GIS (Figure 4-5, Table 1). Thereby, two type (ward and structuring patterns) of tree different urban pattern each map are available for calculating the fractal dimension (Table 1).

PLAN ZONE		PATTERN ON SATELLITE
FABRIC 1	Ward	
	Human settlement	
FABRIC 2	Ward	
	Human settlement	

FABRIC 3	Ward	
	Human settlement	
<i>Table 1: Different urban pattern of Akhan on digital satellite maps</i>		

Box-counting algorithm is a methodology in quantifying the measurement of urban spatial structure. Firstly, we transformed the vector layers of different urban settlement spots into raster images, then fractal dimensions of maps are calculated with the help of Fractalyse. The urban settlement maps represent different process of evolution of urban spatial pattern on the case of Akhan in different side of settlement.



Fractal dimension (D) : 1.835 (Box-counting)
Figure 5: Akhan urban settlement pattern

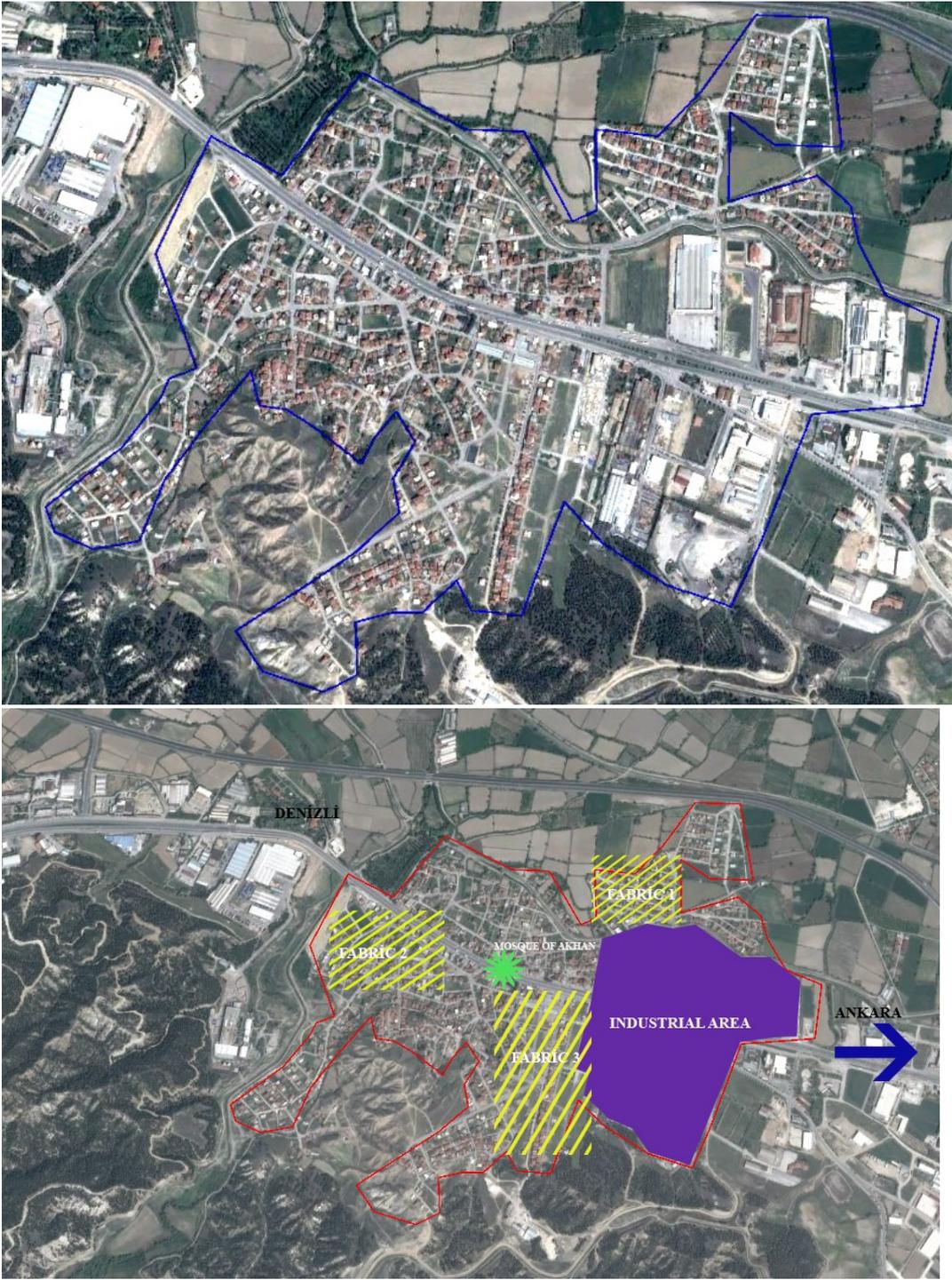


Figure 4: Akhan urban settlement boundary

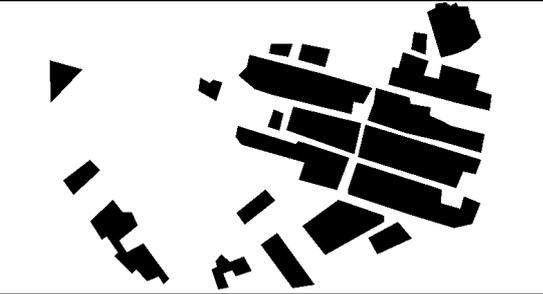
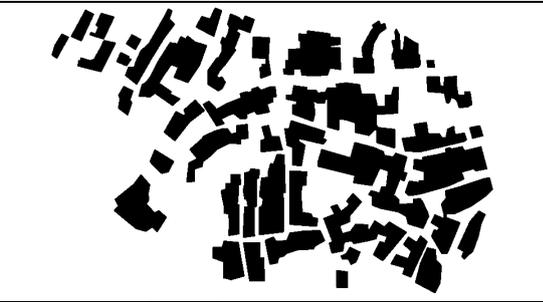
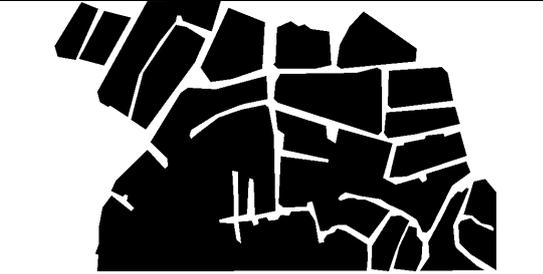
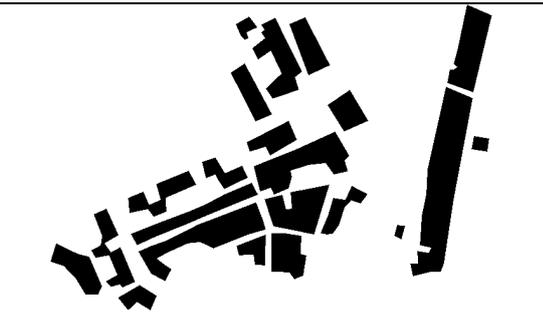
PLAN ZONE	PATTERN	COMPARISON LEVEL	FRACTAL DIMENSION
FABRIC 1		Strong connection with the main transportation road between Denizli and Ankara, hipodalamus system, residential area, has a mosque of Akhan, bordered by agricultural areas on the north	1.66
			1.81
FABRIC 2		Strong connection with the main transportation road between Denizli and Ankara, mixed construction pattern, residential area, organic settlement system	1.708
			1.803
FABRIC 3		Weak connection with the main transportation road between Denizli and Ankara, strong connection with industrial area, attached buildings construction pattern, residential area, mixed ward system	1.665
			1.877

Table 2: Tree fabric of Akhan with fractal dimension

According to analyse results, even though the fractal dimension of Akhans' ward change between 1.803 and 1.877 and the fractal dimension of the same wards' structuring patterns (building area /human settlement) change between 1.665 and 1.708 (Table 2). Keep compact pattern by the reason of the fractal dimension is over 1.60 (Benguigui & Daoud, 1991) both layers warns and building patterns. Here we discuss the changes of fractal dimensions over these three different side of Akhan to explore the spatial morphology is not change remarkably. On the other hand, fabric 3's building area is the lowest value of fractal dimension with 1.665 and conversely is the the maximum value of ward with 1.877. It has been concluded, parcel of land is newest and bigger than the other part of Akhan cause of industrial zone effect.

There were few local authority interventions directly affecting on the land use of Akhan. Agricultural area around the settlement are active. The main change of urban pattern of Akhan was the rehabilitation of the main road between Ankara-Denizli and construction of a industrial areas at the edge of settlement. The reason of Ankara-Denizli transportation road and residential land demands after the new metropolitan municipal law (6360), it was anticipated that Akhan will be redevelopment to residential and commercial land-use units is currently urban growth fallow.

4. Conclusion

Urban planners are faced with unprecedented urban population increase with spatial effect on urban growth in recent years. Viewed in relation to the background to fringe belt and fractal research, three main findings from the studys inner fringe belt is nortworthy. First; Akhan, keep compact pattern by the reason of the fractal dimension regardless of the fact new govern status, Secondly; rural identity is still keeping on the edge of the settlement, agricultural area are important and strong treshold for citizen, Thirtly; fractal dimension comparable boundary, image scale were set the same for different side of city. Clearly, can certainly be used a new tool to explain urban fringe belt, urban growth and urban form.

Previous studies have recognized to explaining urban growth and urban boundaries (Batty, 1987; Batty and Longley, 1987; Longley and Batty, 2010; Tannier et al., 2011; Tannier and Thomas, 2013). In Akhan, development plans did not find solution structural components of urban growth and urban fringe belt weaknesses. After the new municipality law, transformation of land use govern issues from the village to the district has a very general land-use terms they are visible on maps of development plans. There is no doubt that the history of Akhan has been different from Turkish urban morphology. Private property and weak urban planning mechanisms give shape to the land. City walls never surrounded Denizli as a young city. Only fixation line in the city is shaped natural tresholds such as agricultural lands and mountain. The description morphogenetic seems Akhan, keep compact pattern by the reason of the fractal dimation.

Understanding of the urban growth dynamics constitutes the basis for the effective urban planning. The fractal approach presented in this study is important to realize that town plan develop and the issues of urban fringe belts need to be given more consideration in urban planning. Optimum utilization of fringe areas in the city is important. This research helps for following study to obtain more realistic models and new methods for the upcoming model new regards fractal dimension and urban fringe belt, through detailed with data sets. So the

title of this paper not only develops a point of view of urban morphology with fractal dimension but also influenced current research.

References

- Batty, M., and Longley, P. A. (1987). "Urban shapes as fractals". *Area*, 215-221.
- Batty M. and Longley P.A., (1987) "Urban shapes as fractals". *Area*, 19(3): 215–221.
- Barke, M. (1974), 'The changing urban fringe of Falkirk', *Scottish Geographical Magazine* 2, 85-97.
- Barke, M. (1976) 'Land use succession: a factor in fringe-belt modification', *Area* 8, 303-6.
- Barke, M. (1982) 'Beyond the urban growth map: suggestions for more analytical work in urban morphology', *Teaching Geography* 7, 111-15.
- Barke, M. (1990) 'Morphogenesis, fringe belts and urban size: an exploratory essay', in Slater, T. R. (ed.) *The built form of Western cities* (Leicester University Press, Leicester) 279-99.
- Benguigui, L. and Daoud, M. (1991) "Is the suburban railway system a fractal?", *Geographical Analysis*, 23, 362–368.
- Besussi, E., Chin, N., Batty, M., & Longley, P. (2010). The structure and form of urban settlements. In *Remote sensing of urban and suburban areas* (pp. 13-31). Springer Netherlands.
- Beyhan, B., Taubenbock, H., Suffa, S., Ullmann, T., Rauh, J., & Dech, S. (2012). "Urban growth and sprawl of Mersin City, Turkey: change analysis based on Earth observation and socio-economic data/Mersin şehrinin kentsel büyümesi ve saçaklanması: Dünya gözlem verisine ve toplumsal-iktisadi verilere dayalı değişim çözümlemesi", *Megaron Architecture*, 7(1), 3-26.
- Carter, H. and Wheatley, S., (1979) 'Fixation lines and fringe belts, land uses and social areas: nineteenth-century change in the small town', *Transactions of the Institute of British Geographers New Series* 4, 214-38.
- Chen Y., (2011) "Derivation of the functional relation between fractal dimension of and shape indice of urban form, computers, Environment and urban systems, no 35, 442-451.
- Chen, Y. (2013) "Fractal analytical approach of urban form based on spatial correlation function", *Chaos, Solitons ve Fractals*, 49, 47-60.
- Clark A.L. (2009), " Environmental challenges to urban planning: Fringe areas, ecological footprints and climate change, Key challenges in the process of urbanization in Ho Chi Minh City: Governance, Socio-economic, and environmental issues workshop final paper,16-18 September 2009, Ho Chi Minh City, Vietnam,
- Conzen, M.R.G. (1962) "The plan analysis of an English city centre" in Norborg, K. (ed.) *Proceedings of the International Geographical Union Symposium in Urban Geography, Lund 1960* (Gleerup, Lund) 383-414.
- Conzen, M. R. G. (1969) "Alnwick, Northumberland: a study in town-plan analysis", *Institute of British Geographers Publication* 27, 2nd edn (Institute of British Geographers, London).
- Conzen, M. R. G. (1962) 'The plan analysis of an English city centre', in Norborg, K. (ed.) *Proceedings of the IGU symposium in urban geography Lund 1960*, 383-414.
- Conzen, M.P. (2009) "How cities internalize their former urban fringes: a cross-cultural comparison", *Urban Morphology* 13, 29-51.
- Conzen, Michael P., Kai Gu, and J. W. R. Whitehand., (2012), "Comparing traditional urban form in China and Europe: A fringe-belt approach." *Urban Geography* 33.1 (2012): 22-45.
- Dollen, B. von der (1990) 'An historicogeographical perspective on urban fringe-belt phenomena', in Slater, T. R. (ed.) *The built form of Western cities* (Leicester University Press, Leicester) 319-45.
- Ducom, E. (2003) 'Fringe belts and planning: a French example', *Urban Morphology* 7, 103-4.
- Ducom, E. (2005) 'Fringe belts in French cities: a comparative study of Rennes, Nantes and Tours', in Barke, M. (ed.) *Approaches in urban morphology* (Division of Geography, University of Northumbria, Newcastle upon Tyne) 34-43.

- Erdoğan G. (2015); "Kent makroformlarının mekanı kullanma verimliliklerinin fraktal boyut ile incelenmesi, Examining spatial efficiency of cities using fractal dimension", (Unpublished doctoral thesis), Dokuz Eylül University, Graduate School Of Natural And Applied Sciences, İzmir, Turkey.
- Erdoğan G., Çubukçu K.M., (2012) "Explaining space- efficiency in populated cities using urban explanatory variables", AESOP thematic group on Complexity and Planning 10th meeting, November 16-17, 2012, Gröningen- Holland.
- Erdoğan G., Çubukçu K.M., (2014) "Explaining fractal dimension in populous cities", EURAU 2014, Composite Cities, November 12 - 14, 2014, Istanbul- Turkey, 016:001-016:011.
- Frankhauser, P. (1998). "The fractal approach. A new tool for the spatial analysis of urban agglomerations". *Population: an english selection*, 205-240.
- Frankhauser P. (1997), "Fractal Analysis of urban structures", in: E. Holm, ed. *Modelling Space and Networks, Progress in Theoretical and Quantitative Geometry, Gerum Kulturgeografi*, 145-181.
- Gu, K. (2010) 'Exploring the fringe-belt concept in Auckland: an urban morphological idea and planning practice', *New Zealand Geographer* 66, 44–60.
- Hazar D. and Kubat A. S., (2015), "Fringe belts in the process of urban planning and design: Comparative analyses of Istanbul and Barcelona", *ITU A|Z* vol.12,no1,march 2015, 53-65.
- Kukina, I. V. (2006) 'Fringe belts and the planning of Russian cities', *Urban Morphology* 10, 145-6.
- Kropf, Karl.,(2009) "Aspects of urban form." *Urban Morphology* 13.2 (2009): 105.
- Longley, P., and Batty. M. (1989), "On the Fractal Measurement of Geographical Boundaries", *Geographical Analysis*, 21(1), 47–67.
- Mandelbrot, B.B. (1977) "Fractals: Form, chance and dimension". San Francisco, USA: W.H. Freeman.
- McAdams, M. A. (2007) "Fractal analyses and the urban morphology of a city in a developing country: A case study of İstanbul", *Marmara Coğrafya Dergisi*, 15, 150-171.
- Rodrigo Cervantes N E, (1999), "The concept of the fringe belt in a Mexican city: Morelia", in *Transformations of Urban Form*, eds R Corona, G L Maffei (Alinea, Firenze) ,FK2.16 - FK2.20.
- Tannier C., Thomas I., Vuidel G., Pierre Frankhauser P., (2011), "A Fractal Approach to Identifying Urban Boundaries", *Geographical Analysis*, 04/2011; 43(2):211 - 227.
- Tannier, C., and Thomas, I. (2013). "Defining and characterizing urban boundaries: A fractal analysis of theoretical cities and Belgian cities". *Computers, Environment and Urban Systems*, 41, 234-248.
- Thomas I., Frankhauser P. and Biernacki C. (2008) "The morphology of built-up landscapes in wallonia (Belgium): A classification using fractal indices", *Science Direct, Landscape and Urban Planning*, 84, 99–115.
- Seto, K. C., & Fragkias, M. (2005). Quantifying spatiotemporal patterns of urban land-use change in four cities of China with time series landscape metrics. *Landscape ecology*, 20(7), 871-888.
- Sun Z., Jia P., Kato H., Hayashi Y. (2007) *Distributive Continuous Fractal Analysis for Urban Transportation Network*, Proceeding of the Eastern Asia Society for Transportation Studies, Vol.6.
- Shen, G. (2002) "Fractal dimension and fractal growth of urbanised areas", *International Journal of Geographical Information Science*, 16 (5), 419-437.
- Thomas I., Frankhauser P. and Biernacki C. (2008) "The morphology of built-up landscapes in wallonia (Belgium): A classification using fractal indices", *Science Direct, Landscape and Urban Planning*, 84, 99–115.
- Ünlü, T. (2013). Thinking about urban fringe belts: a Mediterranean perspective. *Urban Morphol*, 17(1), 5-20.
- Vilagrasa, J. (1990), 'The fringe-belt concept in a Spanish context: the case of Lleida', in Slater, T. R. (ed.) *The built form of Western cities*, Leicester University Press, Leicester.
- Whitehand, J. W. R., (1967), "Fringe Belts: A Neglected Aspect of Urban Geography", *Transactions of the Institute of British Geographers*, No. 41 (Jun., 1967), 223-233.
- Whitehand, J. W. R. (1988) 'Urban fringe belts: development of an idea', *Planning Perspectives* 3, 47-58.
- Whitehand, J. W. R., (2001), "British urban morphology: The Conzenian tradition", *Urban Morphology*, No. 5 (2, 2001), pp. 103-109.

Erdođan, Gizem, Identifying and Characterizing Urban Fringe with Fractal Analysis on Akhan, Denizli, Turkey, '52nd ISOCARP Congress 2016'

Whitehand, J. W. (2007, June). Conzenian urban morphology and urban landscapes. In Proceedings of the 6th International Space Syntax Symposium.

Whitehand J.W.R. and Morton N.J. (2003), "Fringe belts and the recycling of urban land: an academic concept and planning practice, Environment and Planning B: Planning and Design 2003, vol. 30,819-839.

Whitehand, J. W. R., Gu, K., & Whitehand, S. M. (2011). "Fringe belts and socioeconomic change in China". Environment and Planning B: Planning and Design, 38(1), 41-60.

Yakar M., Alyılmaz C., Telci, A, Baygöl E., Çolak S., Aydın M., Alyılmaz S., Yılmaz H.M. (2009). "3D laser scanning and photogrammetric measurement of Akhan caravansaray", Scientific Research and Essays, 4(13), 1565-1568.

<http://www.tuik.gov.tr>