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Knowledge for better Cities

Editor-in-Chief: Shi Nan, ISOCARP VP, China

Editor: Jim Reilly, United States

Editor: Fran Klass, United States

Coordinator:
Lucian Perici, Romania

Graphic Designer

Ricardo Moura, Portugal
(wwww.ricardomoura.pt)

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ISOCARP PRESIDENT'S FOREWORD

RIC STEPHENS, ISOCARP PRESIDENT 2015-2018

The ISOCARP Congress theme "Cities we have vs. Cities we need" is both a description and prescription for a new urbanism that must adapt and mitigate significant environmental, social and economic change. The ISOCARP *Review 12* and 52nd World Planning Congress have embraced this challenge to transform our cities.

New Urban Agenda

Concurrent with this focus on transformative city planning is the United Nations New Urban Agenda which will be showcased at HABITAT III (H3) in Quito immediately following the ISOCARP Congress. "It is time to think urban: how to mobilize the global community and focus all levels of human settlements, including small rural communities, villages, market towns, intermediate cities and metropolises for demographic and economic growth." [H3] The resulting program will guide sustainable development for the next 20 years. Part of this program are 17 Sustainable Development Goals. *Review 12* topics explore implementation actions for a number of these global goals including 'no hunger,' 'sustainable cities and communities,' 'climate action,' 'life on land,' and others.

ISOCARP is deeply committed to the HABITAT III program and New Urban Agenda. We are proposing multiple events including "Implementing multi-level, integrated planning in the New Urban Agenda—the need to change planning systems and the role of professionals" in Surabaya; "Smart Cities in the New Urban Agenda" and "International Advisory Services" in Quito. These events reflect ISOCARP's deep experience in these areas. We will also be participating in numerous other H3 activities with our partners.

With more than 50 years' experience as the premier global organization for professional planners, ISOCARP continues to examine and guide planning practices, and we will be instrumental in realizing the New Urban Agenda. ISOCARP has a long history of providing international advisory services through our Urban Planning Advisory Teams (UPATs) and, more recently, Strategic / Technical Assistance Teams (STATs). There are also Young Professional Planner (YPP) workshops; Mentor and Student Research Labs (MSRL); Intensive Training Programs (ITPs) and other activities that provide services for students, practicing planners and city staff. All of these programs and projects promote ISOCARP's mission to share "Knowledge for Better Cities."

Acknowledgments

This issue of the ISOCARP Review guides planners, public officials and interested readers through a series of topics which illustrate the characteristics of sustainable cities. It then provides more detailed articles about some of these attributes, such as biophilic designs, improved infrastructure, governance tools and emerging city and regional planning trends. Special sections discuss the integration of food into urban planning as well as articles which plan for the future of our Congress host country, South Africa.

The diversity of topics in Review 12 mirrors the diversity of contributors to this publication who are representative of ISOCARP's global membership. We are greatly indebted to their time and expertise in creating these articles, and proud to have them as contributors to our professional society. In addition to the authors, we are grateful to the Review staff consisting of: Vice President for Publications, Shi Nan; Jim Reilly and Fran Klass, editors; Lucian Perici, publication coordinator; and Ricardo Moura, graphic designer. I also want to recognize the important contributions made by the following co-editors of Review 12: Martin Lewis for his assistance in the South African planning section; and, Yves Cabannes and Cecilia Marocchino, who assembled the section about integrating food into urban planning. I thank all of these dedicated authors, editors and publication professionals for their time and commitment to ensure an informative, relevant and entertaining *Review*.

Finally, I would like to extend my deepest appreciation to the hosts and organizers of this year's Congress in Durban, especially to Martin Lewis who served as the Chairman for the Local Organizing Committee (LOC). It is through the energy and enthusiasm of the numerous members of the LOC that that this Congress will be both meaningful and memorable. ◆

LOCAL ORGANIZING COMMITTEE'S FOREWORD

Times have changed, and times are changing rapidly. Only a few years ago, the proportion of the world's population living in urban areas crossed the halfway mark for the first time in human history. This milestone has signified that the urban age is upon us. Indeed, we are living in an urban age that is experiencing dramatic worldwide transformation. Cities are growing rapidly; urban populations are increasing exponentially; information is flowing whimsically; spaces are changing dramatically, as is their meaning, even more bafflingly.

In particular, there is a considerable increase in urban populations across Asia, Latin America, and Africa. In China, ten million people move to existing cities each year, and the government plans to build more than 300 entirely new cities. In Latin America, the number of people coming into cities like Mexico City, Sao Paulo and Rio de Janeiro are 22, 18 and 10 people/hour respectively, while New York and London demonstrate an urban resurgence at 9 and 10 people/hour, which goes contrary to the majority of mature cities in Europe (especially Eastern Europe).

Sub-Saharan Africa is experiencing a period of intense demographic growth. In 1950, 14% of Africans lived in urban areas compared with 40% today. By the mid-2030s, half are expected to live in cities and towns, with the proportion peaking at 56% around 2050. To put this in a historical perspective, it took Europe 110 years to move from 15% urban dwellers in 1800 to 40% in 1910. So, while only 37% of the population in Africa lives in urban areas today, that percentage is set to increase dramatically, much of it through informal growth.

The world's fastest-growing city, Lagos, Nigeria, is expected to double its population within the next five years to more than 22 million.[1] Congo's capital Kinshasa will have gone from 200,000 to more than 16 million, growing over the next decade at the vertiginous rate of 4% a year (about 40 people an hour). Meanwhile, Delhi is growing at 79 people/hour, Shanghai at 53 and Mumbai at 51.

South Africa is no exception. More than 60% of South Africans live in urban areas, and this figure is projected to increase to 71.3% and 80% by 2030 and 2050 respectively. Cities and large towns produce over 80% of the national gross value added and DOES METROS NEED TO BE DEFINED? metros were growing twice as fast as other cities. Between 1996 and 2012, metros accounted for 75% of all net jobs created in South Africa. This definitely asserts a future that is urban in South Africa.

The challenge though, especially in Asia, Latin America, and Africa is that, urban growth is not accompanied by industrialisation. Most certainly in Africa, the rate of urbanisation is not matched by concomitant processes of industrial growth. Therefore, urbanisation becomes an accomplice for urban poverty. In this respect, the rapid urban growth is concomitant with

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1 Mitchell Beazley (2008). ***Snapshot.*** London: Octopus Publishing Group, p. 34.

the 'urbanisation of poverty' growing especially in townships, informal settlements and inner cities. In these areas, families often have to share one tap, there is no sewerage provision, disease is common and many people are unemployed. More generally, these cities are experiencing: urban sprawl, overcrowding, housing shortages, slums and squatter Settlements, poor transport system, water shortage, trash disposal frustrations and crime.

These conditions are therefore telling about urban changes, but more so, they are reflecting the global disparities that exist in terms of wealth, lifestyles, consumption and situatedness. They call attention to the need to reinvent urban change that can redefine imaginations of belonging, mobility and new urban citizenship. Reiteratively, the study (pdf), produced by the African Development Bank (AfDB), the Organisation for Economic Co-operation and Development and the UN's Development Programme, said authorities must create inclusive growth, jobs, better housing and social safety nets, and improve links with rural areas to boost development in urban areas, now home to about 472 million Africans. Indeed, these conditions challenge urban practitioners to harness urbanisation for sustainable development and inclusive growth in these cities under strenuous conditions. Hence, there is the pressure to reinvent planning and transform cities at local, regional and national scales. Architects, engineers, urban planners, civil society and policy makers all have the responsibility to create sustainable, healthy, 'smart', 'green', adaptive, inclusive, productive, safe, flexible and resilient cities.

The Congress theme: "*The Cities we have vs the Cities we need*" therefore invites us to reflect on our cities as we know them and explore their futures as we want them. It is an open theme that seeks to start a global dialogue on creative ways in which we can build a better urban future. It is about bringing together leading expertise across the fields of architecture, planning, and urban design as well as technical and social spheres of urban studies to collaborate in developing new thinking and solutions that address inclusive urban transformation. It is about opening the debate on and crafting a vision of what the urban future should look like and how to innovatively address the challenges we face. The dialogue is hosted through various platforms, including the presentation sessions, conference website and scheduled events and workshops of the conference.

The theme of the 52nd ISOCARP Congress is conceived as a catalyst to foster trans-disciplinary ways to interpret the past and conceive the future of cities. This requires a reflection on current practice of planning and the making of cities and for the generation of different ways in which the cities we need are created. It calls for sharing of knowledge and practice about cities as well as innovative ways in which desirable cities of the future are created. It provides an opportunity to work toward collaborative solutions for the challenges faced by the cities we have in order to create the cities we need in the future.

In the spirit of the World Urban Campaign (#TheCityWeNeed), the conference seeks to find concrete ways on how to achieve sustainable urban development. Along the pathway of the Habitat III Conference, the conference explores urban change in a way that responds by promoting equity, welfare and shared prosperity. In the inspirational words of Mohamed Ali, "Wars of nations *are fought to change maps. But wars of poverty are fought to map change*." This conference contributes to the mapping of change to fight urban poverty as a pathway to achieve sustainable urban development.

There are several Sub-themes: *Transforming human settlements*; *Planning Activism and Social Justice*; *Envisaging Planning Theory and Practice for the next decades*; *Urban Planning and Policy making in times of uncertainty, fragility and insecurity*; *Intelligent Cities for People*; and *Planning for an interlinked and integrated rural-urban development*; all seek to dissect the challenges faced by cities. But also invites all delegates to forge new ways of building a better future.

In support of the main Congress, a number of Technical Workshops will be held to further showcase the Province of KwaZulu-Natal and to provide the delegates the opportunity to experience planning in different settings.

The *first* technical Workshop is hosted by eThekwini Metropolitan Municipality, which is the largest city in this province and the third largest in the country. This is an Inner-City Tour which consists of three sites. The first site will take delegates through the Inner City. The second part of the tour covers Gugu Dlamini Park to the centrum sites to view the government precinct and the future of the centrum and how it fits into a current function of the city. The third part of the tour will take delegates toward the Marina (Victoria Embankment), which is also featured in this publication, and onto Wilson Wharf. Delegates will have a presentation on the future plans of the Point Waterfront, Beach Front upgrade and future expansion of the promenade.

The *second* Technical Workshop focuses on Peri-urban Development. Delegates will explore non-formal peri-urban development with houses that are formal in nature but do not conform to any planning standards. Delegates will be appraised on the progress to date on developments for formalising Umbumbulu as a rural Service Node. The transition in services that are provided for different areas from rural, peri-urban settlements, townships and suburban areas will be showcased.

The *third* workshop is hosted by the City of uMhlathuze (formerly Richards Bay). This workshop has two study areas that provide a mix of all the themes of the conference. Study area one focuses on Empangeni town and specifically its CBD, which has evolved naturally over time into a functional town that serves the community in the hinterland. Study area two is the uMzingwenya Settlement. The settlement has developed over the last 30 years. Some of the land is allocated by the Traditional Authority, and in some instances local landlords operate without consideration for environmental and service installation issues.

The *fourth* Technical Workshop will be hosted by the KwaDukuza Local Municipality. KwaDukuza Local Municipality is a municipality in the iLembe District Municipality. Study area one consists of the Southern region of KwaDukuza Local Municipality. It is located within an "Aerotropolis" or "Airport city" which has the King Shaka International Airport as its nucleus. It is also located within the eThekwini-uMhlathuze corridor which is the Primary Provincial corridor in terms of the Provincial Growth and Development Plan. Study area two is the EThembeni Precinct Plan/Township Establishment Project. It is located between the towns of Shakaskraal to the south and KwaDukuza to the north. Study area three focuses on Groutville, which is located approximately 4 km south of the KwaDukuza Town. This project entails an upgrading of an existing informal settlement with both formal and informal structures. Study area four is called the "Rocky Park Integrated Housing Project". It is located on the western periphery of the KwaDukuza CBD. This is a mixed-use development, comprising community residential units, affordable units, and lower-income units with associated service infrastructure and social amenities.

Hibiscus Coast Municipality is the host to the *fifth* Technical Workshop. Hibiscus Coast Local Municipality is the economic hub of the Ugu District Municipality in the KwaZulu-Natal Province. The Alamein Avenue Precinct has been identified as the main focus of the workshop. The study area is a small but significant area, located in the southern section of the municipality. Currently, there is a spatial divide between the two settlements which emerged from land needs and access to urban opportunities, resulting in crime, high pedestrian traffic from the informal settlement into the Uvongo town; vehicle traffic congestion; and dilapidation of road infrastructure; etc.

The *last* of the workshops is held in Msunduzi Municipality. Msunduzi Local Municipality is a local municipality in Umgungundlovu District Municipality, KwaZulu-Natal. The Municipality is regarded as the second largest urban centre within KwaZulu-Natal. Its location has a strong influence on the regional channels of investment, movement and structuring of the Provincial spatial framework for growth and development. This workshop has two study areas, namely Greater Edendale and Vulindlela Development, which provide a mix of all the themes of the conference. The two areas bring into focus the ability of the Greater Edendale and Vulindlela Development Initiative (GEVDI) to deliver on its mandate, i.e., a developmental local government tasked with attacking the blight of poverty, exclusion and deprivation.

The LOC invite all of you with open arms to a country where diversity thrives in unity. ◆

FROM THE EDITORS

The publication cycle of the ISOCARP Review is about 10 months and begins once we receive the theme for the upcoming Congress. This usually happens in the Fall, shortly after the Congress. The 2016 Durban Congress theme, Cities we have VS Cities we need, prompted us to research the policy statements and declarations flowing from the worldwide meetings leading up to the Habitat III (H3) meeting to be held in Quito, Ecuador next month. After gathering this information, the editorial staff held several Skype meetings in late 2015 to identify topics that might flow from the Congress theme and be compatible with the H3 meeting agenda. We began to identify authors for the selected topics by reviewing numerous journal articles, web publications and planning and architectural award lists. We also asked planning professionals and academics to make author recommendations. We then contacted the authors. Once an author agreed to contribute an article, we requested that draft articles, with illustrations, be submitted by April 1. We are deeply grateful to our excellent authors who contributed their time and talent. Our work intensified between April and early August, when we edited and created article layouts and designs. This publication you are now reading is the result of this process.

We wanted to make Review 12 into a source book of existing best practices and best sustainable urban projects. With this in mind, we named it "Envisioning Future Cities: Ideas and Examples". It is our hope that the Review 12 articles will assist ISOCARP with its ongoing efforts to contribute to the Habitat III discussion.

This year we offer the reader a structured flow to the articles. We start with a keynote contribution which identifies important attributes of sustainable eco cities. Following, we have a section of articles which more closely define specific attributes identified in the lead article. There is an article which defines the evolving concept of biophilic cities. Three articles define advanced methods to improve stormwater management, urban lighting and urban heat. Another article promotes better governance by learning to better use data analysis. Finally, we provide two articles which display advanced planning urban methods being developed in China to insure that cultural and ecological traditions are incorporated into modern urban plans.

As one would expect in all complex projects, while the publication workflow description sounds very linear, there were several bumps in the process and unexpected opportunities that influenced the final product. For example, one such opportunity resulted from our two-year effort to secure an article about urban agriculture. This discussion matured over time, and with the cooperation of the Food and Agriculture Organization of the United Nations (FAO) and the Bartlett Development Planning Unit (DPU) of the University College London, it morphed into a special section of articles that display the range of state-of-the-art efforts to integrate food into urban planning. These articles are some of the chapters of the book Integrating Food into urban planning, spearheaded by DPU and FAO, and to be published in 2017 by UCL Press. We acknowledge the extraordinary efforts of the co-editors of this section that are co-editors of the book: Yves

Cabannes, DPU/UCL and Cecilia Marocchino, FAO. We hope to make this special food section a permanent part of the publication. After all, while a great deal of attention has been paid to the growth of urban populations, one must recognize that this situation was enabled by unprecedented increases in both food production and agricultural efficiency, thus freeing rural populations to seek other employment. Despite this biochemical and mechanical green revolution, food security remains an issue worldwide, even in the most modern cities. We hope that the on-going special Food Security section will provide information about cutting-edge efforts to integrate food into urban planning.

Another opportunity presented itself when one of our editors was invited to judge a competition where middle school students designed future cities. Amazed by the enthusiasm of the school teams and the high quality of the presentations and models, the Review solicited an article about this event whose real purpose is to interest students in science- and math-based careers, including engineering and planning. We thank the Future Cities teachers at the schools reported in this issue, Kelly Eidell and Debbie Brewster, as well as the wonderful staff of DiscoverE Foundation.

Finally, the Review always locates and publish articles about planning projects important to the Congress host city and country. This year, we were pleased that the Local Organizing Committee solicited these articles, selected the best and provided them for our review. To recognize this effort and the unique focus of these articles, we created a second special section, about planning South Africa's future. Thanks to the many members of the Congress Local Organizing Committees and a special thanks to Martin Lewis, the co-editor of this section. We would like to continue a local host city/nation planning special section in subsequent editions of the Review and so look forward to working with the Portland LOC as soon as possible.

Producing the Review is an intense, demanding, disciplined process which requires the devoted good will and cooperation from our authors. We sincerely thank them for their patience and excellent contributions. We are very pleased to present their papers and sincerely hope that our readers enjoy the publication and share in our sense of awe at what the future holds for cities. ◆

CHARACTERISTICS OF THE CITIES WE NEED

TEN KEY DIMENSIONS FOR ECO CITY DEVELOPMENT IN THEORY AND PRACTICE

JEFFREY R. KENWORTHY

» *Sustainable urban form and transport are central to any attempts at greater sustainability or eco-city development in both prosperous and less prosperous cities, especially because of the powerful city-shaping ability of transport systems.* «

Dubai today presents many factors such as huge freeway systems that work against the quest for eco-cities. By contrast, its expanding metro and light rail system serving high density corridor development provides a more positive approach and highlights the often conflicting forces facing cities in their quest for greater sustainability

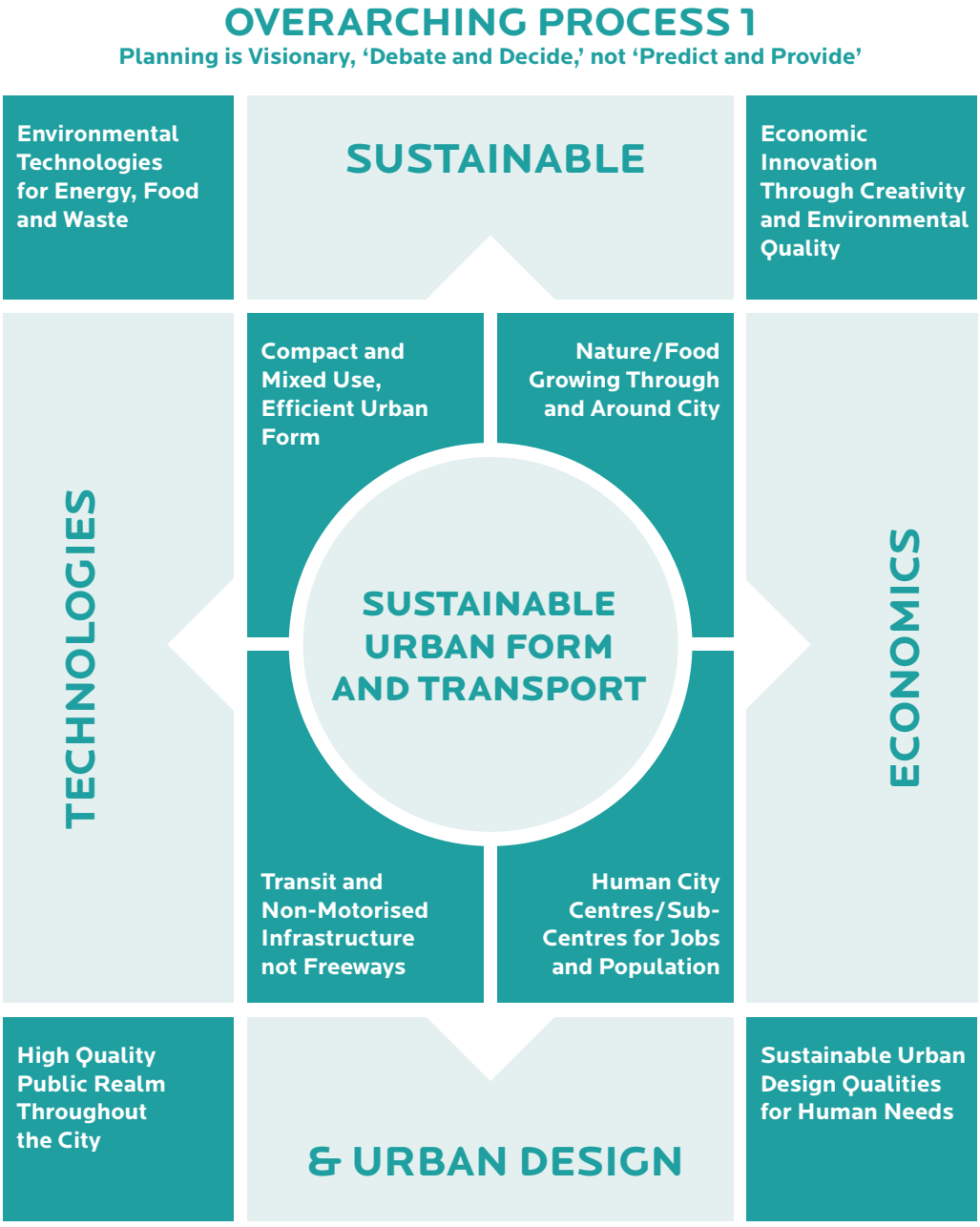


Figure 1: A conceptual model for eco-cities based on urban planning, urban transport, urban design and some governance or process considerations. Source: Kenworthy (2006)

Changing urban development from its present unsustainable forms and patterns in both wealthy and poorer cities is a very challenging process. Not only do urban form, transportation systems and water, waste and energy technologies have to change, but the value systems and underlying processes of urban governance and planning need to be reformed to better reflect a commitment to sustainability.

This paper first summarises ten critical responses which would change the nature of urban development to a more ecological, sustainable model. These dimensions revolve around urban transport systems and their links to urban form and are therefore mostly, though not exclusively, focussed on the problems of reducing automobile dependence in cities, building more sustainable urban form and creating more livable places.

These ten dimensions are not exclusive of other critical factors in the quest for urban sustainability and some caveats, limitations and omissions, as well as a detailed description of each dimension, have been provided in Kenworthy (2006). However, these ten dimensions are central to any attempts at greater sustainability in both prosperous and less prosperous cities, especially because of the powerful city-shaping ability of transport systems.

TEN KEY ECO-CITY DIMENSIONS: THEORY AND BACKGROUND

Figure 1 shows the ten critical eco-city dimensions examined in this paper as a simple conceptual model. Each dimension is described briefly below.

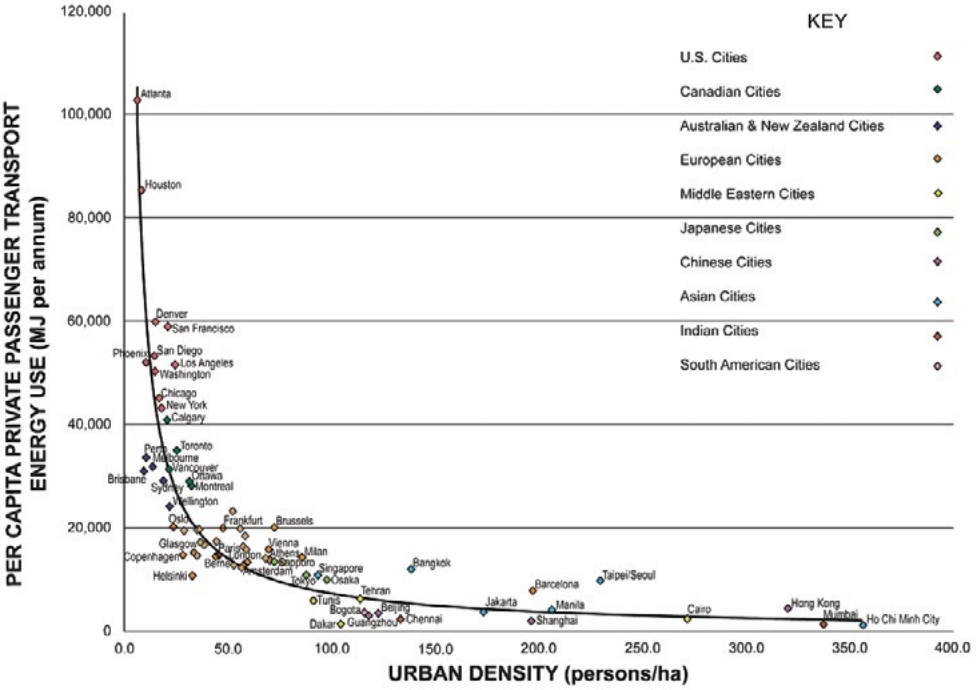
1 · Compact, mixed-use urban form that uses land efficiently and protects the natural environment, biodiversity and food producing areas

There is extensive literature showing the positive effects of compact, higher density, mixed use urban form in reducing dependence on cars, decreasing energy use and increasing the convenience and quality of public transport (transit) and mixed land use (Holtzclaw, 1994; Kenworthy and Laube, 1999; Newman and Kenworthy, 1989, 1999, 2015; Kenworthy and Laube 2001; Naess, 1993a,b). In essence, higher density, mixed uses provide shorter travel distances that make walking and cycling more feasible and make traveling by transit more competitive with the car. They also provide the concentrations of people that are necessary to create the high loads needed by transit systems to offer high frequency, convenient services. Unlike road systems, which deteriorate with increasing use, transit systems typically improve as demand increases (apart from comfort issues which can be challenging in peak periods if insufficient capacity is provided).

Figure 2 shows how density is critical in reducing a metropolitan area's use of energy in private motorised passenger transport.

2 · Natural environments permeate the city's spaces and embrace the city, while the city and its hinterland provide a major proportion of its food needs

With the peaking of world oil production and the high embodied energy costs in food, it is becoming increasingly important to source food supplies more from local bioregions (Campbell and Laherrere, 1995). In the USA, "100- mile restaurants", which source all food products within a 160 km radius, are becoming popular (Beatley, 2005). Additionally, if higher densi-



Automobile Cities
ca 25 persons per ha or less

Transit Cities
ca 30 to 100 persons per ha

Walking Cities
ca 100 persons per ha or more

Figure 2: Urban density versus private passenger transport energy use per capita in global cities, 1995. Source: modified from Newman and Kenworthy (2015)

Photo 1: High density, mixed use urban village (TOD) built on a former park-and-ride lot at Fruitvale BART station in San Francisco

Photo 2: An urban village (TOD) built on a LRT line in Helsinki incorporating land for food growing and nature

ties become a reality in more cities, then there needs to be more shared green space available to inhabitants so that people can maintain contact with nature and have places to recreate and refresh themselves. Somewhat paradoxically, more compact urban development provides greater opportunities for "green cities", both in the sense of food growing in and around the city and more parks and natural vegetation. Not all land needs to be consumed by sprawl, roads and car parks (Beatley, 2000). Additionally, biophilic architecture (green walls, green roofs etc) is becoming increasingly prominent, Singapore being a particularly notable example of its practice throughout that city (Beatley, 2010; Newman and Kenworthy, 2015).

3 · Freeway and road infrastructure are de-emphasised in favour of transit, walking and cycling infrastructure, with a special emphasis on rail. Car and motorcycle use are minimised

The need to reduce motorisation in cities and the many negative effects of excessive automobile dependence are clear (Newman and Kenworthy, 1999). Evidence about the deleterious effects of freeways in terms of increasing car use, energy consumption and automotive emissions has been available for many years (Watt and Ayres, 1974). Furthermore, the futility of attempting to tackle traffic congestion and reducing fuel use and emissions through more road construction and smoother, freer-flowing traffic is well documented (Newman and Kenworthy, 1984, 1988; Goodwin, 1997). Conversely, it has been shown how urban rail systems are central to building better transit systems and also to increasing the levels of walking and cycling, reducing parking requirements, lowering transport deaths and so on (Kenworthy, 2008).

There is also a growing body of evidence that traffic behaves more like a gas than a liquid and actually compresses (disappears) or expands (induced traffic) in response to reduced or increased road infrastructure (Kenworthy, 2012). Seoul is discussed later as an example of this trend (Cairns et al, 1998; Schiller et al, 2010; Napolitan and Zegras, 2008).

Finally, this dimension is critically important in the current transportation policy focus on electric and autonomous vehicles. In many ways the policy debate over urban transport has been hijacked by a somewhat reductionist view that all problems of the automobile and congestion can be solved by electric vehicles and autonomous vehicles, the latter of which are purported to facilitate a great capacity expansion in the existing road systems without costly new widenings or new roads. Such proposals ignore any real questioning of whether an expansion in car use is a desirable path in the first place (Riggs and Boswell, 2016). A more throughtful and measured approach is put forward by Kilcoyne (2015). He warns against the hyperbole surrounding autonomous vehicles and advocates the need to consider their impacts in a more holistic fashion to include the deeper underlying issues such as urban sprawl versus compact communities, transit and non-motorised modes versus the automobile and other factors.

Electric vehicles offer many advantages but we have to ask what role electric vehicles should have in the future. Are they a way to allow an expansion of auto use because they create potentially less pollution and can use renewable energy? Or are they a way to civilise the car so that the remaining vehicle-kilometres of travel after the end of automobile dependence in cities (Newman and Kenworthy, 2015), can be undertaken in a far less destructive way than with current internal combustion engine vehicles? (Kenworthy, 2011).

4 · There is extensive use of environmental technologies for water, energy and waste management – the city's life support systems become closed loop systems

It is very clear that the current patterns of urban resource use and waste production are unsustainable, resulting in huge urban ecological footprints (Rees, Wackernagel and Testemale, 1998). They tend to give urban systems a "parasitic" character. Cities therefore need to progressively adopt urban infrastructure systems that use renewable energy, which harvest and re-use water in a sustainable way and which feed wastes back into resource use cycles, where most life-support systems in cities become closed-

Photo 3: Sustainable water management in Rieselfeld, Freiburg

Photo 4: High quality pedestrian environment and access to the Metro in La Rambla, Barcelona

loop systems. The overall aim of environmental technologies is therefore to maximise the possibility that cities can meet their needs from the natural capital of their own bioregions in a renewable way (Newman and Jennings, 2008).

5 · The central city and sub-centres within the city are human centres that emphasise non-auto access and circulation and absorb a high proportion of employment and residential growth

Amongst the most important parts of any city are its CBD and sub-centres (Monheim, 1988; Gehl and Gemzøe, 1996; Jacobs, 1961). Central cities still remain the single biggest concentrations of jobs in most cities, despite the suburbanisation of work and the falling percentage of people employed in them (Kenworthy and Laube, 2001; Kenworthy, 2014; Newman and Kenworthy, 2015). The high and generally increasing number of jobs and floor-space means that the central city still significantly shapes transport patterns (Thomson, 1977). Transit systems, especially rail, are focussed on central cities and congestion on radial road routes is widespread. Sub-centres around cities are also crucial to making the city more transit-oriented through development of a polycentric structure with "decentralised concentration" of land uses. These high concentrations of activities occur mostly around urban railway stations as in, for example, Vancouver and Stockholm (Cervero, 1998).

6 · A high quality public realm in the city, which expresses a public culture, community, equity and good governance. The public realm includes the entire transit system and all the environments associated with it

A compelling factor that distinguishes 'good' cities from 'bad' cities is how they address the public realm (Newman, 1990). Mike Davis writes about urban communities that have abandoned their sense of responsibility concerning 'the commons', the most obvious being shared urban spaces, streets, parks, transit systems and so on (Davis, 1990). He suggests Los Angeles has become a highly privatised, fear-driven environment, which he characterises as "The Ecology of Fear" or "Fortress LA". Though an extreme example, Los Angeles demonstrates the wider general proposition that the public realm in cities, especially the streets, is crucial in making them more livable and sustainable and indeed democratic (Barber, 1995; Appleyard, 1981; Jacobs, 1993). Putnam (2001) implies that a good public realm is also critical in the development of social capital. One of the features of much current development in Los Angeles, which is occurring around stations on its growing urban rail system (light rail, metro and commuter rail), is that the public realm is becoming more attractive and inclusive and less "fear-driven".

7 · The physical structure and urban design of the city, especially its public environments are highly legible, permeable, robust, varied, rich, visually appropriate and personalised for human needs

The physical layouts and designs that make the most enduring and loved cities have long been known. A range of authors provide detailed accounts of the design of Greek, Roman, Chinese, Japanese and new world cities such as Boston and Los Angeles, showing the central importance of, for example, permeable street patterns, based on regular or deformed grids and legible streetscapes punctuated by well-placed landmarks and significant buildings (Lynch, 1960, 1981; Kostoff, 1991; Bacon, 1974). Others have developed a suite of measurable design qualities that need to be incorporated into urban development (Bentley et al, 1985). These principles reflect centuries of wisdom in place making, which automobile cities have largely ignored, but are now rediscovering through movements such as The New Urbanism (Calthorpe, 1995; Katz, 1994). Newman, et al (2016) develop a new theory of urban fabrics which makes it critical to recognise, respect and rejuvenate the older walking and transit city fabrics and minimise or reform existing auto city fabrics.

Photo 5: A public park in Seoul where people feel comfortable to stay and interact with each other

Photo 6: Rich and interactive human environments are increasingly linked to good economic performance of a city

Photo 7: Good decisions about the future of cities need to directly involve a diverse range of people in meaningful participation processes

8 · The economic performance of the city and employment creation are maximised through innovation, creativity and the uniqueness of the local environment, culture and history, as well as the high environmental and social quality of the city's public environments

Jane Jacobs showed that cities are the key sites and drivers of national economies and cities themselves cannot survive without a viable economic base (Jacobs, 1969, 1984). Any city aspiring to sustainability cannot ignore its economic dimension. Since Jacobs' time, globalisation has strengthened the role of cities in driving the global economy. The "creative city" approach, whereby cities attempt to find innovative and often more locally-based ways of diversifying and expanding their economies, is now an accepted means of economic progress and innovation (Landry, 2000; Florida, 2002, 2004, 2010, 2012).

9 · Planning for the future of the city is a visionary 'debate and decide' process, not a 'predict and provide', computer-driven process

In the post-World War II period transportation planning has been characterised by the use of computer models designed to predict future traffic growth and to work out how much new road infrastructure will be required to meet that projected demand (derogatorily referred to as "predict and provide"). This approach has had very negative effects on the environment of cities, first in cities of the west, and now increasingly in rapidly developing poorer cities where the approach is still being aggressively applied. This is at a time when its use is seriously waning in the West in favour of a transportation demand management (TDM) approach, which attempts to match transportation demand to existing infrastructure provision. This predict and provide technical methodology and the accompanying political and policy decision making processes have resulted in construction of extensive freeway systems, increasing the level of the car travel and energy demand and generating spiralling emissions (Mitchell and Rapkin, 1954; Kenworthy, 2012). Sustainability demands in cities are fostering a more community-based approach of envisioning the future city and asking "what do we want our city to look like in 20 years from now? What qualities should it have compared today? How should it change and how do we get there?" This is a "debate and decide" approach.

10 · All decision-making is sustainability-based, integrating social, economic, environmental and cultural considerations, as well as compact, transit-oriented urban form principles. Such decision-making processes are democratic, inclusive, empowering and engendering of hope

It is not surprising that for sustainable development to be implemented, quite radical departures from normal planning and decision-making processes in cities will be required. This is why there are many activities in cities around the world that are establishing visions of sustainable development and how these can be realised. The key defining characteristics of these efforts are their engagement with diverse 'communities' or 'stakeholders' that constitute any city today and their capacity to infuse a new sense of hope about urban futures (Newman and Jennings, 2008).

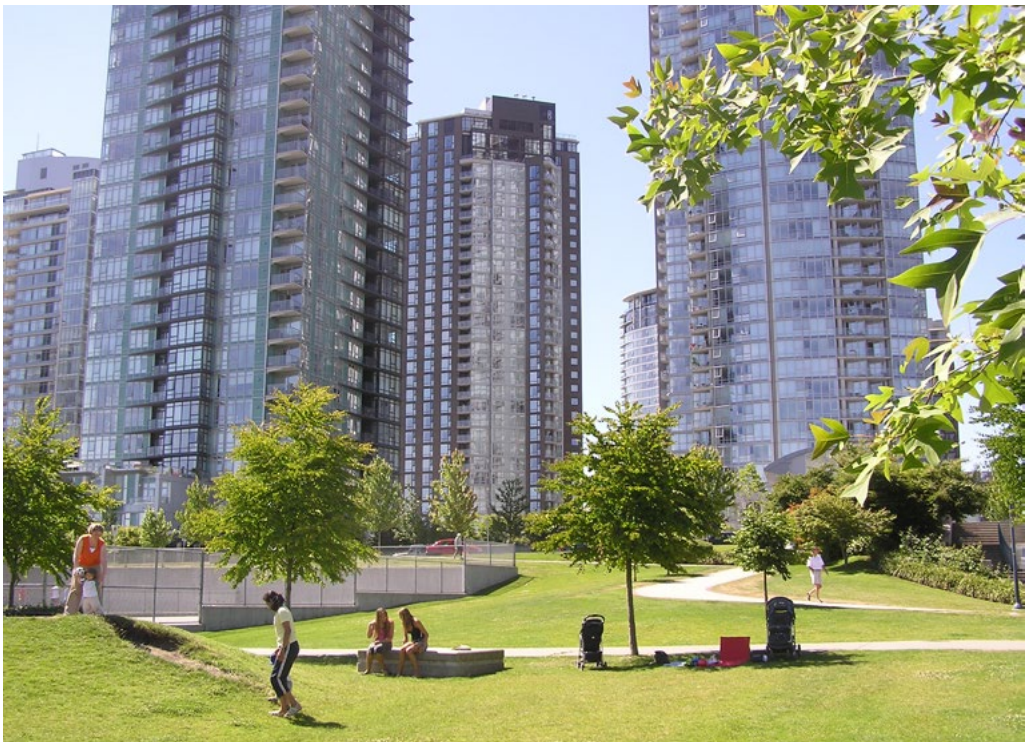


Photo 8: Examples of high density development in Vancouver

ECO-CITY DIMENSIONS IN PRACTICE: SOME GLOBAL EXEMPLARS

This section sets out some examples, among many others, of sound implementation of the above ten eco-city dimensions. Highlighted are: Vancouver, Canada: Freiburg-im-Breisgau, Germany: Portland and Boulder, USA: Perth, Australia and Seoul, South Korea. As expected we find that cities who exhibit one dimension frequently exhibit others since the dimensions are linked. For example, the de-emphasising of road systems and prioritising of higher quality transit systems, are often linked with the development of higher density sub-centres with a better quality public realm. (Please note that 'D' will be used to denote the term 'dimension' in the following material.)

VANCOUVER, BRITISH COLUMBIA

Vancouver is a city located at the core of a metropolitan area. Its popluation of 627,000 is about 25% of the regional total of some 2.5 million people. Perhaps the most distinguishing feature of this North American city is that it has essentially no urban freeways (though the region as a whole does have a modest freeway system)[1].

Vancouver today is a good example of a city that is implementing not only more compact, mixed use urban form (D 1), but it has also prioritised rail transit development, especially new rail infrastructure over new road infrastructure (D 3). The newest rail line is the Canada Line (2009) from the airport to downtown. The city has built up the role of its central area and especially the roles of transit-oriented sub-centres across its metropolitan region (D 5), and is in the process of implementing other dimensions, such as improving the quality of its public realm (D 6) and implementing sustainable urban design qualities throughout much of the urban area (D 7).

Vancouver has also made contributions in the area of environmental technologies through the South East False Creek development which was developed initially as the Winter Olympics Village for athletes in 2010 (D 4). Furthermore it has also made a significant attempt to preserve

agricultural land and natural areas around the city (D 2). The more detailed green preservation achievements in Vancouver itself have been partly shaped by the Greater Vancouver Livable Region Strategic Plan (1996-2011), which created a green belt for the region and limited the amount of suburban land that can be developed[2].

City research has demonstrated that the combination of compact urban form, economic performance and livability has beneficial consequences. The BC Sprawl Report 2004 used indicators of urban form, economic vitality and livability to compare neighborhoods across the Vancouver region (Alexander, Tomalty and Anielski, 2004). It found a statistically significant positive link between higher densities and mixed uses on one hand and positive economic features and enhanced livability. The study suggests a three-way winning scenario for policies that are aimed at creating less auto-dependent living and more walkable and sociable environments (D 8).

Finally, Vancouver has also made an effort to use the principles of "debate and decide" (D 9) and integrated sustainability decision making (D 10) in much of its activities over the last 35 years or so. The scrapping of all freeway plans in the 1970s within the city's boundaries, the planning and consultation regarding development of centres around new Skytrain stations, and, the 2015 decision to remove the Dunsmuir and Georgia viaducts (highways), have all involved, community engagement and commitment to sustainability in decision making.

DIMENSION 1 AND 5 – MIXED-USE URBAN FORM AND TRANSIT-ORIENTED CENTRES

Despite being located in an auto-dependent region, Vancouver has a very lively central and inner city population in places such as False Creek North and South, Yaletown, the city's West End, the Coal Harbor Redevelopment, and many other sites throughout the region (e.g the Arbutus Lands and Fraserlands developments). The absence of high-speed road travel has meant that these premium locations, near to the heart of most amenities and served with speedy transit, have become very popular places to live in order to maintain accessibility and acceptable daily travel times.

TRANSIT NODES ON SKYTRAIN

It has been Vancouver's policy since the mid-1970s to try to concentrate development into transit-rich locations. For example, public consultations with communities affected by Skytrain-linked redevelopments occurred as early as 1978, eight years ahead of the opening of the first Skytrain segment in 1985; just ahead of the 1986 Expo that occurred on the land now known as False Creek North or Yaletown. These discussions facilitated high density development at stations in Vancouver as well as neighbouring Burnaby (Joyce-Collingwood, Metrotown, Edmonds) and further down the line in New Westminster. Such TODs are gradually reshaping the Vancouver region into a genuine polycentric "transit metropolis" (Cervero, 1998).

Over the last twenty-five years, the major success factors of transit development have been: 1. the strong efforts to integrate high density residential and mixed use development into significant nodes around selected stations on the Skytrain; 2. the redevelopment of highly favoured waterfront areas such as False Creek and Coal Harbor; and, even in some cases, 3. the development of strong town centres around bus-only nodes such as Port Moody (soon to have the new Evergreen, Skytrain line). From before its inception, Skytrain's development has gone hand-in-hand with planned high density TOD from which it draws a lot of its patronage.

Part of the success of TOD in Vancouver, Burnaby and New Westminster is the exclusion of Park-and-Ride facilities. South of the Fraser River in the Surrey suburbs, at some stations such as Surrey Central, park and ride facilities surround the station with development set back from the station, producing a poor outcome compared to the larger nodes on Skytrain north of the river which have mixed commercial, office, residential, retail and markets within a short walk of the station. The new housing consists of high rise towers, 3 to 4 storey condominium style developments and townhouses. Some of the housing consists of individual housing cooperatives, which have historically provided more affordable housing options. The TOD at New Westminster is set along an attractive landscaped boardwalk on the Fraser River that includes playgrounds for children and extensive gardens, trees and

Photo 9: Transit-Oriented Development at stations along Vancouver's Skytrain

Photo 10: False Creek development in Vancouver built on land which would have become freeway interchanges

grassed areas. The family units have inner courtyards in which families and friends congregate. Their farmers market, where residents can do their shopping, has open eating areas and a more relaxed, less structured, less sterile atmosphere than a supermarket.

DEVELOPMENT OF NON-TRAIN NODES

As well as the obvious nodes that have sprung up around the Skytrain in the 30 years since its opening, the re-urbanisation trend is characterised by a lot of other new development along the major diesel and trolley bus lines in the city, where many mixed use shopping and business activities already exist. This new development consists of medium to high density housing, including shop-top housing, with special attention to the needs of families wishing to escape the car-dependent suburbs (e.g. False Creek located at the foot of the downtown area and serviced by frequent bus services and some nearby Skytrain stations).

Developments at both False Creek South and North (Yaletown), as well as South East False Creek, the 2010 Winter Olympic Village site, provide examples of how to build high density transit-oriented urban villages in central locations that have, over the years, become more ecologically-oriented. These areas have extensive and beautifully designed open spaces, together with adjacent mixed land uses such as markets, hotels, cultural activities, shops and restaurants. There is great variety in housing forms and styles in these areas, including townhouses, terraced units, medium rise and high rise apartments, with many of the earlier residential developments being cooperative housing. The public spaces and childrens' play areas are traffic free, the only direct road access on the south side of False Creek being essentially from a two-lane road at the rear of the development, with parking mostly under the buildings.

More attention needs to be provided, however, to housing affordability, a major problem all over Vancouver. This is especially so since the end of the housing cooperatives of earlier years, which saw a significant number of affordable housing options spring up in traditionally expensive central and inner areas, many sponsored through the Canadian Mortgage and Housing Corporation (CMHC).

DIMENSION 6 AND 7– THE PUBLIC REALM AND SUSTAINABLE URBAN DESIGN

PEDESTRIAN ORIENTATION

Vancouver does not have a pedestrianised city centre or extensive traffic calming in neighbourhood streets, as in many European cities, apart from the False Creek development which has extensive traffic-free space, discussed below[3]. However, the City of Vancouver has become a highly livable place characterised by a lot of human activity along lively and interesting streets and in its public spaces. One of the most interesting and vibrant public environments is Robson Street, a long avenue that connects the downtown with Stanley Park through the West End. The sidewalks have many pedestrians, notwithstanding the often bumper-to-bumper traffic and high frequency trolley bus services that operate along the street. The street and its land uses work for people.

Punter (2003) describes this strong human dimension and Vancouver's detailed attention to public urban design as a hallmark of Vancouver's success as one of the world's most livable cities. This is in stark contrast to cities in the US, which all too frequently have very hostile street environments due to automobile-orientated development. The West End of Vancouver is the second highest density residential area in North America outside Manhattan and enjoys diverse activities along its main roads. The grid-based, tree-lined residential streets that run across these major streets have numerous pocket parks created from selective street closures between blocks in the fine grained street grid. The area also has Stanley Park and the English Bay foreshore at its doorstep.

The whole of False Creek North and South, and even beyond this area, is knitted together with wide pedestrian and bicycle-only facilities. This pedestrian and bike friendly environment at ground level, below the often towering residential complexes, gives people the option of sustainable transportation, as well as conviviality and convenience. The areas are exemplary in their public realm and commitment to high quality urban design. Vancouver is also reclaiming road space in the CBD for dedicated bike lanes[4].

Photo 11: High quality, interactive public realm in Vancouver

Within these traffic-free neighborhoods where circulation is all by foot, bicycle or other non-motorized modes (e.g. in-line skates), there are local shops, community facilities, child-minding centres, professional suites for dentists and doctors, meeting areas, community playgrounds and sports areas, all within walking or cycling distance of most residences.

DIMENSION 3 - TRANSIT INFRASTRUCTURE, NOT FREEWAYS

In the 1960s Vancouver's transportation plans were similar to those proposed for US cities. If the freeways envisioned in these plans had been built, the land that presently houses these developments would have been alienated with clover-leaf freeway junctions and the quality of life around them would have also been reduced due to fumes, noise and severance.

Vancouver's transformation from a typical auto city really commenced in the early 1970s. The community led a fight to rid the city of all planned freeway construction within the City of Vancouver boundaries. This movement was assisted by a lack of political will to support the highway construction, insufficient funds to build the freeway network, and finally economic issues related to lack of globalisation (Perl et al, 2015).

Transit in Vancouver (buses, trolley buses, Skytrain, ferry and commuter rail) has achieved a lot over the last 30 years. In 1981 transit use was 111 annual trips per person, which had declined to 95 per person by 1991. Then in 1996 trips rose to 118 and by 2006 they had incresed to 134 trips per person per annum. This was just short of its 1961 figure of 138 trips per person, when car ownership in Vancouver was a mere 285 cars per 1000 people compared to the 2006 car ownership of 506 cars per 1000 people. Transit has become more attractive and popular with Vancouverites due to a combination of better, speedier and more diversified services and more attractive ticket offers especially to students. It increased also because many more people are now living within walking distance to transit stops and feeder services to speedier rail, and bus services have improved greatly.

Vancouver, now averaging 150 transit trips per person, enjoys more than double the transit use of the average for 10 large US cities (67 trips per person in 2005). The New York Tri-State metropolitan region is by far the most transit-oriented US urban area and has 168 trips per person, or just 12% more than Vancouver.

Photo 12: Vancouver is going to remove the 1.2 km long Dunsmuir and Georgia viaducts, the only parts of the freeway system ever built

Photo 13: Vancouver is greening some of its main streets and taking road space for new cycle facilities

SUMMARY

Skytrain stations and high density residential precincts in the inner city of Vancouver, have helped to minimise Vancouver's growth in car use in inner areas by increasing transit and non-motorised mode use for a variety of trips. Many people living in these areas can and do walk or cycle to work in the downtown or nearby areas and are able to undertake many shopping, social-recreational and personal business trips by non-motorized modes due to the intensively mixed land uses and high densities in these areas. The attraction of this way of life in Vancouver is underpinned by the quality of the public realm, which is livable and conducive to social interaction and recreational activities.

Other focal points for high density development have been created that are connected by feeder buses to Skytrain stations. Still other attractive high density, mixed use developments have occurred in areas only serviced by buses, such as Port Moody (though the Evergreen Line of the Skytrain is due to open in 2017). Within these centres, pedestrians and cyclists are given attractive and comparatively safe conditions and there exists a civic life in the city spaces that is generally not found in similar suburban areas elsewhere in North America.

Some significant evidence, for the preference of Vancouverites for such well-located, short distance, non-auto travel option sites, is found in the fact that over a 25 year period period the population of the City of Vancouver grew from 431,147 people in 1986 to 603,502 people in 2011 (Canadian Censuses). Noteworthy is the fact that this increase of 40% occurred in the context of falling household occupancy. Also of note, the Vancouver region's urban density declined between 1961 and 1981. Density went from 24.9 per ha in 1961, to 21.6 per ha in 1971 and to 18.4 per ha in 1981. Then at the time that its strong reurbanisation policies began to cut in, it started to increase in density. It went from 20.8 persons per ha in 1991 to 21. 6 per ha in 1996 and finally to 25.6 persons per ha in 2006 (Kenworthy and Laube, 1999; Newman and Kenworthy, 2015).

Other cities that have demonstrated similar achievements to Vancouver in these five dimensions are Stockholm in Sweden, which is one of the world's great "transit metropolises" (Cervero, 1995, 1998). Cities such as Zurich, Bern and Munich are well-known for their good transit systems and attractive public realms, urban design, development of high quality centres and high densities and mixed land uses for more convenient transit, walking and cycling.

FREIBURG – IM-BREISGAU, GERMANY

Freiburg-im-Breisgau in southern Germany also has a strong emphasis on higher density mixed use development, priority to transit, walking and cycling, development of centres based around transit and fine attention to the public realm. As early as 1989 it was being referred to as the Green Planners Dream (TEST, 1989). In addition, Freiburg is noted for its efforts to preserve agricultural land and natural areas amongst urban development (D 2) and in particular its achievements in the area of environmental technologies (D 4). This latter factor has also been important for Freiburg's economy, which now generates significant money from its environmental technology reputation and demonstration projects.

DIMENSION 2 – FOOD GROWING AND NATURAL AREAS

Freiburg-im-Breisgau is a small university city of 222,203 people (2014)[5] nestled in the Black Forest area of southern Germany. The total land area of the city of Freiburg is 15,306 ha. Of this area only 4,861 ha, or 32%, is required for urban development including all transportation functions. Some 42% is devoted to forests, and 24% is agricultural uses, recreational areas, water protection areas and other undeveloped land (Rikort et al, 2014). This means that more than two-thirds of Freiburg's land area is devoted to green uses. Freiburg has an urban density of 46.1 persons per ha (Rikort et al, 2014). The average for the German sample in the author's global cities database is 48 per ha, which is approximately three times the density of typical auto cities in the USA and Australia. It is only possible to achieve this kind of land use by stopping the spread of new urbanisation into greenfields sites. Freiburg identifies growth areas, usually areas ripe for redevelopment, and master plans those areas for higher density residential and

Photo 14: The Rieselfeld development is anchored by the LRT line on which it is located

Photo 15: Vauban is well-served by a LRT line which also helps to green the neighbourhood

Photo 16: Freiburg's pedestrian and cycle-friendly public environments

mixed use development. Then it connects these sites to the rest of the city with transit, mainly LRT, but also buses and cycleways.

As a result of Freiburg's urban development strategy, it has low dependence on cars. For *all* daily trips, in 1999 (latest hard data), 50% were by walking and cycling, transit 18%, leaving only a 32% share for cars[6].

DIMENSION 4 – ENVIRONMENTAL TECHNOLOGIES

Freiburg has created a reputation worldwide as an environmental technology global "hot-spot". In 1975 the State government of Baden-Württemberg decided to build a nuclear reactor. The very intense, but successful opposition to that policy combined a civil society movement with heavy university involvement. As a result, in the 1980s, Freiburg developed its energy supply concept around renewable energies plus curbing demand, including focussing on transit, walking and cycling and the creation of a built form and public realm that favoured these modes and minimised the need to travel (Peirce, 2009). In the 1990s Freiburg further responded to sustainability by basing its future development on a climate protection concept. Since 2007 its climate protection action plan aims to have a 40% reduction of CO_2 by 2030 (compared to 2007 levels). This plan focuses on sustainable transportation and building and construction standards. Freiburg has had low energy construction since 1992, a subsidy programme to encourage the deployment of energy saving construction since 2002, and new stricter building standards since 2008, with formalised energy saving plans in all public buildings[7].

For decades Freiburg's development has been strongly based on citizen action and participation. Citizens are shareholders in solar and wind power stations. There is direct participation in the spatial development plan and the municipal budget. Citizens act as technical experts on committees and there is much citizen-led environmental education and many campaigns. This citizen participation and

Photo 17: Solar photovoltaic arrays appear on many buildings in Freiburg

networking of stakeholders have helped create a vision of sustainable development, which enjoys much consensus across political parties (Salomon, 2009).

Freiburg had the following achievements in this field (2010):

- Cogeneration covering 50% of electricity demand.
- District heating in new city quarters such as Vauban. Vauban uses a biomass burning plant to dispose of some of its organic waste.
- 90 small scale Combined Heat and Power (CHP) cogeneration plants.
- Five 1.8 Megawatt (MW) windmills.
- Several small scale hydro power turbines.
- More than 10 MW of installed photovoltaic power with 10 million kWh output per annum and 15,000 square metres of solar thermal infrastructure.
- The region sells itself as a Solar City with strong research, industry and a network of stakeholders called SolarRegion Freiburg.

Freiburg also has a multi-layered waste management strategy consisting of different types and colours of bins for waste separation at source (common throughout German cities). There are regular waste bins, bio-degradeable waste bins, green paper bins for paper recycling, and yellow sacks for recyclable plastics. It has 380 stations for glass recycling (green, white and brown glass in separate containers). There is separate collection of hazardous wastes not permitted in any bins and places for the collection of electronic waste such as old computers and mobile phones (also throughout Germany). Finally, it has reuse in the form of a produce exchange system.

These principles and more, such as sustainable water management and sustainable transport, are practiced in new extensions to the city such as Rieselfeld and Vauban. Sustainable water management involves channelling the rainwater falling on the site through green swales that also act as a green open space network through the development. There are

also some "holding ponds" for water that are landscape elements amongst the housing and young children play in them. As well, many of the dwellings have photovoltaics and solar hot water systems.

The district of Freiburg-Rieselfeld was developed out of a need to provide for new housing in the late 1980s and early 1990s and accommodates 11,000 people. Rieselfeld was only possible through as extension of Freiburg's LRT system, along which there are several stops serving the new district. The LRT runs on a grassed corridor through the new district, along which is located a linear neighbourhood center with a rich mix of shops, food stores, restaurants, professional suites and other uses, and above those are several floors of housing. The whole of Rieselfeld is accessible by foot from the LRT stops and both the main street and the residential streets connecting to the LRT stops are bicycle and walking friendly. At many times of the day there are a lot of children riding bikes, walking and playing in the streets. Along this main LRT street are civic functions such as a library, churches and a large square where children enjoy water fountains. Rieselfeld is an excellent example of TOD linked in a linear rather than nodal form to new urban development.

Vauban is a redevelopment area, on a site near to the city, including an old French military barracks and linked to the rest of the city by an extension of the LRT system, again running along a green corridor. Some of the old buildings have been retained and recycled into a kindergarten and other civic uses. Vauban is a dense, mixed-use new neighbourhood of 5,000 people strongly focussed on environmental technologies, especially for renewable energy. It has passive and plus energy houses, meaning that these latter dwellings generate net energy, which is fed back into the grid and as already indicated, it has its own power plant burning waste organic material.

It is a "car free" neighbourhood, but if one wants to have a car one has to store it in a solar parking structure on the fringe of the neighbourhood, which generates enough power for the garage's needs, but also feeds excess power into the grid. Vauban is strongly oriented to transit, walking and cycling and one of its most evident features is its family-friendly public realm. Children and parents are seen walking and riding bikes through comparatively safe 30 km/h residential zones. There are also many parks, which are intensively used by parents and children. Overall, Vauban successfully blends, high density housing, mixed uses, green spaces, transit and walking facilities and the use of environmental technologies into a rich and highly livable place.

SEOUL, SOUTH KOREA: FREEWAY AND ROAD REMOVAL (DIMENSION 3)

Seoul undertook perhaps the boldest ever example of freeway removal[8]. In order to resurrect the culturally significant Cheonggyecheon River, the decision was made to tear down 5.8 km of the Cheonggye freeway and the surface street below. That freeway and surface street system together carried 170,000 vehicles per day through the heart of the city. The freeway alignment has been transformed into a linear green heart for the city, a place to promenade and enjoy. All this occurred without any significant traffic disruption.

Prior to removal of the roads between 2003 and 2005, Seoul had already embarked upon a number of strategies to better manage private transportation in the city. In 1996 tolls of about $2 were introduced on two major entry points into the CBD. Traffic fell by 14 per cent and speeds improved by 38 per cent. Traffic returned to pre-toll levels but occupancy improved and average speeds remained higher. In 1997 regular fee increases were introduced for public parking, parking requirements were lowered for commercial buildings and a parking permit system introduced for residential parking. In 2003 a voluntary 'No Driving Day' was introduced, including financial inducements to participants.

The concept for the project[9] started with two engineers considering the idea of restoring the Cheonggyecheon River, because the Cheonggye District had become one of the dirtiest, noisiest parts of the city and would remain this way with the freeway.

The corridor in which the demolished roads were located is served by multiple subway lines, but importantly the city overhauled the bus system. This included an expansion of a bus rapid

Photo 18: Sustainable water management in Freiburg

Photo 19: Child-friendly public spaces in Freiburg

Photo 20: Seoul's green linear heart after the demolition of the elevated Cheonggye freeway and surface road underneath

transit system operating in exclusive median lanes, which had been introduced in 1996. By 2005 there were four routes covering 35 km and by 2007 there were seven routes covering 68 km. Curb-side bus only lanes were also expanded, the fares and timetables were coordinated, including use of a smart card and ITS technology, and services were integrated with the subway system and the services color-coded for ease of use and identity. These changes were also widely publicized leading up to the road removal.

The results were very good. Within months, transit user satisfaction had reached 90 per cent, speeds for the BRT had improved by between 33 per cent and 100 per cent and accidents and injuries on all routes had fallen by a third. But the litmus test of all this was that in five months between January and May 2005 bus patronage rose by almost 1 million per day or almost 25 per cent and the volume of private traffic through central Seoul dropped 9.1 per cent and citywide traffic by 5.9 per cent. The project planner Kee Yeon Hwang also said ..."as soon as we destroyed the road, the cars just disappeared and drivers changed their habits". Other benefits of the project included:

- Average 30 per cent increases of adjacent land value;
- Temperatures in the green corridor are about 4 C below those of areas one-quarter mile away (400 meters);
- Extra water, open space access and recreational opportunities with a jump in the quality of life of city center residents, workers and visitors.
- Re-branding of Seoul's image internationally to one of a more sustainability-focused city
- Long term economic benefits of the project are estimated by the Seoul Development Institute to be $8.5 to $25 billion and 113,000 new jobs.

The success of the project changed the direction of transportation planning in the city and moved it towards transit and non–motorized modes. The project was an example of traffic behaving more like a gas than a liquid. Traffic engineers and transportation planners are trained to think of traffic as a liquid that holds its volume and will flow over everything if blocked or allowed to grow in excess of its current 'container'. However, traffic tends to shrink when road capacity is removed, as has been proven time and again when pedestrian zones have been created (Kenworthy, 2012). The project has inspired Seoul to focus even more on transit and especially to enhance conditions for pedestrians and cyclists and to continue improvements to the public realm.

PORTLAND, OREGON; BOULDER, COLORADO AND PERTH, WESTERN AUSTRALIA – DEBATE AND DECIDE, NOT PREDICT AND PROVIDE AND INTEGRATED SUSTAINABILITY DECISION MAKING

(DIMENSIONS 9 AND 10)

PORTLAND, OREGON

Portland is the most successful and well-known example in the USA of a city that has reshaped itself under a strong vision extending as far back as the 1970s. At this time it established an urban growth boundary to limit sprawl, decided to build a light rail system call Metropolitan Area Express (MAX), which opened its first line in 1986 and scrapped a freeway that would have destroyed 3000 homes (Newman and Kenworthy, 1999). In 2001 it also introduced a separate tram or streetcar system which operates in the inner city. LRT stations and areas around streetcar stops are now a major focus for new growth, with numerous compact, mixed use centres developing along the LRT system and tram system in the inner city, particularly in the Pearl District. Parks and green spaces have been created and property values have risen with strong population growth and company location decisions.

Portland had a visioning process called Region 2040, a broad-based community representation process involving 44 stakeholders developing a vision and strategic goals for the region. At the heart of Portland's growing success over many years has been strong community engagement and empowerment through groups such as 1000 Friends of Oregon who have fought for a sustainability-based vision for their region, focussed on reducing automobile dependence and radically improving transit options[10].

The roots of Portland's performance in land

Photo 21: Portland's downtown market and light rail transit, the result of scrapping the construction of a freeway

use and transportation development dates back to the 1970s when Governor Tom McCall spearheaded a statewide growth management strategy, in particular the establishment and maintenance of urban growth boundaries (UGBs) in Oregon. Portland established such a boundary inside which all urban growth had to occur. This boundary has been linked to transportation since 1991 through the "Oregon Transportation Planning Rule", which applies a growth rule to limit increases in Vehicle Miles of Travel (VMT). The Spring 2009 status report from Tri-Met indicates that between 1996 and 2006 daily VMT increased only 19% while population increased 27% and transit patronage rose 46% (Tri-Met, 2009).

Portland's transit success can also be traced to the land use-transportation integration evident in Portland's 1973 Downtown Plan. A Transit Mall, which opened in 1978 was envisioned as the centrepiece of downtown revitalization and marked the beginnings of a trend to leverage broader community building objectives through transit investment. Other achievements began to punctuate where Portland was going as a city: the conversion of a downtown parking lot to a park, the creation of Pioneer Courthouse Square out of a parking lot, now a major community meeting point in downtown between the one-way pair of streets along which MAX operates, the removal of the Harbor Freeway along the Willamette River in downtown and its conversion to Tom McCall Park. The River Place urban village redevelopment adjacent to the new park, was also built on a commuter parking lot along the river with a hotel, shops at ground level and several floors of apartments above.

Further important steps in Portland's efforts to reinvent itself as a more sustainable and livable city came with successful civil society opposition to the Western Bypass loop of the I-5 freeway through rural lands just outside the growth boundary. Together with the growth management advocacy organization, 1000 Friends of Oregon, a study was undertaken jointly with the USEPA to develop a new approach to the problem. This produced a new planning model called LUTRAQ (Land Use, Transportation and Air Quality). The freeway was scrapped and now transit-oriented development is evident on the Westside light rail line, which was opened in 1998. By that time 7,000 transit-supportive residential units were already under construction in station precincts (Arrington, 2009). Today Portland has 97 km of LRT and 11 km of streetcar. By 2009 over $US9 billion of development had occurred around this transit network and its transit-friendly land use planning (Arrington, 2009).

Portland's 2040 Growth Management Strategy of "build up, not out" is built around transit.

PERTH, WESTERN AUSTRALIA

Perth engaged in a community visioning process in 2003 called "Dialogue With The City", which evolved out of the State Sustainability Strategy involving 42 areas of government, together with business and civil society. The human settlements part of this strategy emphasised innovative and efficient use of resources, less waste output, enhanced equity and livability and a greater sense of place in local communities.

Faced with a huge increase in urban sprawl and car dependence, the State government decided to involve the community on an unprecedented scale to develop a 2030 vision for Perth. The process involved a community survey of over 1700 households and one-day forum involving 1000 participants. A critical part of the forum was a game that each group of 10 people played to plan for the expected increase in in the number of new households. Each decision taken had a flow on effect, which was either positive or negative. People were thus forced to confront the dilemmas of urban planning, trading-off personal lifestyle preferences with systems effects, such as loss of bushland, traffic congestion and other implications[11]. This process resulted in a new plan called "The Network City," which called for around 60% of new dwelling construction to occur within existing built up areas to reduce car dependence and sprawl. The process forced participants to consider sustainability in urban planning.

Perth has also constructed two new rail lines totalling 111 km since 1993, which has involved citizen engagement and heated debate. It also developed a Livable Neighbourhoods design code for suburbs which focuses on walkable communities by changing regulations to reflect priorities such as connectivity of road systems, a sense of place and higher densities and mixed uses in new town centres based around transit[12].

BOULDER, COLORADO

Boulder is a small university town with a 2014 population of around 103,000 people situated in the larger Boulder County area of around 313,000 people. Boulder County is part of the larger automobile-dependent Denver region

Photo 22: Portland's downtown (left, showing Pioneer Courthouse Square) and Pearl District (right, showing the streetcar) have been transformed through pedestrian and transit priority

of about 3.3 million people, though Boulder separates itself from Denver's urban sprawl by a green belt. The city has a progressive history in sustainability terms, being the first US community, in 1959, to introduce a green belt to stop its own urban sprawl and urban encroachment from outside. It did this through a community organization called Plan Boulder, which is still involved in Boulder's development[13]. Boulder distinguishes itself from nearly all American communities of its size in a number of ways, especially through its innovative transit system.

Boulder maintained a "predict and provide" approach to transportation development through most of the post-war period. However, financial, political and physical realities intervened to make this approach unsustainable. In 1996 the Transportation Master Plan set a TDM goal to hold traffic levels to 1994 levels and to reduce single-occupancy vehicle mode share to 25% (Havlick, 2005). The city focussed on travel choices, rather than compulsory car use. This involved improving transit services, creating demand for transit trips, enhancing the bicycle and pedestrian system, marketing and providing good information about the new choices, changing land use and urban design approaches, tackling parking pricing and establishing some dynamic relationships between the city and the University of Colorado ("town-gown" partnership), all in consultation with the Boulder community. It also stopped some large-scale road expansion in neighbouring counties, mainly through public purchase of properties and development rights to prevent development that did not fit with Boulder's growth management and TDM strategies.

A big community-based innovation in Boulder has been the Community Transit Network (CTN), a network of six differently branded types of bus routes that are part of the GO Boulder network, whose goal is to shift 19% of commuters from their cars onto other modes. In 1990 CTN transit ridership was reportedly 5,000 per day and by 2002 had risen to 26,000 per day or a 420 % increase (Bruun, 2004). The routes are referred to as the Hop, Skip, Jump, Bound, Stampede and Dash and buses are accordingly branded and are of different sizes. All carry bicycles at the front. The Hop services are

the shortest routes and the distances get progressively greater towards the Dash[14].

The CTN is the product of a community consultation process. Boulder undertook its successful transit innovations (defining certain major corridors as high-frequency all-day, all-evening, and weekend services) only after a year of extensive public involvement. A citizen group of some 50 community leaders, working with several City of Boulder and transit agency staff, devoted time and energy to this effort, including large public meetings. Significant changes to transit need to be undertaken through public support to ensure usage and ownership of transit systems. They formed a new unit called GO Boulder as a way of circumventing the Public Works Department, which was operating on traditional principles. They also established the City of Boulder Transportation Committee, which ensured citizen interest in the issues[15]. It finally took approximately 10 years to establish the CTN, and each route involved about 1 year of citizen-involved planner per route.

The CTN is now a well-supported community-based system using buses that are family-friendly and bus drivers are employed as community ambassadors. Strong transit use was developed through: innovative Neighborhood and Business Ecopasses[16] which give purchasers unlimited transit access at cost-effective rates; marketing and education; seamless interfaces between bus, bike and pedestrian facilities; good connections to regional services and transit-supportive land use; and, good urban design (Bruun, 2004).

CONCLUSIONS

There are many principles that need to be used to deliver ecologically based urban and transportation planning. The ten dimensions discussed here are by no means exhaustive but are certainly central to efforts towards greater urban sustainability. This paper has provided some insights into Vancouver, Portland, Freiburg im Breisgau, Boulder, Perth and Seoul who have practiced various combinations of these principles with reasonable degrees of success. ◆

All photos courtesy Jeffrey Kenworthy

ENDNOTES

1 The Vancouver region's average road traffic speed in 2006 was 38.6 km/h, whereas metro areas in the USA and Australia average between 43 km/h and 52 km/h (Newman and Kenworthy, 2015).

2 See for example: http://www.metrovancouver.org/services/regional-planning/metro-vancouver-2040/resources/Pages/default.aspx accessed April 10, 2016

3 Vancouver does have the Granville Street Mall, a transit only mall running several blocks in the downtown along which run a number of bus routes.

4 See http://vancouver.ca/streets-transportation/improving-our-cycling-network.aspx accessed April 12, 2016

5 http://www.citypopulation.de/php/germany-badenwurttemberg.php?cityid=08311000
accessed April 11, 2016

6 http://www.freiburg.de/pb/,Lde/231648.html accessed April 11, 2016

7 See: http://www.ecotippingpoints.org/our-stories/indepth/germany-freiburg-sustainability-transportation-energy-green-economy.html. Accessed April 11, 2016

8 See: http://www.seattle.gov/transportation/docs/ump/06%20SEATTLE%20Case%20studies%20in%20urban%20freeway%20removal.pdf accessed April 11, 2016

9 The full story of this project is in a 25 minute documentary called Seoul: The Stream of Consciousness (see www.e2-series.com accessed April 11, 2016).

10 e.g. see later Land Use, Transportation, Air Quality or LUTRAQ at https://www.friends.org/resources/reports accessed April, 11, 2016

11 see http://www.21stcenturydialogue.com/index.php?package=Initiatives&action=Link&file=dialogue_with_the_city.html accessed April 11, 2016 and Marinova, et al, 2004

12 see http://www.planning.wa.gov.au/dop_pub_pdf/LN_Text_update_02.pdf accessed April 11, 2016

13 http://www.planbouldercounty.org/ accessed April 11, 2016

14 see https://bouldercolorado.gov/transportation/transit-system-plan accessed April 11, 2016

15 The 2009 Mayor, Will Toor, started his civic involvement with this committee

16 see https://bouldercolorado.gov/goboulder/eco-pass-program accessed April 11, 2016

REFERENCES

Alexander, D., Tomalty, R. and Anielski, M. (2004) *BC Sprawl Report: Economic vitality and livable communities*. Smart Growth BC, Vancouver.

Appleyard, D. (1981) *Livable Streets*, University of California Press, Berkeley, 382 pp.

Arrington, G.B. (2009) 'Portland's TOD evolution: From planning to lifestyle', In Curtis, C, Renne, J.L and Bertolini, L. *Transit Oriented Development: Making It Happen*. Ashgate, Surrey.

Bacon, E.N. (1974) *Design of Cities*, Penguin Books, New York, 336 pp.

Barber, J. (1995) Mending Our Lovely Metros, *The Globe and Mail,* Focus Section D, September 9, 1995.

Beatley, T. (2000) *Green Urbanism: Learning from European Cities*, Island Press, Washington DC, 491 pp.

Beatley, T. (2005) *Native to nowhere: Sustaining home and community in a global age*. Island Press, Washington DC, 408 pp.

Beatley, T. (2010) *Biophilic Cities: Integrating Nature into Urban Design and Nature*. Island Press, Washington DC, 208 pp.

Bentley, I., Alcock, A., Murrain, P., McGlynn, S. and Smith, G, (1985) *Responsive Environments: A Manual for Designers*, Architectural Press, Oxford, 152 pp.

Bruun, E. (2004) *Community Oriented Transit Best Practices*, Working Paper 1, Independent Assessment Study of District 2 Transit Services, Alameda-Contra Costa Transit District, Transit Resource Center, Florida.

Cairns, S., Hass-Klau, C. and Goodwin, P. (1998) *Traffic Impact of Highway Capacity Reductions: Assessment of Evidence*. Landor Publishing, London, 261 pp.

Calthorpe, P. (1995) *The Next American Metropolis: Ecology, Community and the American Dream*. Princeton Architectural Press, Princeton.

Campbell, C.J., and Laherrere, J.H. (1995) *The World's Oil Supply 1930-2050*, Petroconsultants, Geneva.

Cervero, R., 1995, Sustainable new towns: Stockholm's rail served satellites. *Cities*, 12 (1), 41-51.

Cervero, R. (1998) *The Transit Metropolis: A Global Inquiry*. Island Press, Washington DC.

Davis, M. (1990) *City of Quartz: Excavating the Future in Los Angeles*, Vintage, London, 462 pp.

Florida, R. (2002) *The Rise of The Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*, Perseus Books Group, New York, 416 pp.

Florida, R. (2004) *Cities and The Creative Class*, Routledge, New York. 208 pp.

Florida, R. (2010) *The Great Reset: How New Ways of Living and Working Drive Post-Crash Prosperity*, Harper Collins, New York.

Florida, R. (2012) *How and Why American Cities are Coming Back* [Online]. Available: http://www.theatlanticcities.com/jobs-and-economy/2012/05/how-and-why-american-cities-are-coming-back/2015/ [Accessed 10/04/2016].

Gehl, J. and Gemzøe, L. (1996) *Public Spaces, Public Life*, The Danish Architectural Press and the Royal Danish Academy of Fine Arts School of Architecture Publishers, Copenhagen, 96 pp.

Goodwin, P. B. (1997) Solving congestion (when we must not build roads, increase spending, lose votes, damage the economy or harm the environment, and will never find equilibrium)", Inaugural Lecture for the Professorship of Transport Policy, University College, London, 23 October.

Havlick, S. (2005) *TDM in Boulder: A town-gown partnership*. The University of Colorado, Boulder. Powerpoint presentation.

Holtzclaw, J. (1994), "Using residential patterns and transit to decrease auto dependence and costs", Report to Natural Resources Defense Council, Washington DC.

Jacobs, A. B. (1993) *Great Streets*, The MIT Press, Massachusetts, 344 pp.

Jacobs, J. (1961) *The Death and Life of Great American Cities*, Vintage Press, New York, 474 pages.

Jacobs, J. (1969) *The Economy of Cities*, Random House, New York, 288 pages.

Jacobs, J. (1984) *Cities and The Wealth of Nations*, Penguin, Harmondsworth, 257 pages.

Katz, P. (1994) *The New Urbanism: Toward an Architecture of Community*, McGraw Hill, New York, 288 pages.

Kenworthy, J. (2006) The Eco-City: Ten Key Transport and Planning Dimensions for Sustainable City Development. *Environment and Urbanization* Special Issue, 67-85, April.

Kenworthy, J. (2008) An international review of the significance of rail in developing more sustainable urban transport systems in higher income cities. *World Transport Policy and Practice* 14 (2), 21-37.

Kenworthy, J. (2011) *International Benchmarking and Best Practice in Adapting to a Future of Electric Mobility in Germany: Sustainable Transport or Just Electric Cars?* Report to Hessen State Government through the Frankfurt University of Applied Sciences, Frankfurt am Main, Germany, February.

Kenworthy, J. (2012) Don't shoot me I'm only the transport planner (apologies to Sir Elton John) *World Transport Policy and Practice* 18 (4) 6-26.

Kenworthy, J. (2014) Trends in Transport and Urban Development in Thirty-Three International Cities, 1995-6 to 2005-6: Some Prospects for Lower Carbon Transport In Lehmann, S. (ed.) *Low Carbon Cities: Transforming Urban Systems*. Chapter 5, pp 113-130, Routledge, London

Kenworthy, J. and Laube, F. (1999) (with Newman, P., Barter, P., Raad, T., Poboon, C., and Guia, B), *An International Sourcebook of Automobile Dependence in Cities, 1960-1990*, University Press of Colorado, Niwot, Colorado, USA, 704 pages.

Kenworthy J, and Laube F. (2001) *The Millennium Cities Database for Sustainable Transport*, International Union of Public Transport (UITP), Brussels and Institute for Sustainability and Technology Policy (ISTP), Perth: CD ROM database.

Kilcoyne, R. (2015) Autonomous vehicles and the VMT problem. *Human Transit* (Blog) Novermber 13, 2015 - (http://humantransit.org/2015/11/a-veteran-transit-official-ponders-why-promoters-of-autonomous-vehicles-ignore-vmt-and-the-need-to-p.html accessed April 10, 2016).

Kostoff, S. (1991) *The City Shaped: Urban Patterns and Meanings Through History*, Thames and Hudson, London, 352 pages.

Landry, C. (2000) *The Creative City: A Toolkit for Urban Innovators*, Earthscan Publications, London, 300 pages.

Lynch, K. (1960) *The Image of The City*, The MIT Press, Cambridge, Massachusetts, 194 pages.

Lynch, K. (1981) *Good City Form*, The MIT Press, Cambridge, Massachusetts, 514 pp.

Marinova, D, McGrath, N. and Newman, P. (2004) Dialogue with the City: An Era of Participatory Planning for Provision of More Sustainable Infrastructure in Perth? *Proceedings of International Summer Academy on Technology Studies*, Austria, pp 195-210.

Mitchell, R.B. and Rapkin, C. (1954) *Urban Traffic: A Function of Land Use*, Columbia University Press, New York, 226 pages.

Monheim, R. (1988) Pedestrian zones in West Germany - The dynamic development of an effective instrument to enliven the city centre, In Hass-Klau, C. (editor), *New Life for City Centres: Planning Transport and Conservation in British and German Cities*, Anglo-German Foundation, London, pages 107-130.

Naess, P. (1993a) Energy use for transport in 22 Nordic towns, NIBR Report No 2, Norwegian Institute for Urban and Regional Research, Oslo.

Naess, P. (1993b) Transportation energy in Swedish towns and regions, *Scandinavian Housing and Planning Research*, Vol 10, pages 187-206.

Napolitan, F. and Zegras, C. (2008) Shifting urban priorities? Removal of inner city freeways in the United States. *Transportation Research Record* 2046: 68-75.

Newman, P. (1990) The search for the good city, *Town and Country Planning* Vol 59, No 10, pages 272-275.

Newman, P. and Jennings, I. (2008) *Cities as sustainable ecosystems: Principles and practices*. Island Press, Washington DC, 296 pages

Newman, P. W. G. and Kenworthy, J. R. (1984) " The use and abuse of driving cycle research: Clarifying the relationship between traffic congestion, energy and emissions", *Transportation Quarterly* Vol 38, No 4, pages 615-635.

Newman, P. W. G. and Kenworthy, J. R. (1988) "The transport energy trade-off: Fuel-efficient traffic versus fuel-efficient cities", *Transportation Research* Vol 22A, No 3, pages 163-174.

Newman, P.W.G. and Kenworthy, J.R. (1989), *Cities and Automobile Dependence: An International Sourcebook*, Gower, Aldershot, England, 388 pages.

Newman, P.W.G. and Kenworthy, J.R. (1999), *Sustainability and Cities: Overcoming Automobile Dependence,* Island Press, Washington DC, 442 pp.

Newman, P. and Kenworthy, J. (2015) *The End of Automobile Dependence: How Cities are Moving Beyond Car-Based Planning*. Island Press, Washington DC.

Newman, P., Kosonen, L. and Kenworthy, J. (2016) Theory of urban fabrics: planning the walking, transit/public transport and automobile/motor car cities for reduced car dependency. Town Planning Review 87 (4), 429-458

Peirce, N. (2009) German city emerges as a world class energy saver, http://citiwire.net/post/973/ Washington Post Writers Group.

Perl, A., Hern, M. and Kenworthy, J. (2015) Streets paved with gold: Urban expressway building and global city formation in Montreal, Toronto and Vancouver. *Canadian Journal of Urban Research*, 24 (2), 91-116.

Punter, J. (2003) *The Vancouver achievement: Urban planning and design.* UBC Press, Vancouver, 447 pp.

Putnam, R. (2001) *Bowling Alone: The Collapse and Revival of American Community*, Simon and Schuster, New York, 544 pp.

Rees, W.E., Wackernagel, M. and Testemale, P. (1998) *Our ecological footprint: Reducing human impact on the earth.* New Society Publishers, Gabriola Island, BC, 160 pp.

Riggs, W. and Boswell, M.R. (2016) No Business as Usual in an Autonomous Vehicle Future. http://www.planetizen.com/node/85210/no-business-usual-autonomous-vehicle-future accessed April 10, 2016).

Rikort, A., Markiewicz, M., Herrmann, M. and Kreisel, S. (2014) *Comparative Urban Data Collection and Analysis Focussed on Freiburg im Breisgau: Transport and Land Use Sustainability in Cities*. Master Project, GEKO Programme, Frankfurt University of Applied Sciences, Frankfurt.

Salomon, D. (2009) Freiburg Green City: Approaches to Sustainability. Presentation to European Green Capital Award, 12.01.2009. see for example: http://www.ecotippingpoints.org/our-stories/indepth/germany-freiburg-sustainability-transportation-energy-green-economy.html accessed April 11, 2016.

Schiller, P.L. Bruun, E.C. and Kenworthy, J.R. (2010) *An Introduction to Sustainable Transportation: Policy, Planning and Implementation*, Earthscan, London, 342 pp

TEST (1989) *Quality streets: How traditional urban centres benefit from traffic calming.* Transport and Environment Studies, London, May.

Thomson, J. M. (1977) *Great cities and their traffic*, Penguin Books: Middlesex, UK.

Tri-Met (2009) *Status Report*. Spring. 20pp.

Watt, K.E.F. and Ayres, C. (1974), "Urban land use patterns and transportation energy cost", Presented to the Annual Meeting of the American Association for the Advancement of Science, San Francisco.

ELEMENTS OF CITIES WE NEED

PLANNING FOR CITIES THAT LOVE NATURE
THE EMERGING GLOBAL MOVEMENT OF BIOPHILIC CITIES

TIM BEATLEY

Figure 1: Birmingham has declared its intention to be the first Biophilic City in the UK. Not thought of by many as especially natureful, it is a city with one of Europe's largest urban parks, Sutton Park.
Image Credit: City of Birmingham

» *An urban future is imagined in which nature is not a distant and occasional destination, where humans are only visitors, but one that defines the very "home" in which we live. The idea that the city is an ecosystem (it is!), and that we might aspire to living in a nature-immersive urban environment, are ideas that are beginning to catch on.* «

Figure 2 (left): Wellington is a biophilic city that increasingly recognizes the unique marine nature all around it. Shown here is the rocky edge of the Taputeranga Marine Reserve, closeby to the City's downtown. Wellington is developing a vision of "Blue Belts" to complement its commitment to terrestrial-based Green Belts.
Image credit: Tim Beatley

Zealandia is an impressive experiment in Wellington, New Zealand. Here, native species of birds have been largely decimated by the introduction of non-native species. Zealandia, a large forested wild zone in the middle of the city, encircled by a 2.2 meter tall predator-proof fence, seeks to change that. The tagline for Zealandia is "bringing birdsong back to Wellington," and already it has had considerable success. The numbers of the Kaka parrot have increased from a low of 6, when re-introduced in 2002, to as many as 250 today. Importantly, many of these birds now are being seen in other areas of the city, especially in the so-called "halo" zone surrounding Zealandia. It is an interesting story and a bold goal for the city; the notion that wherever you live in this city, whatever neighborhood you reside in, you ought to be able to hear and enjoy bird song. It is a different way to judge the long term success of the planning and environmental design efforts. It also is a metric to gauge the progress of the city using a target more in line with the goals and vision of a biophilic city.

Wellington has also been working in many other ways to strengthen its connections to nature. There is an abundant network of greenspaces, and an ambitious target of planting two million new trees has been set, with significant progress made towards that goal. It has emphasized the planting of native trees and plants throughout the city, in places like median strips and road verges. There is an extensive network of trails to hike, and nature not far away from where most people live. Recently the Parks department sponsored a Peak Bragging campaign, encouraging residents to hike up to the top of one of the City's twelve peaks and post a creative photo online (with prizes offered for the best pictures). The City has produced a series of online interactive maps to help residents to plan and undertake their urban hiking adventures.

METRICS OF BIOPHILIC CITIES

BIOPHILIC CONDITIONS AND INFRASTRUCTURE

» Proximity to parks and green spaces;
» Percentage of land area covered by trees or other vegetation;
» Number of green design features (e.g. green rooftops, green walls, rain gardens);
» Fair distribution of nature;
» Extent of natural images, shapes, forms employed in architecture, and seen in the city;
» Extent flora and fauna (e.g. species) within the city;

BIOPHILIC BEHAVIORS, PATTERNS, PRACTICES, LIFESTYLES

» Average portion of the day spent outside;
» Visitation rates for city parks;
» Percent of trips made by walking;
» Extent of membership and participation in local nature clubs and organizations;

BIOPHILIC ATTITUDES AND KNOWLEDGE

» Percent of residents who express care and concern for nature;
» Percent of residents who can identify common species of flora and fauna;

BIOPHILIC INSTITUTIONS AND GOVERNANCE

» Percent of municipal budget dedicated to biophilic programs;
» Design and planning regulations that promote biophilic urbanism;
» Presence of institutions that promote education and awareness of nature;
» Number/extent of educational programs in local schools aimed at teaching about nature;
» Nature organizations and clubs of various sorts in the city, from advocacy to social groups;

Figure 3: In Oslo forests are very important, and many citizens regularly visit them. Two-thirds of this city is comprised of protected forest, much of it easily accessible with public transit.
Image credit: Tim Beatley

Perched on the Cook's Strait, the city is increasingly aware of the marine world just beyond the coastal boarder of the city. Already the city boasts a marine protected area, just a few minutes away from downtown. There is a Marine Education Centre, that most children in the city have the chance to visit, and most impressively a new vision of a "blue belt" encompassing the watery realms of the city to complement the city's green belts.

Wellington already is a biophilic city in many ways, and an early partner city in the new global Biophilic Cities Network (see the text box for more information about this project). Cities like Wellington are at the forefront of crafting a new vision of urban living where nature is the key to a quality of life and to a healthy, meaningful life. This city is on the leading edge of a global movement that understands that nature and cities can and must go together; that the dichotomy of nature v. cities is wrong. While it may be premature to call this a movement, there are several positive trends and an undeniable growing awareness that more nature in cities can help address many, perhaps most of the challenges we are facing today.

Nature is uniquely suited to developing important resilience and ecosystem services and benefits, at the same time that it helps us cope with the stresses of modern life. Unlike important sustainability goals which define how we must change or how much we must conserve, it can be argued that biophilic cities provide a vision of the kinds of sustainable places we actually want to live in and love. And there is much productive overlap between biophilic cities, and urban resilience and sustainability. Many of the important ways that cities can be more natureful, from planting trees to installing vertical gardens, will, in turn, help to address rising urban temperatures, adaptation to climate change, and will reduce energy consumption and greenhouse gas

emissions. It is a vision of the future of cities that emphasizes the profound importance of cities as flourishing, both for the human species and for the many other species that either co-occupy urban environments and spaces around us or that are profoundly impacted by the ecological footprints associated with urban life.

THE POWER OF NATURE IN CITIES

That nature is an unusually potent elixir is no longer a bold premise, but widely accepted. While the word "biophilia" was first used by social psychologist Erich Fromm, it was Harvard biologist E.O. Wilson who popularized it and given it widespread currency. Wilson defines "biophilia" as "...the innately emotional affiliation of human beings to other living organisms. Innate means hereditary and hence part of ultimate human nature" (Wilson, 1984).

Much research has bolstered the basic insight that we have co-evolved with nature and are likely to be happiest and healthiest in, and among, the natural world. Japanese researchers speak of "forest bathing," for instance, and have shown how a walk in a forest or natural area reduces stress hormone levels and helps to boost our immune systems (e.g. Africa, Tsunetsugn, and Wang, 2015). Walking and spending time in nature changes our mood for the better, to be sure, and helps reduce long term chronic stress. There is considerable evidence that investing in urban nature, for instance trees and urban forests, deliver considerable benefits, such as reductions in crime and gun violence, as several studies have shown (e.g. Weinstein et al 2015). These positive impacts have not been lost on the medical and public health communities, and now doctors are prescribing time outside, time spent in nature as at least a partial antidote to the ills of modern times. Trees and nature, moreover, help to foster social cohesion and social relationships, which in turn provide major help benefits.

Nature in and around cities can help make cities more resilient in the face of climate change, and mitigate other economic and social shocks that cities around the world will face[1]. Natural solutions abound in confronting a variety of resource constraints and environmental challenges faced by cities, whether water conservation, air pollution, flooding and stormwater management, and food insecurity, among others.

Being in nature seems also to hold the promise of making us better human beings. There are now studies that show that we are more likely to be generous in the presence of nature, more likely to think longer term, and more likely to exhibit cooperative behavior (e.g. Zelenski, Dopko, and Capaldi, 2015).

WHAT IS A BIOPHILIC CITY?

What precisely a biophilic city is, or could be, remains an open question and a point of discussion; but this much is agreed.[2]. A biophilic city is a city of abundant nature, a natureful city, to be sure, and a city that seeks to put nature in all its forms at the center of its design and planning. It is a city that seeks to conserve and celebrate its biodiversity (the flora, fauna and fungi) and to integrate many forms of new nature into the design of new buildings and built environments. From living rooftops to vertical gardens to vegetated terraces, there are many ways that even very dense urban settings can accommodate greater biodiversity and nature. In these ways a biophilic city seeks to blend more traditional land and nature conservation efforts with ecological design and green building. Efforts at expanding food production in the city are also part of the biophilic cities agenda, whether rooftop beekeeping, or urban orchard planting, as some cities are doing. The following are attributes which define a Biophilic City.

REIMAGING BUILDINGS

There has been considerable progress in re-imagining building, such as homes, offices, schools, and hospitals, as more natureful structures. Living rooftops and vertical gardens, for example, have become increasingly common biophilic design elements, and offer the possibility of providing significant bird and invertebrate habitat. While not a replacement for more traditional parks and protected areas, they can collectively make the city a habitat for many other forms of life. Mainstream architecture schools are warming up the importance of teaching biophilic design, and certification organizations, like the Living Building Future, have emphasized biophilic design elements.

Figure 4 (top): The ParkRoyale Hotel in Singapore, designed by the firm WOHA, reflects the emphasis in that city on incorporating nature into the vertical realm. The vertical nature included in this hotel is an amount more than twice the area of the lot it is built on.
Image credit: Tim Beatley

Figure 5 (bottom): A Biophilic City is a city that supports the design of living, working and learning spaces that are natureful and include abundant plants and natural light. An exemplary project can be seen in the new Healey Family Center at Georgetown University in Washington, DC.
Image credit: Tim Beatley

ENHANCE THE CONNECTEDNESS BETWEEN NATURE AND URBAN POPULATIONS

Another type of biophilic design are those which offer the opportunity to enhance nature connectedness for the occupants and users in buildings. An example is the new Healey Family Center at Georgetown University, in Washington, DC. It has been designed to maximize natural light, with features such as interior green walls, and visual connections to the Potomac river. The emergence of forms of architectural design that emphasize access to daylight, natural ventilation, indoor plants and greenery, views of nature from office and flat windows--often collectively referred to as biophilic design--is a complementary movement to biophilic cities and urbanism, which tend to focus more on the spaces outside buildings and the larger urban and regional environments in which buildings sit. But the biophilic principles are the same, and aims are complementary. Indeed, a biophilic city is in part defined as a city with many (most) of its buildings are biophilic--that is, a city that through its development codes or through financial incentives or technical support encourages or mandates biophilic design.

Figure 6: One measure of a Biophilic City is the extent to which its residents have opportunities to experience and enjoy the nature around them. Here, a group of college students are on a bird watching hike. Image credit: Tim Beatley.

ESTABLISHES CO-EXISTENCE WITH NATURAL SPECIES

But a biophilic city is more than the sum of its buildings, it is a city that grows nature (or allows nature to grow) between the buildings; a city that worries about how little time its residents spend outside; and a city that seeks to invest in biophilic infrastructure, from trail networks to gardens to river restoration to urban forestry. It is a city that sees those biophilic buildings and projects as profoundly situated in the larger garden or forest or park.

It is a city that acknowledges an obligation to seek humane co-existence with other forms of life, and understands that cities are shared spaces, occupied by many other species. This spirit of co-existence manifests in cities in many different ways[3]. Co-existence can take many forms, such as design for habitat connectivity and wildlife movement. Edmonton, Canada, now requires that wildlife passages be designed into any new road or infrastructure projects, and has now completed 27 such passages. Recently we have been working together with colleagues at the Humane Society of the US to explore methods which recognize the need to treat humanely the urban wildlife that occupy cities and to look for non-lethal ways to resolve human-wildlife conflicts.

ADVANCES A WHOLE-OF-CITY, WHOLE-OF-LIFE APPROACH

Often a biophilic city is described as a place that seeks to advance a whole-of-life approach to fostering connections with nature. As an office worker you ought to experience a work environment that is drenched in daylight and is natureful and healthy. Most of us should find ourselves working in such settings, and evidence suggests that worker productivity goes up significantly in these more natureful environments (something not lost on employers). Nature can and

should be present in the work and living spaces around us, but also at every other urban scale. Abundant nature needs to be present in urban neighborhoods and throughout a city and metropolitan area. Sometimes described as rooftop to region, or room to region, a Biophilic City is characterized by integrated, mutli-scaled, highly connected natural systems and features.

Our partner cities are pushing the vision of a Biophilic City even further, towards the direction of an immersive urban nature condition. Singapore, for instance, has taken the step of changing its motto from "garden city" to "city in a garden," a subtle but important shift. Why live in a city where one needs to travel to visit the garden (or the park, or the forest), when we ideally ought to be able live in the garden. Nature in biophilic cities is necessarily multisensory, and so preserving and designing natural urban soundscapes is important. Research is now suggesting the beneficial value of birdsong, for instance, something every urban neighborhood should be entitled to. The natural soundscape is understood in biophilic cities to represent an important asset, that can help to nurture and heal and enhance meaning and quality of life (see Beatley, 2013).

ENGAGES URBAN POPULATIONS TO CARE ABOUT NATURE

Finally, a biophilic city is not just defined by the presence or absence of nature, but by the many ways that residents are engaged in and with that nature. How much do they care about the nature, how knowledgeable are they about the wondrous nature around them, and in what ways do they celebrate, enjoy, care about, and work on behalf of that nature. We have sought to understand the many opportunities in cities to engage that nature; whether through bird watching, tree planting, community gardening, urban hiking and camping, among the many other possibilities. A biophilic city should be defined by its efforts to amplify and maximize these opportunities for engagement. Some cities, such as New York, now offer summer camping in many of their parks. Others provide direct opportunities for involvement in bush care or urban nature restoration activities. An important measure of a biophilic city is the abundance of programs, organizations, clubs, that provide direct opportunities to connect with local nature, and to work on its behalf.

Support for citizen science has grown in many cities and there are new and creative ways to engage the public; ways that impact knowledge, build emotional connections and connectedness and also increasingly contribute to advancing knowledge about urban nature. Bio-blitzes are increasingly common. Wellington, has even undertaken a marine bio-blitz[4] (the first in the world). Other examples of citizen science programs include Dolphin Watch, in Perth, Australia, which enlisting citizens to monitor and track local indo-Pacific bottlenose dolphins and the Urban Slender Loris Project, in Bangalore, India, where citizens learn about and look for that species in treetops at night.

PROMOTES CURIOSITY

A Biophilic City is a curious city, and a city that helps to foster a culture of curiosity. Nature in cities represents a virtually limitless opportunity to instill wonder and awe. Indeed, a key goal for the cities would be to maximizing of opportunities for awe. Whether a harbor glimpse of an Orca whale (as in Wellington), or watching flocks of migrating Vaux Swifts spectacularly landing in chimneys (as in Portland, OR), or learning about the remarkable diversity of ants in the median strips (as in New York City), the nature of cities can in many ways be awe-inspiring. We increasingly recognize that awe provides meaning to our lives and deeper engagement in our lives. Some research even suggests that experience of awe may alter our perceptions of time, and certainly contribute positively to well-being. Biophilic Cities strengthen the sense of living in a world that is complex, mysterious and vast in many ways that we are only beginning now to comprehend. Awe provides a much-needed sense of humility and perspective to our otherwise hubris-filled lives. How we foster engagement, a culture of curiosity, and maximize the moments of awe and wonder for its residents remains a challenge, but an important goal of a Biophilic City.

How we measure that culture of curiosity is also a challenge. The Biophilic Cities Network is partly about sharing different approaches to metrics, and to tracking and monitoring long

Figure 7 (top): Much of the challenge to city planners today is to imagine dense and compact cities, that are walkable and sustainable, but that also include abundant nature. Singapore, shown here, seeks in many creative ways to grow and extend its nature and aspires to be a "City in a Garden". Image credit: Tim Beatley

Figure 8 (bottom): A biophilic City is a city that seeks to re-connect its residents to nature. Here a child finds a young American toad. Image credit: Tim Beatley

term progress at becoming more biophilic. We have been exploring different categories of indicators and targets. Table 1 illustrates some of those. Each new city joining the Biophilic Cities Network is asked to choose a minimum number of indicators, and to pick ones that are suited to and meaningful for that city.

QUESTIONS AND OBSTACLES REMAIN

Our nascent work at exploring and developing the concept of a Biophilic City, and the emergence of the Biophilic Cities movement is exciting. Many cities are finding new and creative ways to insert nature and to protect and celebrate the nature already present. There is a new vision of the city emerging--one that understands that nature even in dense urban environments can be present, and indeed often is, in many more ways and in many more places than we have imaged. There is a new and different urban future which is possible. An urban future is imagined in which nature is not a distant and occasional destination, where humans are only visitors, but one that defines the very "home" in which we live. The idea that the city is an ecosystem (it is!), and that we might aspire to living in a nature-immersive urban environment, are ideas that are beginning to catch on.

How to bring about this urban nature immersion remains an open question. In leading cities like Singapore it is happening through a set of complementary programs and policies. For instance, as part of its landscape replacement policy new high rise buildings are required to incorporate nature to a remarkable degree. New developments in that city are in friendly competition to see which can design in the most nature. There are financial subsidies for green elements, investments in research and development, and recognition of biophilic design and planning leaders through an annual Skyrise Greenery Award. Not every city will be able to put in place such an impressive complement of policies and regulations, but many will, and many will be inspired by the successes in places like Singapore. What will be necessary to push the biophilic city vision forward will vary from place to place, but it will likely require some combination of citizen engagement, market demand, and strong political leadership.

Biophilic cities are seeking to reform and modify more traditional planning codes to make more room for nature. In Singapore their vertical greening policies turn the traditional metric for massing and density, the floor area ratio[5] (FAR), on its head. They now require a green area ratio. There are other examples in other cities. Such as the new office and retail building 300 Lafayette, in the SOHO neighborhood in New York City. Here, extensive vegetated terraces are included, planted with native plants, with the total area of planting more than replacing or replenishing the pristine ground level nature that existed before there was any development on the site.

There remain open questions about how to best deliver nature in cities, and how to creatively finance these investments. We will need new mechanisms for tapping into revenue from the returns on biophilic investments, recapturing savings from lowered energy costs associated from heat reduction and shading benefits of trees and greenery, and the valuing non-cash benefits such as improved learning environments in schools and reductions in crime. The agenda of biophilic cities is one that must involve a city's formal governance structure, but can involve a variety of public-private partnerships, and the important engagement of community groups and NGO's. In our Biophilic Cities Network we have been collecting and reporting on a variety of organizations and organizational structures for delivering nature in cities.

Moving forward there will be other open questions and challenges. How we bring the vision and practice of biophilic cities to less wealthy parts of the world and how we understand the ways that urban-nature interventions and planning can address daunting problems of urban poverty, the living conditions in informal housing environments, and climate resilience, will remain challenges. I am convinced that biophilia can be a significant part of the answer, and that we can find even more compelling applications, or models, in the developing world. But we need to collect more practical models of how nature can be designed and planned in these places. In the US, there remain important concerns about social justice, and the often profound inequality in access to nature in poor

Figure 9: Here in Bishan-Ang Mo Kio Park, in Singapore, a concrete flood control has been dramatically transformed back into a beautiful, meandering natural streams.
Image credit: Tim Beatley

Figure 10: Singapore has more than 300 kilometers of trails and walkways as part of its Park Connector Network. This is one of the author's favorite segments, the Southern Ridges, where the it is possible to stroll at tree canopy level and to experience breathtaking views of the city.
Image credit: Tim Beatley

Figure 11: Singapore's Super Trees show the development of new and interesting hybrid forms of human-designed nature. These metal structures incorporate thousands of living plants and perform many of the functions as natural trees.
Image credit: Singapore Nparks

and minority communities. Increasingly there is the concern that natureful design interventions (such as the High Line park in New York City) often serve to raise the cost of housing and can displace current residents (something that has been dubbed eco-gentrification; see Dooling, 2009). New planning mechanisms are needed to minimize these potential impacts and to ensure a fair distribution of the benefits that flow from investments in nature.

How a city defines its "nature" is another significant open question. In coastal cities there is a special opportunity and obligation to expand the understanding of nature, as most existing ones are (and new cities will be) located along or near coasts or waterways. These areas have a special opportunity and obligation to expand their understanding of nature to include the marine and fresh water environments nearby, environments and habitats that are largely unseen or unrecognized. In cities like San Francisco and Wellington, the marine realm represents a remarkable biodiversity and wondrous natural realm that urbanites can and must understand and connect with emotionally. Some cities have begun to take steps to expand their perception of, and priority given to, these blue nature realms. In some cities, such as Seattle and Singapore, significant efforts to educate about this marine world, for instance through low-tide walks at city parks. There are innovative marine-based citizen-science initiatives, and efforts to extend and expand city spatial planning to encompass marine environments (such as Wellington's emerging idea of "blue belts"). Singapore has undertaken an impressive comprehensive marine biodiversity inventory, with major public engagement, and leading even to the discovery of some marine species new to science. The agenda of Blue Cities, or Blue Urbanism, seeks to expand biophilic sensibilities and priorities to these biodiverse environments[6]. There is much more to do here, but it is clear that biophilic cities have unusual opportunities to connect with, and steward over, aquatic nature.

Cities have a major impact on the health of oceans, of course, from non-point water pollution, to the prevalence of plastic waste to the overharvesting of fisheries, and can be leaders in addressing all of these problems. This raises the question of a biophilic city being partly defined by concern for extra-local nature. There is the unfortunate paradox that some of our greenest and most natureful cities also exert, through the import of food, wood, energy, materials, a tremendous negative impact on far-away nature, including oceans. This spatially-expanded notion of a biophilic city is an important one, and though perhaps more difficult to put into practice, lends supports for idea such as circular metabolism[7] for cities, developing local sustainable sources for wood, helping to financially underwrite and support sustainable enterprises in other nations. And, to circle back to the marine realm, cities should work to support marine conservation efforts that may occur in distant parts of the world (and of course we are all connected on this small blue marble).

There are other important questions about what constitutes "nature." Nature is to a considerable extent a culturally defined term. In the work of the Biophilic Cities Network we understand it to be quite broadly defined: it is the underlying ecology and remnant nature found in in and around cities, it is the natural systems and hydrology present in cities, and the native (and non-native) flora and fauna and fungi there. But it also includes designed nature, as seen in the integrating of highly artificial forms of nature into buildings and built environments (e.g. living walls, green courtyards, sky gardens). But we also are seeing the emergence of new and interesting hybrid blends of the natural and the built, such as the new Supertrees of the Gardens by the Bay in Singapore-large metal, tree-shaped structures, with many thousands of living, growing plants on them. In the biophilic design community there is also much support for the use of natural shapes, forms and materials, and the strong belief that these are also important elements in creating healthy, uplifting environments. Cities, like Wellington, exhibit to a remarkable degree the presence of shapes from nature in the design of buildings and streetscapes there (for instance, bollards in the shape of fern fronds!). Empirical evidence about the power and import of this kind of nature remains scant, but they do appear to be helpful and beneficial references to nature in cities.

So these are exciting times as we watch the advancement of this new idea about the primary role of nature in global urbanization. Nature is not the only ingredient needed to create resilient, sustainable, flourishing urban environments. But the inclusion of nature is essential to leading healthy, happy, meaningful lives in an increasingly urban world. And there is a growing appreciation for the need to have nature all around us, even in dense cities. The biophilic cities movement, and our nascent but promising new Biophilic Cities Network, are driven by this appreciation, and a growing body of empirical research demonstrating the power of nature.

We look forward to hearing from potential partner cities who would like to join the Network (please visit www.biophiliccities.org), as well as individuals and organizations in cities around the world, who we hope will together help to propel forward this hopeful vision, as a necessary parallel to unbridled global urbanization. ◆

ENDNOTES

1 Peter Newman and I have made the case that "Biophilic Cities Are Sustainable Cities" in a recent issue of the online journal Sustainability (Beatley and Newman, 2013).

2 For more detailed discussions of what a Biophilic City is see Beatley, 2011; and forthcoming

3 We have recently profiled several impressive examples in the US of efforts to understand how cities and wildlife can co-exist, including the Bay Area Puma Project, in the San Francisco Bay Area, and the Coyote Project. For more information see: www.biophiliccities.org

4 A BioBlitz is an intensive biodiversity inventory, usually focused on a specific geographical area within a city, such as a park. It is a form of citizen science in that volunteers do much of the collecting, usually in teams that include trained scientists. The BioBlitz usually occurs within a short, concentrated time, often 24 hours.

5 FAR is a measure of the proportion of the area of the building lot taken up by the area of the building occupying that lot

6 see Beatley, 2014 for a fuller discussion of this aspect of biophilic cities

7 In a city with a circular metabolism there is an emphasis on rethinking the flows of goods and materials that sustains a city: the size of these flows should be reduced, and the supply lines shortened (e.g. cities can produce more food and energy locally). The circular dimension argues that cities must re-define traditional wastes streams as potential productive inputs—for instance, biogas is extracted from sewage and then used as a fuel to produce power. For a more complete discussion of the topic of urban metabolism, and emerging examples of circular urban metabolism, see Beatley, Green Urbanism (Island Press, 2000).

THE BIOPHILIC CITIES NETWORK

About six years ago we started the Biophilic Cities Project at the University of Virginia. It began as a way to study and explore how nature could be incorporated into cities, and how nature could be central to our emerging visions of city life. With initial funding from the Summit Foundation, we set out to study the concept and practice of various cities which exhibited an environmental vision in their city plans. We enlisted the help of a set of partner cities around the US and the world including Wellington, Singapore, Vitoria-Gasteiz in Spain, and, San Francisco, Milwaukee and Portland in the USA. In 2013 we brought these cities together to compare notes and to discuss the many different ways these cities were protecting, growing and connecting residents to nature in their cities. At the end of four days of presentations and conversation, attendees signed a biophilic cities pledge and together we launched the global Biophilic Cities Network.

With the help of an informal steering committee, we have developed a new protocol for future partner cities joining the Network. We have also undertaking many activities aimed at spreading the word about what was already happening in member cities. These have included making documentary films about partner cities (the film about Singapore (please see: https://www.youtube.com/watch?v=XMWOu9xIM_k) has been watched by more than 40,000 views, for example) organizing webinars, publishing an e-newsletter often with a particular urban nature theme (from blue urbanism to urban trails), collecting model codes, actual ordinances, municipal laws and best practices (Insert link here), much of this happening through a newly designed (and still being developed) biophilic cities web site (www.biophiliccities.org).

We are poised, we hope, to add significantly to the Network and the substantially grow the number of cities participating as partner cities. Recently the Washington, DC, city council adopted a biophilic cities resolution, and has now submitted their official application to join the Network, as has Edmonton, Canada. Other cities, from Pittsburgh, Pennsylvania to Melbourne, Australia, have expressed interest in joining and we are hopeful that the Network will expand and build. In several of these cities new grassroots organizations have formed to promote discussion and collaboration around these issues, including groups like Biophilic DC, in Washington, and BioPhilly, in Philadelphia. Community conversations about the vision of biophilic cities have been organized with local partners in a number of places, including Denver and recently Phoenix, Arizona.

How these cities will interact, and in precisely what ways the Network will prove useful in advancing the biophilic cities agenda remains unclear. Together these cities will hopefully be a force on behalf of nature, within and beyond their borders. Hopefully each will learn from the experiences of others, and there will through the Network be an accumulated body of knowledge about how to effectively protect and integrate nature into cities and urban life. Already this is happening.

For more information see www.biophiliccities.org

REFERENCES

Africa, Tsunetsugn, and Wang, 2015, "Seeing the Forest for the Trees," Harvard Design Magazine.

Beatley, Timothy. 2011. Biophilic Cities: Integrating Nature Into Urban Design and Planning, Washington, DC: Island Press.

Beatley, Timothy, 2013. "Celebrating the Natural Soundscapes of Cities," found at: http://www.thenatureofcities.com/2013/01/13/celebrating-the-natural-soundscapes-of-cities/

Beatley, Timothy, 2014, Blue Urbanism: Connecting Cities and Oceans, Washington, DC: Island Press.

Beatley, Timothy, forthcoming. Handbook of Biophilic City Planning and Design, Washington, DC: Island Press.

Dooling, Sarah, 2009. "Ecological Gentrification: A Research Agenda Exploring Justice in the City," International Journal of Urban and Regional Research, Volume 33, Issue 3, pages 621–639, September.

Rudd, Melanie, Jennifer Aaker and Kathleen Vohs. "Awe Expands People's Perception of Time, Alters Decision Making, and Enhances Well-Being". Psychological Science, 2012

Selhub and Logan, 2012. Your Brain On Nature: The Science of Nature's Influence on Your Health, Happiness and Vitality, New York: Wiley Press.

Weinstein, Netta, Andrew Balmford, Cody R. DeHaan, Valerie Gladwell, Richard B. Bradbury, and Tatsuya Amano. "Seeing Community for the Trees: The Links among Contact with Natural Environments, Community Cohesion, and Crime," BioScience, November 2015 DOI:10.1093/biosci/biv151

Wilson, E.O. 1984. Biophilia, Harvard University Press.

Wolch, Jennifer, Jason Byrne, and Joshua Newell, 2014. "Urban green space, public health, and environmental justice: The challenge of making cities 'just green enough'" Landscape and Urban Planning, 125: 234-244.

Zelenski, John M., Raelyne L. Dopko and Colin A. Capaldi, 2015. "Cooperation is in Our Nature: Nature Exposure May Promote Cooperative and Environmentally Sustainable Behavior," Journal of Environmental Psychology, 42, 24-31.

LIGHTING THE FUTURE CITY
THE IMPORTANCE OF LIGHTING IN FUTURE CITIES

SANDY ISENSTADT

Figure 1: Urban Light (2008) is a large-scale assemblage sculpture by Chris Burden - Los Angeles. The installation consists of 202 restored street lamps from the 1920s and 1930s. Most of them once lit the streets of Southern California [1]


Wilshire Bl
ONLY
ONLY

Rupert Brooke was said to be a gifted writer "on whom the gods had smiled their brightest." But he was flummoxed by the bright gods he discovered in Times Square, New York, when he went there around 1914. He had never seen anything like these beings, comporting in their sky-high pantheon as he gazed up at them: a devil unable to bend back the bristles of "vast fiery tooth-brushes"; not far was "a divine hand writing slowly . . . its igneous message of warning to the nations: 'Wear—Underwear for Youths and Men-Boys'". Nearby, "a celestial bottle, stretching from the horizon to the zenith." Close to that "a Spanish goddess, some minor deity in the Dionysian theogony, dances continually, rapt and mysterious. And near the goddess, Orion, archer no longer, releases himself from his strained posture to drive a sidereal golf-ball out of sight through the meadows of Paradise; then poses, addresses, and drives again." For all their determined activities these "coruscating divinities" including two warring youths "clad in celestial underwear," and the "Queen of the night," a winking sphinx whose "ostensible message burning in the firmament beside her, is that we should buy pepsin chewing-gum" remained a mystery. "What gods they are who fight endlessly and indecisively over New York is not for our knowledge." For Brooke, Times Square was a "*flammantia moenia mundi*"; a fiery-walled world, a notion first voiced by Lucretius regarding the border between the earth and the heavens, across which tracked the blazing sun (Brooke, 1916).

Brooke was speaking, of course, about the array of "spectaculars" or sky-signs that illuminated and animated multi-story rooftop-mounted billboards bristling from the buildings surrounding Times Square. Times Square had been famous for them for more than a decade before Brooke arrived. The first large-scale electric sign went up in Times Square in 1903 to sell whiskey, something that fit well with a nighttime entertainment district. Numerous signs followed swiftly, many of them achieving near iconic status and recalled warmly decades later. One of the largest signs advertised Wrigley's Spearmint Chewing Gum. Installed in 1915, it spanned an entire block, reached up eight stories and featured "spearmen" hunting colored fishes (Starr, 1998)

For many, the randomness of these signs seemed to recapitulate the unplanned boisterousness of American cities. Foreigners saw them as a metaphor for America's untutored energy. The animated signs' short, repeated sequences asked nothing of memory, an appropriate request for a still-young country. The journalist Mildred Adams argued that New York's lights displayed brash American commerce, "conglomerate and cock-sure, hard-edged, blatant, young enough to turn a full blaze of light into every corner," rather than the "ordered and experienced, worldly wise" Parisian manner, which spotlighted only what was tasteful about French society (Adams, 1932). There was no place on earth quite like it and, by many accounts, Times Square remains today the most popular tourist destination in the world.

Figure 2: Historic view of Times Square, 1920 - where the urban zone of illuminated commercial speech first appeared[2]

EVERY PLACE LIGHTS UP

But Times Square is no longer unique. Its combination of blinking patterns of color and light, its soaring scale summoned to sell stuff, its flaming walls of animated winks, dances and underwear; all have appeared in city after city around the world. Ximending, in Taipei; Piccadilly Circus, in London; Shibuya and Shinjuku, in Tokyo; Causeway Bay and Mong Kok, in Hong Kong; Orchard Road, in Singapore; and Nanjing Road, in Shanghai all brim with entertainment, shopping, food and street life bathed in the light of over-scaled flashing signs. Another such district, Bukit Bintang, in Kuala Lumpur, even features a shopping mall, one of the world's largest, actually named for Times Square. Las Vegas and Pudong, Shanghai, might likewise be considered city-scaled versions of Times Square, with hectares of winking spectaculars. All these places have distinct histories and diverse geometries but the experience of visiting them is surprisingly similar. The people there, the goods for sale, the languages spoken, and the smells wafting about; all are different enough to be distinguishable, but all are overlooked by the same cast of coruscating divinities of illuminated commercial speech. Electric light brought these disparate far-flung places together into a distinct urban type, forged in the canyons of Manhattan and subsequently spun off like sparks from a flame.

Electric lighting brought other sorts of uniformities, too. Early in the 20th century, cities could experiment with a wide range of light sources, including two kinds of mercury-vapor lamp, Nernst lamps, Moore tube lamps and a number of types of arc lamps, not to mention gas lamps, which stayed competitive with electric for the first two decades of the 20th century. The commercialization of tungsten filament incandescent bulbs, with their many advantages, narrowed the options considerably. In addition, cities competed to outshine each other even in the dark days of global depression, with street lighting a visible sign of urban health and a token of progress. More than a few boasted of being "the best lighted city in America" or, like Denver, fancied themselves a "City of Lights."

An entire "white way movement" sprang up in the early 20th century, referring to Times Square and the brightly lit blocks of Broadway that led up to it. Manufacturers specialized in "white way" lighting systems that usually consisted of clusters of incandescent tungsten-filament bulbs encased in translucent globes and hung in clusters from decorative lamp standards. In a short time, there were several hundred "white way" installations in the United States and Europe. An advertisement for modernity, they became foundational to civic identity, with New York often serving as the barometer. In Los Angeles, for example, city boosters argued that the wattage on their Broadway was greater than New York's if the calculation were made on a *per capita* basis (Isenstadt, 2014).

At about the same time, the automobile led to a further homogenization of urban lighting. Lighting engineers began to think more about maintaining uniform visual conditions for drivers moving 40 km/hr rather than pedestrians walking 5 km/hr. This led to brighter lights and less variation, as well as more light directed to the surface of streets rather than to sidewalks. The factors of lighting design - including brightness, color, orientation, distribution, pole intervals and lamp mounting heights - were recalibrated to meet the needs of moving vehicles. Then, as cars followed roads out into the countryside, towns and suburbs were lit in similar fashion. Drivers' needs for higher levels of lighting and constant visual conditions prevailed over other concerns such as local architectural character, or the visual comfort of those whose homes stood along major arteries. To a large degree, lighting engineers focused on the question of how to move the largest volume of traffic through any given road system at night.

As such thinking spread, a global luminous order blanketed otherwise dissimilar cities. As the historian John Jakle described it: "In the nighttime city, functionality hinged on one dimension,"automobility". Street lighting soon brought a profound sameness to nighttime seeing" (Isenstadt, 2014). For quite a long time, similar transportation oriented concerns underpinned the planning of urban lighting through much of the world.

Figure 3: "Open Air," an interactive aerial architecture of light, Philadelphia, Pennsylvania. Photo by James Ewing[3]

LIGHTING TECHNOLOGY TODAY

Today, everything has changed. On the technological side, fields such as electrical engineering, software design, materials science and photometry, to name just a few, have been making enormous advances in lighting technologies. Light-emitting diodes (LEDs) have been around since the 1960s but only in the past two decades have they been used broadly for lighting applications. They are small and efficient, which means that most of the energy they use is converted to light, rather than heat, as with conventional incandescent bulbs. Consequently, they are now being used more and more for street lights and for building interiors and exteriors. In fact, there is now a global push to ban incandescent bulbs altogether. The United States, the European Union, Japan, China, India, Russia and Brazil have all set up deadlines to replace incandescent lights and, in some cases, even halogen lamps, with LEDs. And the changeover is only just starting to accelerate as global markets are penetrated more and more by LEDs. As efficiencies increase and costs per element continue to decrease, LEDs are expected to come into even wider use. Their tiny size also lends them great versatility. LEDs can now also be found embedded in furniture and bathroom and kitchen faucets, woven into clothing and attached to jewelry, to name just a few recent applications.

Organic LEDs (OLEDs) are still somewhat new but even more promising. Whereas LEDs are point light sources made from inorganic materials, OLEDs are fabricated as surfaces comprised of layers of organic materials, which makes them more environmentally friendly and easier to recycle. Currently, they are used in digital displays and some interior applications due to their relatively high cost, but larger-scale applications are on the horizon as manufactur-

ing capacity grows. They can be very thin and very light and offer high contrast; they can also be readily laid onto flexible substrates to create radiant sheets or even worked into luminous three-dimensional objects. It is possible even to print LEDs and OLEDs now using off-the-shelf technology, suggesting that soon anyone will be able to make their own light sources. The certain prospect is that any and every surface in a city has the potential to glow.

Lighting controls have likewise advanced greatly with the development of sensors that can detect ambient conditions such as room occupancy levels, fog, highly reflective snow or other factors that affect lighting. Sensors can be embedded in roads to detect traffic density and then initiate dimming cycles to raise or lower street lights. The latest iteration of California's building code goes so far as to require occupancy sensors that can adjust lighting and other building systems in new construction for a range of building types. Manufacturers are already touting sensors in their new lamp designs as standard features. Further, many such products are being combined in interoperable lighting systems, variations of which travel under the names of "smart lighting," "connected lighting," "intelligent lighting" and "adaptive lighting." In these systems, sensors independently communicate with each other or with computers in centralized building or urban control centers, which manage a range of "networked field devices," including sensor-enhanced lamps. Controls can also be made interactive so that passersby might use their cellphones to brighten street lights, much as one might switch on the light in a room. One example of the use of such controls could be seen at Open Air, a light show that took place several years ago along the Benjamin Franklin Parkway in Philadelphia. There, powerful projectors were manipulated by viewers' cellphones to create swaying and intersecting shafts of light. The long horizontal boulevard, a legacy of City Beautiful planning, was thereby reimagined as long diagonal beams sweeping across the night sky.

MODERN MUNICIPAL USES OF LIGHTING

Municipal governments are already using such controls to great advantage. One of the first roadways to deploy dynamic lighting was the M65, in Lancashire, England. Along that route, lighting levels might automatically drop by as much as 50 percent, depending on traffic density (Collins, 2002). A major impetus for government adoption of new light sources and sophisticated controls is the potential for drastic reductions in energy use and, thus, operational costs. Lighting often takes up large portions of municipal energy budgets and the savings can be significant. New York City swapped incandescent traffic signals for LEDs and saw a drop in related energy costs of a reported 81 percent. Hundreds of cities have by now installed LED lighting. The average savings in energy costs was 59 percent, as noted in a study of more than 100 European cities ("LED Projects", 2012). More imperative even than municipal budgets, diminished use of energy directly lowers greenhouse gases emitted in the production of electricity.

Seeing the opportunity for continued adoption, businesses, too, now specialize in lighting management, a new urban service geared to coordinate the convergence of sensors, computer controls, networked communications and lamp types, not to mention other elements of building and urban systems. The overall outcome of these developments is the smart city, a conurbation threaded through with digital infrastructure that is responsive to specific conditions, seeks sustainable infrastructure and that facilitates the making of humane urban systems.

In terms of our understanding of vision, great strides have been made in the field of photometry, which considers light in relation to visual perception, and in the physiology of vision. In engaging the eye, consideration has to be given to a number of factors, not just objective measures of radiant energy, including the position of the source in the field of view, total volume of light striking the retina, length of exposure to the source, and degree of contrast with a background, as well as the brightness of the light source. Vision, in short, is deeply subjective. Satisfactory seeing can be as much a matter of a person's frame of mind as it is a question of wattage.

Today, however, lighting engineers can manipulate light at the level of the photon, and, equally important, they can measure physiological responses just as finely. In the study of the M65 roadway mentioned above, en-

gineers also tested "ocular stress" in drivers, finding that electrical activity in the orbicularis - the large muscle surrounding the eye - ranged nearly 25 percent in response to changing levels of lighting. These new investigative tools are arriving just in time because the conditions for vision are changing so profoundly. Until recently, most studies of vision have presumed photopic, or well-lit conditions, which is ideal for color perception and visual resolution, taking advantage of the cone cells in our eyes. In contrast, scotopic vision, which occurs under low levels of light, was infrequently analyzed. Today, however, the urban night is a mixture not only of low and relatively high lighting levels, it is also punctuated by variously colored lights from different sources in different sizes and with different degrees of animation. In response, scientists in various disciplines are starting to study vision under such mesopic, or mixed luminous conditions.

CONTEMPORARY LIGHTING DESIGN

Perhaps the most impressive change has come about on the design side. For years, corporate interests have been behind most lighting research and design. In the early 20th century General Electric was the majority stakeholder in the National Electric Lamp Association (NELA, originally the National Electric Lamp Company), a trade organization, until an American federal court found it guilty of colluding to fix prices and forced it to divest. Nonetheless, NELA persisted, launching various lighting education programs based on its research, much of it valuable, but aimed ultimately at bolstering the electrical industry's growth. At the same time, many of the most innovative lighting designers worked in theater, only occasionally venturing on to design architectural lighting, as was the case with Abe Feder, Howard Brandston and Basset Jones. Even within the theater, lighting designers did not receive their due until the early 1960s, when the profession was recognized as such and allowed to join the United Scenic Artists Union.

In the last two decades the field has moved well beyond these strictures with the founding or refashioning of a number of professional and governmental organizations such as the International Association of Lighting Designers, the American Lighting Association, the National Lighting Bureau, the Illuminating Engineering Society, to name just a few. While corporations still conduct useful studies, a number of independent groups have become leaders in lighting research, such as the Lighting Research Center at the Rensselaer Polytechnic Institute and the Intelligent Lighting Institute at the Technische Universiteit Eindhoven. In addition, there have been special initiatives such as the Lumina Project and the World Bank's Lighting Africa project, both dedicated to finding sustainable, off-grid lighting solutions for areas without an electrical infrastructure in place.

In many ways, lighting design is in the midst of an unprecedented flowering, driven in part by the wide range of new sources and computerized controls and, most influentially, a heightened awareness on the part of the public and city officials regarding the importance of urban lighting. The International Dark Sky Association, for instance, has successfully campaigned to educate people about the dangers of light pollution with numerous community events across more than 50 local chapters around the world. Making urban lighting more efficient and more sustainable is a primary goal of their efforts. Leading design firms, such as Light Collective, Light Cibles, Agence Concepto, Speirs + Major, ACT Lighting Design, Atelier Ten, Philips Lighting, Arup Lighting, to mention only some, now see cities as canvases for luminous inventions that are effective, evocative and environmentally sound.

The net result is a substantial widening of the scope of our understanding of what lighting can do in the city. Traditional functions of lighting remain, of course. Security, the most enduring role of urban light, is still paramount. Wayfinding and orientation, that is, knowing where you are in the city and where you need to go, are likewise long-standing aims of urban lighting. Cities have been requiring lighting on commercial frontages or in public squares for hundreds of years, for example. These functions continue to be crucial but they are understood differently now.

Feeling secure in the city entails much more than moving through an envelope of bright light. A good deal of research has shown that a sense

of security is a psychological state that rests on a number of factors not found in crime statistics. Brightness alone can create stark shadows and lead to slower visual apprehension or lead to afterimages that can momentarily impair vision. The possibility of a pedestrian controlling nearby lamps through her cellphone can also contribute greatly to a feeling of security as well as provide an actual deterrent to crime. (Painter, 1999; Welsh, 2009; Grohe, 2011) Likewise, orientation today means more than providing illuminated directional signs. With urban transit systems needing to integrate a range of vehicles, including bicycles, trams, light rail, automobiles, buses and so on, not to mention pedestrians, lighting can help differentiate modes, facilitate transfers and, at the same time, visually unify the entire system. The lighting for Canada Rail in Vancouver, for example, designed by Total Lighting Solutions, encompasses a system comprised of sixteen differently configured stations with clarity, crisp lines and graphic character.

Figure 4: Canada Line Station at the Vancouver International Airport, ca. 2010. Total Lighting Solutions, Inc. Photo by: Charlie McLarthy[4]

FUTURE DIRECTIONS FOR URBAN LIGHTING

Beyond rethinking these traditional functions of light, designers are proposing whole new possibilities. Lighting as an element of urban redevelopment is one potential direction. In 2006, for example, the Dutch firm Daglicht en Vorm won a competition sponsored by the city of Rotterdam to help redevelop Katendrecht, a run-down district near the harbor. On one street, the Atjehstraat, the firm created "Broken Light," a remarkable scheme that casts ample light on the street for cars, pillars of light between windows on buildings and a staccato, mottled pattern of light on the sidewalk. Residents followed the unusual design's planning and installation and took part in the festivities once the lights were switched on (Metz 2012). Building community awareness was likewise a goal in a very different project at Canal Park, in southeast Washington, DC. There, an area of abandoned houses and vacant lots was redeveloped as a diverse and affordable area redubbed Capital Waterfront. A weed-strewn lot at the center was transformed into a park, with the public invited to work with designers and planners. Atelier Ten, the lighting designers, placed a luminous cube at the center, on which local artists project their work and movies are screened at night. The park's attractions draw visitors at night, making this formerly perilous area an urban oasis (Loeffler, 2015).

Yet another possibility for bringing together groups of people is the use of projected light. In the late-19th century, stage lighting pioneer Adolphe Appia foresaw the possibility of throwing light across space to create forms and textures and advance a dramatic narrative. Today, lasers - optically amplified projected light - have moved well past the light shows where most people first encountered them. They are stronger now, and more portable; coupled with computer controls, they are also capable of intricate detail. Several years ago, sportswear manufacturer Nike, for instance, developed #MiPista, a virtual pop-up soccer pitch projected from a van on to streets and squares in Spain. The demonstration project, now over, had a van on call all night in Madrid; it could arrive and set up within minutes after receiving a request. Nike's commercial motivation notwithstanding - the firm developed a special shoe for the laser lines - the idea holds promise for any number of impromp-

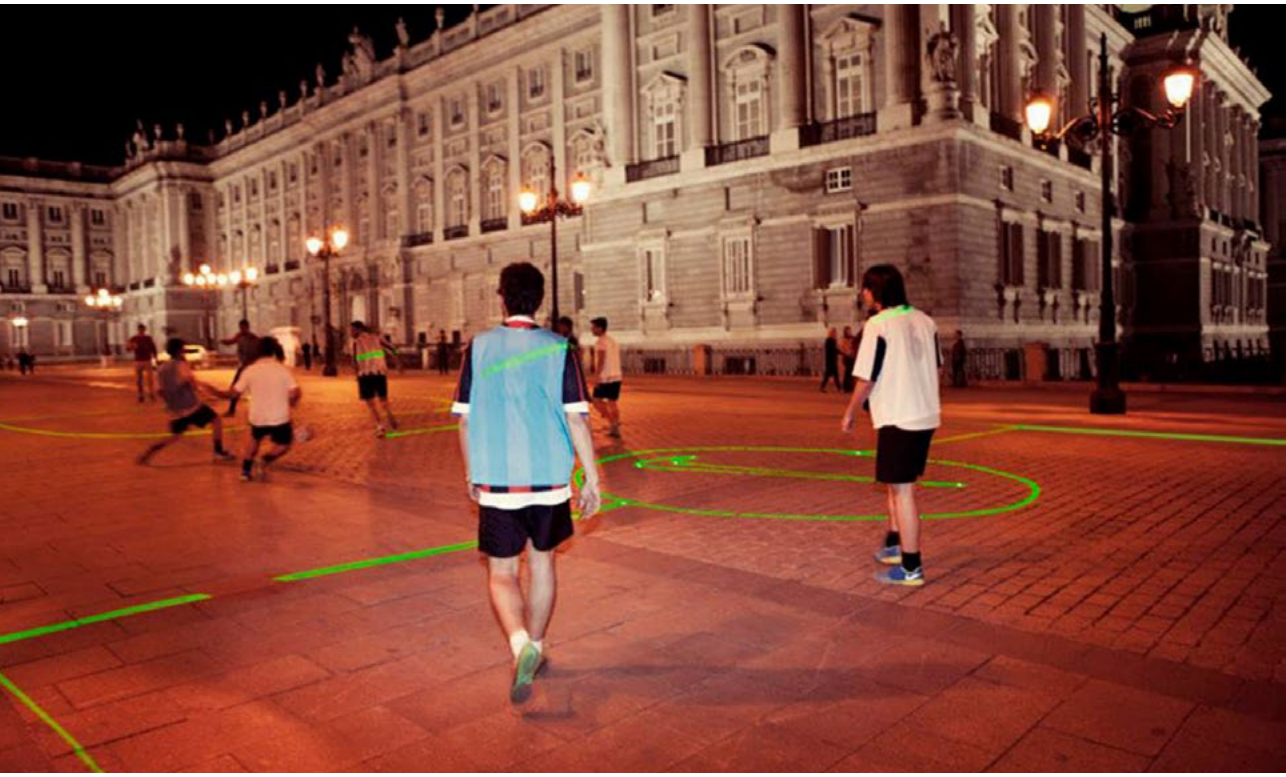


Figure 5: #MiPista, a virtual pop-up soccer/football field created by a van, mobile crane and crew, Madrid, 2013. Photo from: nike-footballspain[5]

tu urban events.

Such possibilities have greatly expanded the range of questions we can now ask regarding urban lighting. Light is ubiquitous but it has somehow remained invisible in sociological research, notes Don Slater, a professor at the London School of Economics. He, along with his colleagues, co-founded "Configuring Light. Staging the Social," a research program dedicated to looking at light as a formative, material element of human environments that bears on the satisfaction of social needs (www.configuringlight.org). In one study, the team conducted research in Derby, UK, in regard to a new lighting master plan. The purpose of the lighting plan was to consider a number of issues, including ways that lighting can help revitalize urban districts, accommodate special-interest groups such as the elderly and balance current uses with anticipated and even unforeseen future uses. Significantly, they also addressed questions of financing infrastructure projects, an especially meaningful matter given the finite resources of most municipalities. The city served "multiple socialties," each with unique and sometimes even competing lighting accommodations. As they succinctly noted, "lighting ... involves political decisions" (Entwistle, 2015).

Although new lighting technologies have enabled such forward-looking efforts, they are likewise being called upon to look back on our shared urban heritage. Many cities have embraced preservation efforts as a means of sharpening their unique cultural assets and, in many cases, mobilizing them to increase tourism as a source both of local pride and new revenue. Cities such as Bilbao, Spain, for example, recognized the opportunity to reinvent itself as a culturally rich destination following the decline of its traditional industries. The question many such cities face is how to balance the old with the new, how to honor the past without being sac-

Figure 6: Lighting differentiated according to surface, architectural character and function create a meaningful ribbon of light along the Donaukanal as it cuts through Vienna. podpod design for the City of Vienna. Photo © MA 33/ Gerhard Dully[6]

charine or replicating a set from Disney World. Many cities now ask precisely these questions of their lighting, too: “How does "new" light reveal the historic city?” as Susanne Seitinger, a manager with Philips Lighting, phrased it. She was discussing efforts to revitalize the Donaukanal, in Vienna. There, the lighting design firm podpod called for a “light ribbon” drawn across the heart of the city that would unify both banks of the canal and at the same time distinguish special spots along it. Pedestrian strips were bathed in a warm white light to enhance facial recognition and eye contact, while vehicular routes were doused in the pinkish-yellow light of high-pressure sodium lamps and building facades were differentially lighted to accord with their architectural or historic character. The result was a cultural hierarchy rendered in light, in some ways making the city more legible by night than by day. New technologies and thoughtful design combined in Vienna to flatter the city’s historic complexion (Seitinger, 2015).

Efforts such as those in Vienna represent perhaps the greatest shift in lighting design thinking of recent years: how can light enhance a city’s unique nocturnal identity. Picture Paris, for example, and the Eiffel Tower is there. Or Sydney, and you see the Opera House. In time, perhaps lighting might become the emblem of a city. It’s already happening to some extent. The Golden Gate Bridge is a San Francisco icon by day but at night eyes shift toward the Bay Bridge, wrapped in fulgent fibers of light by artist Leo Villreal. The lucent sculpture was planned to run for two years; public affection for the work will keep the lights on permanently. Likewise, Tokyo’s Skytree, at 634 meters, is not only a hard-to-miss landmark, it is also a beacon to the city’s past. Each year, the tower is lighted in two styles inspired by Edo period aesthetics, recalling when the city was the seat of the Tokugawa shogunate, and timed to co-

Figure 7: A new nighttime landmark: the San Francisco Bay Bridge. Leo Villareal, *The Bay Lights* (2013). Photo by Lucas Saugen[7]

Figure 8 (right): The Tokyo Skytree, the world's second tallest structure, combines height and history with its cherry blossom season lighting[8]

incide with the season of cherry blossoms, a longstanding decorative and, even, philosophical motif in Japan. At night and in season, the Skytree hosts "the world's number one night cherry blossoms" and by means of this association helps to rehearse the country's initial assimilation of electricity in terms unique to Japanese society (Mizuta, 2015). Shanghai rests even more of its identity on its night lighting. Known as "the city of blazing night" since at least the 1930s, the city has in recent decades reconfigured itself as a global financial center, brandishing the slogan "Let Shanghai Light Up" since the 1990s and forging fantastic multi-colored lighting into a spectacular kind of soft power. The city has even established a Night Lighting and Construction Management Agency to oversee illumination plans, especially on the banks of the Huangpu River that separates the old city from Pudong, the new district known to a large degree by its spectacular lighting (Lin, 2015). For its part, Baltimore, an American city long in decline, is just now launching "Light City Baltimore," a large-scale light festival, modeled on those of a number of other cities, intended to attract international attention and, ideally, free-spending tourists. (http://lightcity.org/about-the-festival/). Projects such as these demonstrate that, while the laws of physics that govern electricity are universal, the ways in which light is incorporated and made part of the urban fabric vary in culturally specific ways.

By means such as these, many cities are lighting up a nighttime profile that aligns only partially with their daytime geography. Kings Cross Square in London, adjacent to two major rail terminals, had long provided a disheartening entry into the metropolis, not at all in keeping with the stations' importance. A redesign has turned the situation around, especially at night.

StudioFRACTAL Lighting Design considered intersecting traffic patterns and developed an all-LED scheme that provides ambient light from a set of tall columns that also function as nighttime landmarks, smaller columns that help orient and guide pedestrians and a number of smaller sources deployed as freestanding elements or embedded in plaza furniture. All these elements combine with lighting on the station façade to create something of a variegated luminous solid that one passes through, rather than a set of surfaces one walks over or alongside. At night, a radiant kind of monumentality appears to bring the site into alignment with the essential functional role it plays in the city's life. Artec3 Studio, to take only one more example, has designed the lighting for several plazas in Spain, including Firalet Square in Olot, north of Barcelona, and Torico Square, in Teruel, Spain, north of Valencia. Both designs give to light a palpable sensibility, making the most ethereal of perceptions into a kind of living presence.

In sum, these recent, staggering developments are giving rise to a contemporary urban nightscape characterized by an amalgam of point sources, radiant surfaces, flashing words and patterns, glowing mobile screens and so on, all of which can fluctuate in color and intensity and respond to programmed sequences, changing conditions or individual whim. Until a short time ago, energy was squandered by inefficient lamps or sent into space by poorly-designed luminaires. Now, light can be placed where and when it is needed, with near-pinpoint accuracy and at relatively low cost. In the past, lighting ranged between utilitarian and decorative. Now, it can be transformative, an active element in shaping the conduct and character of urban life. Formerly, cities had come to be overspread by uniform lighting suited to automobile drivers. The Times Squares of the world were a spectacular relief to those conditions, however much they might have recalled one another. Today, cities are distinguishing themselves with patterns of light fine-tuned to their streets, the buildings that line them and the people who move along them. The synaesthetic city was once conjecture; now it is a looming reality as designers use sound and touch to activate lighting and meld the senses in new ways.

Figure 9: Pudong, Shanghai,
city laser light show[9]

Figure 10: A new center at night, through light. King's Cross Square, London. Lighting Design: StudioFRACTAL. Photography: Hufton + Crow, Will Scott Photography (2013)[10]

Figre 11: Plaza lighting with a palpable presence. Artec3 Studio, lighting design. Adjuntamente d'Olot, Girona, Spain. Photo ©Pep Sau. 2011[11]

The spatial and even behavioral implications of such changes are still unfolding but, clearly, new forms of lighting today have potential to harness otherwise dimensionless digital technologies in the formation of distinctive places that generate a sense of scale, immediacy and presence. The rhymes and reasons of these new coruscating divinities no longer elude us: they are the product of reason, design, experiment and necessity, and are pursued by countless technicians, designers, artists and civil servants. They no longer cavort mysteriously, as Brooke supposed in Times Square, they commingle now to broaden and brighten the public's dawning consciousness of the potential of lighting to rewrite the urban night. ◆

ENDNOTES

1 Retrieved on May 15th from http://www.liljevalchs.se/press/pressbilder/konsten-och-staden/mats-liliequist-3/

2 Irma and Paul Milstein Division of United States History, Local History and Genealogy, The New York Public Library. "Manhattan: Broadway - 46th Street (West)" The New York Public Library Digital Collections. 1920. http://digitalcollections.nypl.org/items/510d47dd-5880-a3d9-e040-e00a18064a99

3 Rafael Lozano-Hemmer, "Open Air, Relational Architecture 19", 2012. Commissioned by: Association for Public Art. Source: http://www.lozano-hemmer.com/showimage.php?img=philly_2012&proj=260&type=artwork&id=24

4 Source: http://www.lightingdesign.ca/sites/default/files/project-images/Vancouver%20International%20Airport%20Station%201%20Charlie%20McLarthy.JPG

5 Source: www.designboom.com/technology/nikes-laser-beam-soccer-field-lets-you-play-at-night/

6 Source: http://podpoddesign.at/en/projects/oeffentlicher-raum/lichtraum-donaukanal/

7 Source: http://artobserved.com/2013/03/san-francisco-leo-villareal-the-bay-lights-at-the-bay-bridge-through-2015/

8 "Kawazu Cherry Blossoms & Tokyo Skytree-27-3-015," posted by max001. Source: http://stylegifpic.com/kawazu-cherry-blossoms-tokyo-skytree/

9 mcgarrett88. "Shanghai Pudong Bright Lights," 2013. Source: https://www.flickr.com/photos/bonsaitree/19039801039

10 Source: http://www.stantonwilliams.com/projects/kings-cross-square/

11 Source: http://www.artec3.com/Firalet-Square

REFERENCES

Adams, M. (1932) “In Their Lights the Cities Are Revealed,” New York Times (Dec. 11): SM12.

Brooke, R. (1916).Letters from America. New York: Charles Scribners’ Sons.

Collins, Andy, et.al. (2002) “Dynamic Dimming: The Future of Motorway Lighting?” The Lighting Journal (Sept./Oct.): 25-33.

Entwistle, J., D. Slater, and M. Sloane, (2015) “Derby,” in Isenstadt (2015a), 159-163.

Grohe, B. (2011) “Measuring residents’ perceptions of defensible space compared to incidence of crime,” Risk Management 13 (February/April): 43-61.

Isenstadt, S. (2014) “Good Night,” Places, (Spring).

Isenstadt, S. (2015a), Cities of Light. Two Centuries of Urban Illumination, co-edited with Margaret Maile Petty, and Dietrich Neumann. New York: Routledge.

Isenstadt (2015b) “New York City,” in Isenstadt (2015a), 82-86.

Jackson, Davina, ed., (2015) SuperLux. Smart Light Art, Design & Architecture for Cities New York: Thames & Hudson.

Jakle, J. (2001) City Lights. Illuminating the American Night Baltimore: Johns Hopkins University Press. 256-257

“LED Projects and Economic Test Cases In Europe,” (2012) EUR Report # 25352EN, Institute for Energy and Transport, Joint Research Centre, European Commission.

Lin, J., “Shanghai,” in Isenstadt (2015a), 115-122.

Loeffler, M. “Washington, D.C.” in Isenstadt (2015a), 140-143.

Metz, T., (2012) “The Power of Light,” Architectural Record (August): 127-128

Mizuta, M. E., “Tokyo,” in Isenstadt (2015a), 109-114.

Painter, K. and N. Tilley, eds., (1999) Crime Prevention Studies (Monsey, NY: Criminal Justice Press, 1999), 47-76.

Seitinger, S., “Vienna,” in Isenstadt (2015a), 130-136.

Starr, T and Hayman, E. (1998) Signs and wonders: The spectacular marketing of America. New York: Doubleday.

Welsh, B. and Farrington, D. (2009) Making Public Places Safer: Surveillance and Crime Prevention London: Oxford University Press.

MANAGING URBAN STORMWATER AND ITS INFLUENCE ON BUILDING A SUSTAINABLE, RESILIENT CITY PHILADELPHIA, PENNSYLVANIA

HOWARD M. NEUKRUG · LAURA BARRON

» Rainwater has a value that can be used to not only rejuvenate the environment, but also the city's economy and infrastructure. «

Philadelphia Water has been working with other city agencies, urban planning organizations, developers, private and public land owners, community groups and politicians to successfully leverage new green stormwater infrastructure (GSI) solutions into new urban thinking, planning and construction to insure a sustainable and resilient city into the 21st century and beyond. The Green City, Clean Water (GCCW) program is part of a new "One Water" management approach to integrating the traditionally "separate" business sectors of drinking water, wastewater, stormwater and water resource management. The Philadelphia model is being adopted by cities throughout the US.

Figure 1: Green roof installed on Philadelphia's Central Public Library. Source: Philadelphia Water Department

BACKGROUND

There is urgent need in the US for a new generation of infrastructure to replace the current water and sewer pipe networks which were largely designed and built between the 1880s and the 1940s. These systems are wearing out and becoming obsolete. The grand problems they solved at the turn of the 20th century (typhoid, sanitation, delivery of water, etc.) do not address new 21st century threats (emerging pathogens, toxins from Cyanobacteria, heavy metals, sewer overflows, drought, floods, and more).

The costs to rebuild these systems in the US is estimated at over 1 trillion USD[1]. It come at a time when the economy cannot afford this outlay, much less the plethora of other challenges facing 21st century urban America, such as those attributed to changes in climate, economy, security, demographics, as well as societal responses to urban issues of environmental justice and economic inequity.

To alleviate this problem, one of the most critical elements of the United States Clean Water Act of 1972 was its massive construction grant programs for expanding and improving regional wastewater treatment. By the mid-1990s, this program, along with new rules governing the discharge of industrial wastes, dramatically reduced river and stream pollution in the US. In fact, only one major pollutant source, urban stormwater runoff, remained largely unchecked.

Stormwater runoff can affect almost all aspects of a water systems, including scarcity, flooding, pollution, infrastructure capacities, erosion, wildlife habitats; and stream temperatures. To manage this runoff, utilities began constructing large underground storage systems, often employing massive tunneling projects. This approach, used by urban water engineers for millennia, manages increased demand by increasing infrastructure capacity. With little to no jurisdiction over urban planning, development controls, or land management, the urban water engineer really had no choice *but* to design to manage, regardless of how much runoff was sent to its sewer inlets. Issues of climate change and increasingly extreme weather events seemed only to further justify this approach.

Indeed, among the most significant programmatic costs to US water utilities in the past two decades have been massive tunnel construction projects designed to reduce the overflows of raw sewage and stormwater into our rivers and streams. Up until the middle of the 20th century, major portions of the nation's water waste went largely untreated and directly into rivers. Since that time, the city has invested billions of dollars to build modern, state-of-the-art Water Pollution Control Plants (WPCPs) to treat the wastewater to levels cleaner than the river water itself. Today, cities like Philadelphia operate some of the most advanced, complex, and efficient wastewater facilities in the world.

But no matter how sophisticated the facilities, the overflow problem persists. The capacity of the sewer network and the pumping and treatment facilities proves insufficient to capture and treat all of the polluted rainwater that is generated nearly every time it rains. In fact, for Philadelphia, only about 67% of the combined sewage/rainfall is "captured" – the rest continues to pollute rivers and streams. This is not only disgusting, but also is legally unacceptable under the Clean Water Act. The cost of managing the rainfall is no longer a hidden fee or tax paid by direct discharge to our streams, but rather is a new cost to cities and suburbs for years of urbanization.

Today, the US water sector is moving toward a newer, softer, greener, more decentralized approach of managing runoff. Instead of increasing sewer capacities to meet runoff capture requirements, a new paradigm has been introduced to limit the demand on our infrastructure by managing rain water more locally, by allowing the rainwater to be captured and managed on-site. Put simpler, rainwater will no longer be treated as a waste product to be discharged as expediently as possible to a sewer drain. Instead, rainwater runoff has been recognized to have significant beneficial impacts on the environment and economy. More importantly, rainwater has a value that can be used to not only rejuvenate the environment, but also the city's economy and infrastructure.

Figure 2: Rain garden corner bump out installed by Philadelphia Water.
Source: Philadelphia Water Department

Figure 3: Students playing on new GSI playground. Source: Philadelphia Water Department

CITY-FOCUSED SUSTAINABILITY INITIATIVES

The 2008 inauguration of Mayor Michael Nutter brought with it a revolution of green progressive thinking for Philadelphia. Fulfilling a campaign promise, he formed a Mayor's Office of Sustainability, which spent its first years developing a policy and benchmarking document for meeting new sustainability goals that addressed issues of energy, green space, and water.

This timing was extremely fortunate for Philadelphia Water, which was negotiating with the USEPA on the details of its stormwater program. Most importantly, the city's political emphasis on sustainability and the Department's focus on stormwater got the citizens of Philadelphia involved at all levels and all ages. From rain barrel programs and home-situated rain gardens, to science, engineering, and math lessons in water management in our schools, to community groups repairing vacant lots and protecting their new neighborhood parks, increased community involvement and engagement with sustainable water practices has greatly increased the capacity of the GCCW.

GREENER CITY, CLEANER WATER

"Green City, Clean Waters" (GCCW), created in 2009, aims to reduce the amount of polluted runoff that enters the city's water system. Unlike conventional stormwater management programs in the US and elsewhere, it does not rely solely on increasing sewer and treatment plant capacity to manage a seemingly ever-increasing load of rainwater[2]. GCCW aims to "conserve rainwater", meaning that we now value our rainwater as an urban asset and not as a wastewater product. Rather than discard the rainwater down a sewer drain as swiftly as possible, we now look to use it to improve the quality of urban life. We want to use water management techniques to balance nature, development, and people in the urban setting.

As America's first capital, the city of Philadelphia was among the world's great industrial cities at the turn of the 20th Century. Now, following a 25% loss of population over the past 50 years, Philadelphia is transforming again, this time into a beautiful, vibrant, green city, destination for tourists, and hub for innovation, healthcare, and education. However, because of its industrial history, the city remains marred with environmental challenges and has needed to place special focus on sustainable development as the city revitalizes.

Despite the positive changes Philadelphia has seen, the storm sewer system can surcharge during even small rain events, and result in sewage, trash, and flooding in our rivers and streams. Increasing sewer capacity (through the construction of bigger and bigger pipes, tunnels, and

Figure 4: Raingarden installed in Philadelphia's public school, Greenfield Elementary School. Source: Philadelphia Water Department

pumping stations) can no longer be considered affordable, justifiable, or sustainable.

In order to alleviate the demand on the city's sewer system, the GCCW program proposed a variety of "green stormwater infrastructure" (GSI) systems to intercept stormwater, using soil, water, and plant catchment systems to infiltrate water into the ground, evaporate and transpire water into the air, and, in some cases, slowly release a portion back into the sewer system. Through this new green infrastructure, the city seeks to not only improve water quality for residents, but also to improve the regional environment and create a more resilient, threat-resistant system.

In addition to increasing resilience and environmental quality, the city sought opportunities to use urban redevelopment to increase the integration of key system services so as to create a more sustainable, attractive and livable city. Philadelphia Water has started to partner, coordinate, and integrate its water infrastructure operations and capital improvements into the very fabric of the city. By doing this, it can use its water capital to improve not only the city's tunnels and sewage but also parks, school, businesses, homes, public facilities, universities, and much more.

CREATING 10,000 GREEN ACRES

In partnership with the US Environmental Protection Agency (USEPA), the GCCW program has agreed to build 10,000 Green Acres (GAs) over the next 25 years. One GA is defined as the conversion of one acre of impervious land to one acre that manages the first one-inch (2.5 cm) of each rainfall. Table 1 shows the five-year benchmarks for the program. As of this writing, the program has surpassed its first five-year goal of 750 acres by 130%.

These GAs, combined with certain improvements in wet weather capacity at the wastewater treatment plants and sewer systems, are intended to increase the efficiency of the sewer system from managing just 67% of overflows to 85%, or, said another way, more than a 33% increase in the working capacity of the system (9 billion gallons of additional runoff management).

Since this program called for the conversion of 10,000 acres of impervious land that was managed in an environmentally sensitive manner, everyone seemed to get on board, including: the Streets Department with litter control, "complete streets[3]" and bicycle lane projects; Parks and Recreation began a million tree planting campaign with its non-profit cohort, the Pennsylvania Horticultural Society; the school district became interested in our schemes to "green" asphalt schoolyards; and our City Planning department developed an environmentally friendly "Plan 2035".

METRIC	YEAR 0	YEAR 5	YEAR 10	YEAR 15	YEAR 20	YEAR 25
TOTAL GREENED ACRES	0	750	2100	3800	6500	10000

Table 1: Green Acre Goals by Year (year 0 began June, 2011)

Land management strategies used to achieve 1000 GAs during the first five years of the GCCW program are shown in Textbox 1 and will be discussed further in this document:

→ Green and/or porous pavement street improvements following water/sewer reconstruction projects
→ Improvements to schoolyards, parks, vacant land and other open space areas
→ Improvements to public facilities
→ Instituting a parcel-based stormwater fee system to encourage rainwater conservation
→ Creating a stormwater credits system for on-site stormwater management
→ Competitive grants to public and private entities to improve properties
→ Development regulations requiring private management of the first 1.5 inches (3.8 cm) rain

Textbox 1: Land Management Strategies for achieving Green Acres

FINANCIAL AND SOCIAL INCENTIVES TO CREATE CHANGE

Taking advantage of the spread of progressive green thinking in Philadelphia, the water utility institutionalized several important programs, regulations, and policies that not only supported its own goals of water quality, but also the city's goals to improve livability, jobs, and sustainability.

The most important driver for change began with new stormwater development regulations[4]. Under the new regulations, developers needed to provide measures to abate runoff on their properties.

These new regulations did add to the design and construction cost of new buildings and created some friction within the development community. Everyone accepted that they needed plumbing to run drinking water into the premises and wastewater out, but stormwater management was considered "free" - to be collected by the landowner and discharged to the sewer. It has taken careful talks, encouragement and cooperation to dispel the traditional philosophy on water management - that the sewer capacity was practically unlimited, since any overflow "just went to the river".

To support the development community, Philadelphia Water recognized that time equals money and worked to compensate for the new costs by issuing "expedited permits" for projects which included on- site stormwater abatement systems, such as green roofs and porous pavement projects. In addition, engineering support services were provided free of charge to developers and engineers early on in the conceptual project design phase which helped increase efficiency and ease costs. Though it was a long process to find reasonable procedures that allowed for stormwater management as well as development, it ultimately resulted in

Figure 5: Green roof installed on Golkin Hall of the University of Pennsylvania's Law School. Source: Philadelphia Water Department

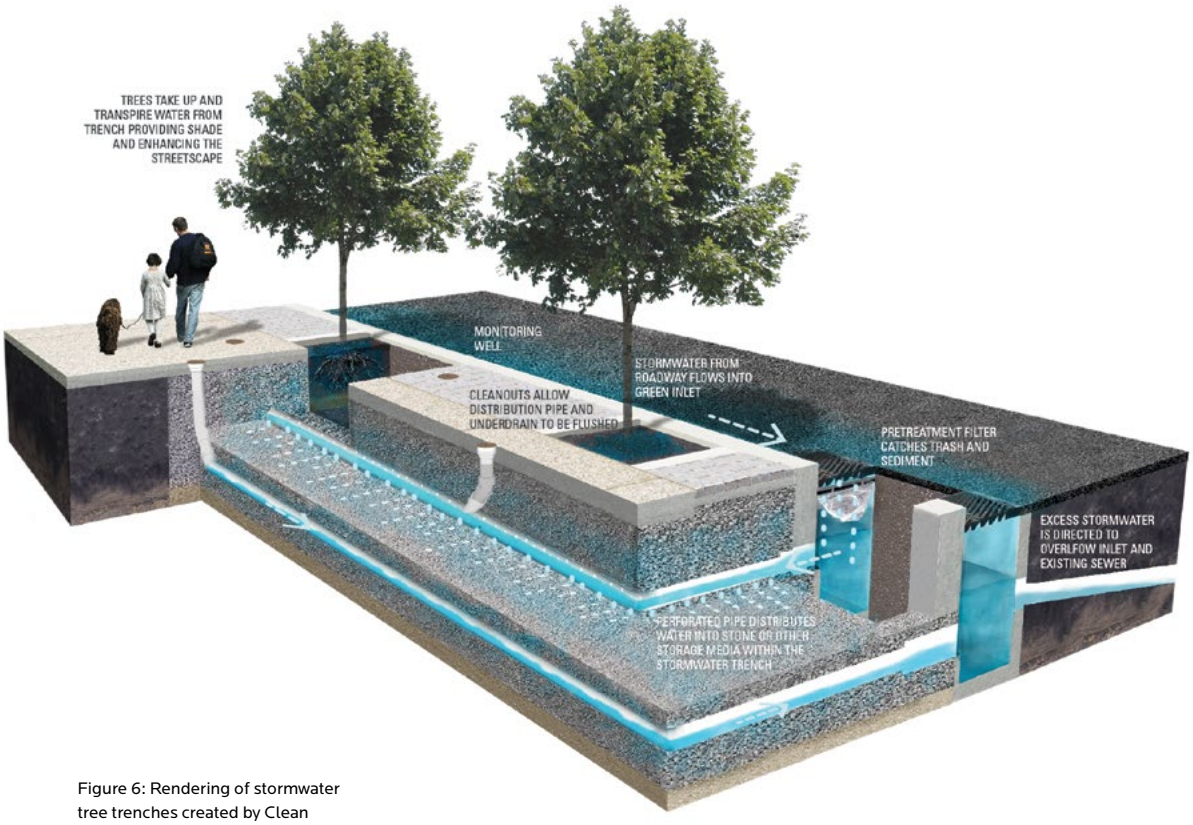


Figure 6: Rendering of stormwater tree trenches created by Clean Water, Green Cities Plan. Source: Philadelphia Water Department

a new modern building designs that led to LEED certifications and increased market value and a city exporting its architectural and engineering prowess to other cities across the US.

In 2011, perhaps the most important element of a green stormwater program was put in place, a parcel based billing system for deriving revenues to pay for the Philadelphia Water US $150 million "stormwater utility". Philadelphia Water commoditized the rain in order to remediate this negative externality from the true cost of managing that rainfall. In effect, the impervious and gross areas of every property parcel in Philadelphia was analyzed and priced so that each property owner paid their "fair share" for managing the rainwater.

This created an incentive for private landowners and government agencies to reduce their stormwater fees by personally managing the runoff from their property. In effect the city created a credit incentives program for property owners to move off of the city stormwater system, thereby decentralizing stormwater management. In order to facilitate the conversion of land into green stormwater management systems, Philadelphia Water also created grant opportunities for landowners to further motivate them to retrofit their systems.

With these policies came a wave of community support that turned out to be the most rewarding and sustainable return on investment for the city. Community groups vocalized their desire to make changes – from school yards to vacant lots, so much so that Philadelphia Water

Figure 7: Philadelphia Water encourages residents to implement green infrastructure in their homes, like pervious surfaces for backyards and patios. Source: Philadelphia Water

was accused of "inciting the masses" despite the ability to execute the projects due to funding restraints. For example, controversy arose over the fact that the specific funding could only support water projects, but when picnic tables or play equipment are involved, other funding sources was required. This forced politicians and government agencies to collaborate and fundraise.

In 2015, Philadelphia Water worked with the development community in a very democratic process to revise the regulations, provide more management of runoff (1.5 inches (3.8 cm) of rainfall), and create new incentives for developers to use "green" alternatives for stormwater management. The city worked to be widely supportive throughout the change in regulation, from providing educational materials regarding the changes, to working with the community to make sure their viewpoints were heard. One stakeholder even described their experience as, "democracy the way it was intended to be."

The city has seen significant progress since the inception of GCCW. In 2006, Philadelphia had one green roof. By the end of 2015, the city boasted over 150 green roofs, creating a new industry; Design, construction, and maintenance of green roofs became a new business for Philadelphia and green jobs expanded across the city. At its core, the investment in Green City, Clean Waters has certainly met its triple bottom line goals of improving the environment while making Philadelphia a greener, more viable place to live and work.

RE-ENVISIONING INFRASTRUCTURE

As noted earlier, urban land management and control has remained an area largely outside the purview of the water industry. As Philadelphia Water learned more about the full impact of urban land use decisions on water quality and quantity, it is becoming increasingly more difficult to integrate water issues without addressing the complexity of the urban systems of land management. Questions arose such as, how do we integrate and coordinate the construction and rebuilding of public roads, public spaces, and private development in a manner that most efficiently and effectively manages our water resources, prevent pollution, and create a cohesive and leveraged and sustainable city system?

It will take vision and leadership to overcome the multiple barriers that confront the city to find local solutions for our global water problems, *and* to do so in a way that supports a livable, sustainable city. With urban water systems as a national focal point for reform and financial support, there is no better time to integrate environmental protection strategies, responsible land use, and dynamic zoning reform with infrastructure improvements through the use of integrated urban systems thinking.

As to the future, cities across the world must recognize that GSI is a very new field. Innovations are occurring daily. Regular analyses and modeling of these systems along with adaptive management at the water and city levels are essential to achieve the correct future balance of clean, abundant water and green, sustainable, and resilient cities. ◆

→ A recent study found that the new regulations helped catalyze a best-in-class GSI industry cluster in Philadelphia, with meaningful consequences for the local economy. The study found that the local GSI industry is experiencing double-digit annual growth and conservatively represents annual economic impact of almost US $60 million, supporting 430 local jobs and generating nearly $1 million in local tax revenues. The innovative solutions birthed for the GCCW program also produced export opportunities for the benefit of the local economy and established Philadelphia as a leader in stormwater management, positive media coverage, national awards, and emulation from such cities as New York City and Washington DC.

ENDNOTES

1 http://gsipartners.sbnphiladelphia.org/wp-content/uploads/2016/02/SBN_FINAL-REPORT.pdf

2 Like many global cities, Philadelphia is experiencing unusually heavy intensity, short duration but more frequent rain events over its highly impervious ground cover so the concern for rainwater runoff burden has increased significantly.

3 In June 2009, Mayor Nutter issued the Complete Streets Executive Order, requiring all City departments and agencies to balance the needs of pedestrians, bicyclists, public transit users, and motorists when making decisions regarding the transportation system and development projects. The Order places a high priority on increasing safety and convenience for those traveling in the public right-of-way, particularly children, the elderly, and persons with disabilities (City of Philadelphia Complete Streets Handbook)

4 In old, industrial cities like Philadelphia, most development is actually re-development of a previously purposed and built site; not the development of "green" (previously undisturbed) sites. (This has allowed Philadelphia to actually reduce impervious cover in the city by about 0.4% per year, just through the demolition and re-building of properties.)

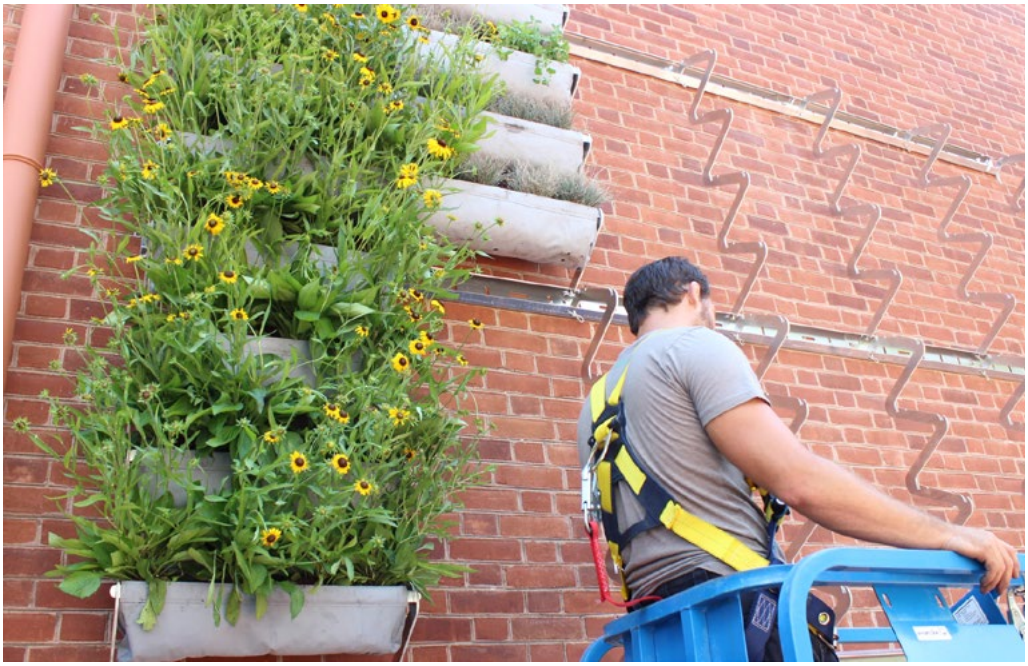


Figure 8: “Drainspotting” initiatives use temporary art work by Frank McShane to decorate storm drains in Schuylkill River Park and Vernon Park. Source: Philadelphia Water Department

Figure 9: Living wall installation on the Park Institute building. Source: Philadelphia Water

CITIES OF THE FUTURE MITIGATING THE EFFECTS OF EXTREME HEAT

MERCEDES BEAUDOIN

Figure 1: Eiffel Tower at sunset during summer time

» *Many studies show a correlation between an increase in green areas and a reduction in local temperature. Densely urbanized areas leave sparse room for converting paved areas into vegetated surfaces. Some techniques to try and increase the urban canopy include: tree planting programs along streets and in neighborhoods; creating and connecting linear parks (e.g., the Cheonggyecheon in Seoul, Republic of Korea); and, establishing pocket parks throughout the urban realm. Another option is transforming traditional flat roofs and buildings sides into green roofs and vertical gardens.* «

Extreme heat may not be the first emergency disaster to come to mind when discussing major causes of death, yet, extreme heat has caused more deaths in the United States than hurricanes, tornadoes, earthquakes, floods, and lightning combined from 1979 to 2003[1] and Europe's 2003 heat wave killed more than 70,000 people in one summer[2].

Warmer weather may be here to stay for a while. Each of the last three decades has been successively warmer than the change in temperature between any preceding decade since 1850[3]. Though climate change is a large contributor to extreme heat on a macro scale, cities and the attributes of each city, create their own micro climates which influences *city-level* temperatures. As more and more people move to cities (by 2025 some 65% of the world's population is expected to urbanize[4]), it is imperative for urban planners around the world to consider mitigation strategies for this extreme heat phenomena.

This article first provides an overview of the Urban Heat Island (UHI) phenomena. It briefly describes the various public health threats caused by extreme heat. Finally, it discusses the means by which planners around the world are pursing to adapt their cities to mitigate such effects.

URBAN HEAT ISLAND

Urban heat islands are described as municipal areas experiencing higher temperatures during the day and less nighttime cooling abilities than adjacent rural areas. Studies show the annual mean temperature of a city with one million or more people can be 1.8- 5.4° Fahrenheit warmer than its surroundings during the day and as much as 22° Fahrenheit warmer at night[5]. The Urban Heat Island Effect (UHI) is not a traditionally considered a natural disaster, but a hazardous phenomenon created and perpetuated by human-constructed ecosystems – cities.

Aggravating this problem is the fact that global temperatures are forecasted to increase by 2° to 11.5° Fahrenheit in the 21st Century according to a 2007 report by the United Nations Intergovernmental Panel on Climate Change (IPCC). In fact, the same IPCC report projects temperatures to upsurge even more in urban areas than the overall global temperature. As a result, some researchers feel that the Urban Heat island (UHI) is one of the major problems facing humanity and one of the numerous ways cities contribute to climate change.

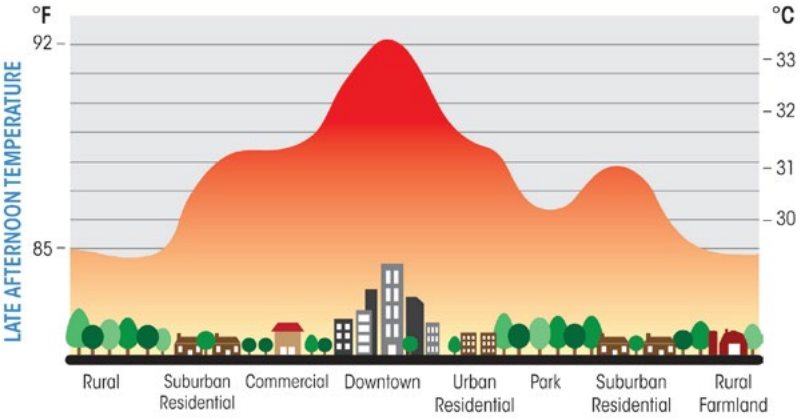


Figure 2: A profile of an urban heat island

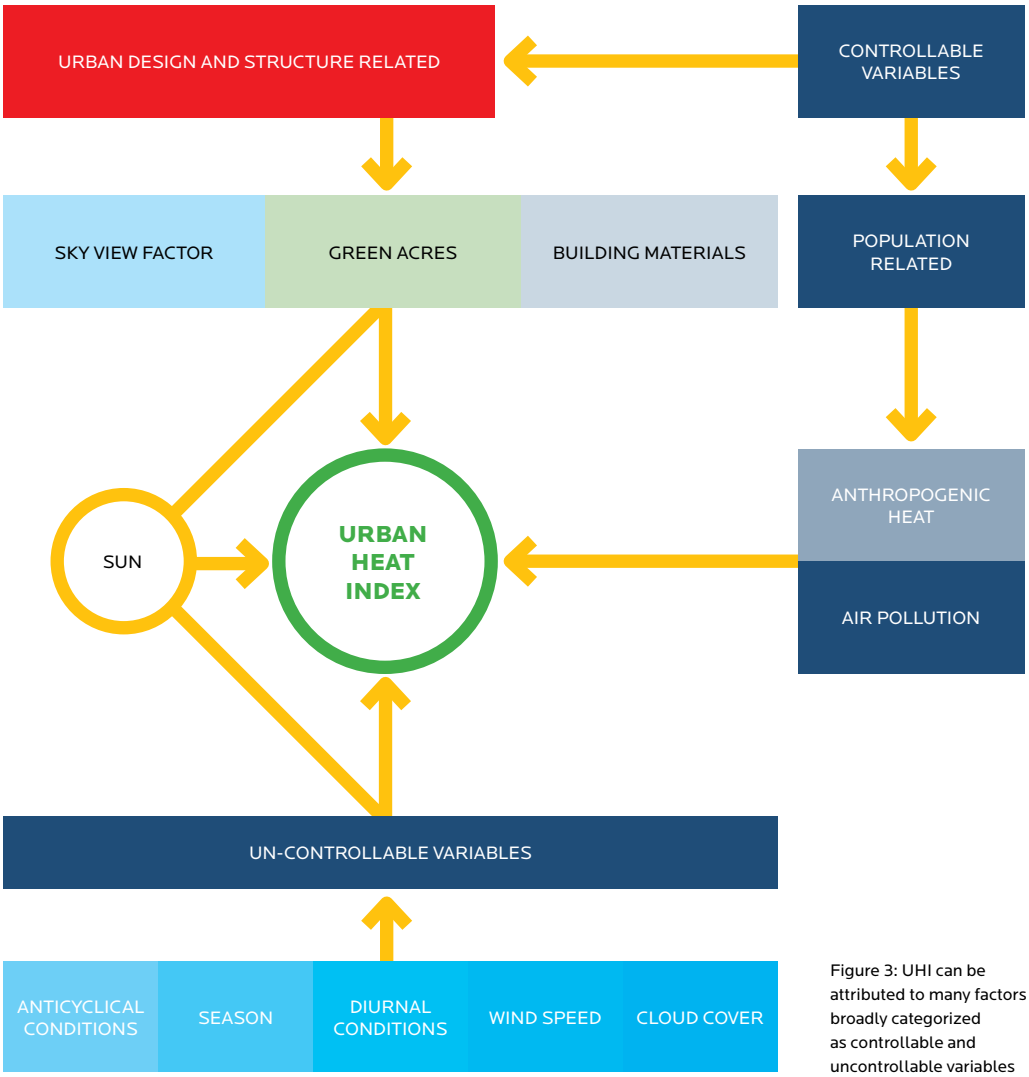


Figure 3: UHI can be attributed to many factors broadly categorized as controllable and uncontrollable variables

Figure 4: High summer temperatures and an abundance of asphalt surfaces in the Central Arizona-Phoenix LTER study area create conditions for urban heat islands[9]

CAUSES OF UHI AND ITS EFFECT ON THE CITY

Urban heat is mainly attributed to anthropogenic sources such as heat released from automobiles, power plants, and air conditioners. These heat sources are caught within the built environment and re-radiated by other large urban structures, such as tall or poorly placed buildings that hinder airflow in and out of cities. Building materials themselves also contribute to the exposure and radiation prospects of heat. Cities lacking in or decreasing albedo—a reflection coefficient used on buildings—also induces heat radiation[6] . Additionally, the type of building and infrastructure material can store heat energy during the day and release that energy into the environment at night. Finally, Land use decisions also plays a major role in how cities impose more or less heat on their citizens. As cities expand, vegetated surfaces such as forests, fields, and valleys are replaced by buildings, roads, and other impervious surfaces fashioned out of materials that store short-wave radiation[7]. Vegetated surfaces, on the contrary, provide social-ecological services such as absorbing and metabolizing such energy, providing shade, and contributing evapotranspiration[8].

Figure 5: Chicago Skyline

HEALTH AND OTHER IMPLICATIONS OF URBAN HEAT ISLANDS

The subject of UHI has become highly interesting for planners and scientists alike due to its adverse environmental, economic, and social impacts on society. The adverse effects of UHI includes the deterioration of the living environment, to an increase in energy consumption[10], a raise in ground-level ozone[11] , and, most tragically, increased illness and mortality rates[12].

The UHI escalates potential health risks by increasing the maximum temperatures citizens are exposed to and by increasing the span of time citizens are exposed to these higher temperatures. Being exposed, even briefly, to elevated temperatures can cause serious heat-related health issues when the human body is incapable of adapting to the heat by properly cooling off. Numerous factors affect the body's ability to cool down during extreme heat including: humidity levels, age of person, obesity, fever, dehydration, heart disease, mental illness, poor circulation, sunburn, and/or prescription drug and alcohol use[13].

Heat-related illnesses range in severity depending on the speed of the body's temperature increase during extreme heat trials. Elevated body temperatures are reported to permanently damage the brain, internal organ system, and respiratory system[14] . Additionally, increased temperatures have been shown to induce heat stroke, heat exhaustion, heat cramps, heat stress, heat rash, and heat syncope in individuals living and working within urban areas[15].

Furthermore, researchers note heat-related illness potentially affect an individual's mobility, awareness, and/or behavior. Secondary health hazards affected by urban heat islands include increased concentrations of air pollutions and impaired water quality, both of which increase morbidity.

As previously mentioned, the UHI is specifically robust at night, reducing the ability of urban residents to cool themselves down during this time of traditional relief. Such a lack of nighttime relief is strongly correlated to increased mortality. In fact, Hoverter (2012) states the average heat-related deaths per year in the

U.S. is 700 and predicts the increase greenhouse gas emissions to surge the prediction to 3,000 to 5,000 deaths annually by 2050. One can imagine these numbers inflated in less-developed countries with poorly-planned megacities unequipped to mitigate such extreme heat. Regardless of region in the world, the most vulnerable populations for heat-related morbidity and mortality are the elderly, infants and children, people with chronic medical conditions, and lower socioeconomic persons.

High UHI levels can also effect a city's infrastructure, such as warping or cracking transportation infrastructure such as roads, airport runways, and even rail lines (U.S. Global Change Research Group, 2014). UHI can also encourage other disasters and emergences in cities such as droughts or fires. Furthermore, urban heat islands can affect daily occurrences and behaviors by increasing energy use, energy costs, and pollution levels for a metropolitan area.

HOW CITIES CAN MITIGATE UHI

Heat-related deaths and illness are preventable, yet many people succumb to the effects of extreme heat. Thus, it is vital planners are aware of the risks of the UHI and the preventative strategies that can be integrated in city plans.

The design of a city affects every social, environmental, and economic characteristic of that city. Implementing a UHI mitigating built environment and planning strategy can reduce the heat impacts of cities including: (1) protecting public health; (2) reducing energy consumption and thus decreasing greenhouse gas emissions; and, (3) potentially providing mutually beneficial environmental effects (e.g., storm water management, improved air quality). These designs and strategies include: albedo designs, increased vegetation cover and connection, climate action plans, and heat-related emergency management plans.

Albedo. Some researchers say temperature rises, including global warming, could be fought with a paint job. This strategy is called the Albedo Effect where painting surfaces of buildings, streets, and other surfaces the color white reflections some of the sun's radiation waves. Using albedo materials can reduce the amount of

Management Strategy	Common Components
Albedo Enhancement	Installation of highly reflective roofing or paving materials
Building Energy Efficiency	Minimum insulation values in building codes with efficient light fixtures and appliances
Climate Action Plan	Adopt a cross-sectoral plan for all climate related phenomena for all strategies
Green Roofs	Installation of vegetative roofing materials
Heat-Related Management	Devise plan with emergency management departments to prepare for heat-related events
Regional Forest Management	Requirements for the protection of regional forest cover in proximity to urbanized areas
Renewable Energy Programs	Requirements for wind, solar, geothermal, or other renewable energy sources
Urban Tree Management	Municipal tree planting programs with requirements for tree protection ordinances
Vehicle Energy Efficiency	Minimum fuel efficiency standards for municipal fleets; acquisition of alternatively fueled vehicles
Vehicle Travel Demand Management	Ride sharing programs, transit investments, provision of pedestrian and cycling facilities

Table 1: Strategies to Mitigate Urban Heat and common components of each strategy

solar radiation absorbed through buildings and urban structures to keep their surfaces cooler. Typically, urban albedos are in the range 0.10 to 0.20 but in some cities these values are exceeded[16]. North African towns are good examples of high albedo urbanized areas (albedos of 0.30 to 0.45) whereas most US and European cities have lower albedos (0.15 to 0.20) according to Taha (1997).

Vegetation. Another strategy cities can pursue is just as easy to pursue: keep and connect as much vegetation as possible. The USDA Forest Service recommends that 40% of urban land should be covered by tree canopy. However, most cities in the U.S. have tree canopies ranging from 16% to 39%, which means that the benefits of tree cover—heat management, air quality, water and energy conservation—are not evenly distributed. This distribution could present a social equity issue.

Effective use of green infrastructure for urban heat management requires a change in our approach to urban planning. In traditional planning, green infrastructure is an afterthought; the focus is on "grey infrastructure" (e.g., roads, buildings, utilities) with green places located in the leftover spaces. In contrast, planning for urban heat management incorporates "green infrastructure" as an essential design element. Such planning begins with an inventory of all assets, both natural and built; then a strategy to protect those assets and a plan for green space is developed before the built elements are located. Both green and grey elements should receive equal priority in planning and funding, with equal expertise in management and design, and are designed as complimentary systems.

Many studies show a correlation between an increase in green areas and a reduction in local temperature[18]. Densely urbanized areas leave sparse room for converting paved areas into vegetated surfaces. Some techniques to try and increase the urban canopy include: tree planting programs along streets and in neighborhoods; creating and connecting linear parks (e.g., the Cheonggyecheon in Seoul, Republic of Korea);

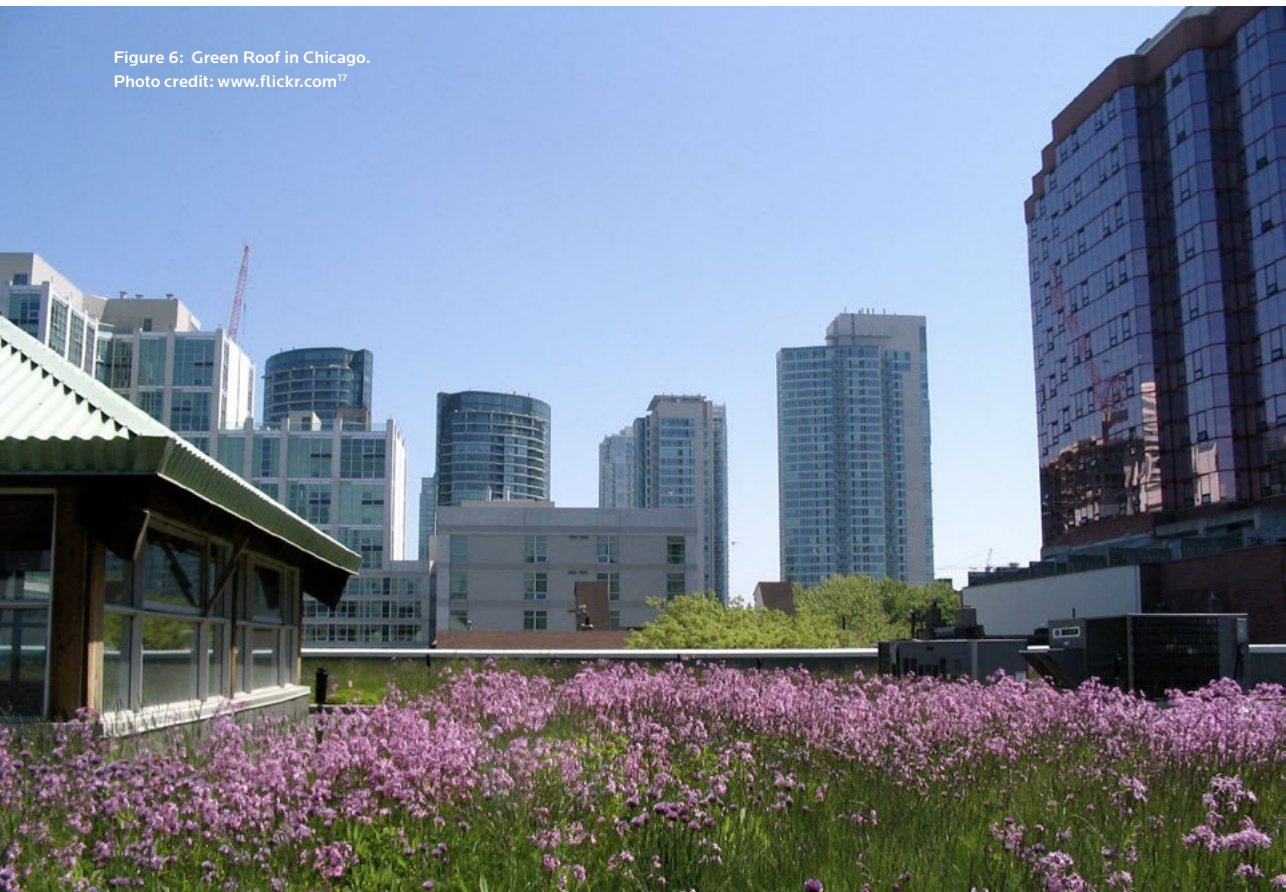


Figure 6: Green Roof in Chicago.
Photo credit: www.flickr.com[17]

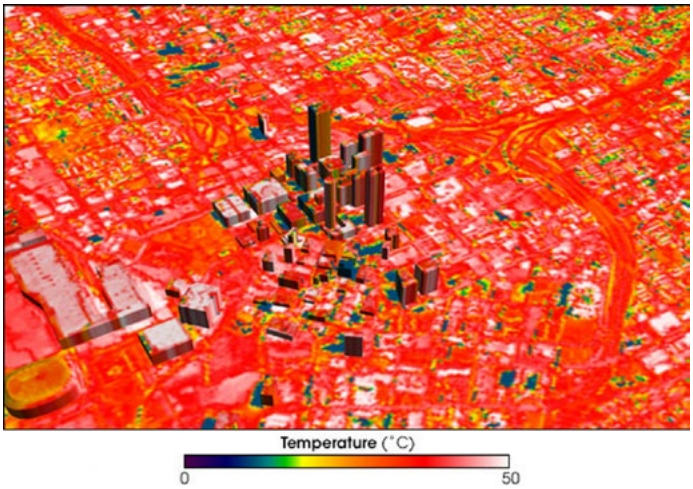


Figure 7: Thermal heat mapped in Atlanta, Georgia. Temperatures can rise by 10-12 degrees during the day time

and, establishing pocket parks throughout the urban realm. Another option is transforming traditional flat roofs and buildings sides into green roofs and vertical gardens.

Akbari, Shea Rose, and Taha, (2003) have estimated roofs to constitute 20-25% of the surface area in urban environments. For public health effects, a mass conversion to vegetated roofs potentially reduces the UHI, improves air quality and storm-water management, provides biodiversity, and fosters a location of urban amenities[19]. As for the infrastructure of the city, such a conversion would increase the lifespan of building materials underneath the soil, decrease building energy consumption, and reduce noise pollution from entering the building[20]. Though mass conversion seems unlikely due to pre-existing buildings' structural support issues, several existing roofs could be converted into green roofs without issues[21]. Toronto, Canada has led the pack in North American for becoming the continent's first city to adopt a green-roof policy. In 2015, France approved a law requiring newly built commercially zoned buildings to at least partially cover roofs in plants or solar panels.

Even though Susca, Gaffin, and Osso, (2011) and others have reported significant decreases in temperature around albedo and vegetated- replaced surfaces throughout cities, and it seems a simple a strategy, such mass conversions are a lofty investment for local governments to pursue. However, since cities are the economic engines of the world, without this investment the health and welfare of said urban environments could potential diminish via heat thereby reducing their economic competitive advantage. Additionally, since a city's planning department and emergency management department both want to reduce the UHI, it is imperative these agencies work together and share resources.

Heat-Related Emergency Management. A less holistic approach is to integrate a city's comprehensive master plan and its emergency management plan to provide a plethora of resources, and strategies to adapt cities for heat increases. U.S. cities such as Chicago, Philadelphia, Phoenix, and Milwaukee have developed heat emergency response plans[22]. Cities in oth-

Figure 8: An Iraqi man shows a thermometer reading more than fifty degrees Celsius on July 30, 2015 in the capital Baghdad. Photo credit: Ahmad Al-Rubaye (Ahmad Al-Rubaye/ AFP/Getty Images)[23]

er countries include Ahmedabad in India and Vancouver in Canada. Most European countries have nation-wide heat related emergency management plans.

Ahmedabad's plan is the first heat-health action plan in South Asia. This plan creates both immediate and long term actions to increase preparedness, information-sharing, and response coordination with the aim of reducing the health impacts of extreme heat on their population. Ahmedabad's plan consists of four key strategies. The first is simple: create public awareness and community outreach to communicate the risks of heat waves and how to prevent such heat-related illness and death. The second strategy is initiating an early warning system and inter-agency coordination to warn residents of rising temperatures. The third strategy is capacity building among health care professionals to better recognize and respond accordingly to heat-related illness during times of extreme heat. The final strategy in this plan is reducing populations' exposure to heat and promoting adaptive measures. This final strategy is where planners can really help as their strategy includes mapping high-risk areas, potable water, and cooler spaces around the city for populations to locate during heat waves. Such geographical information can make the difference between life and death.

Though such strategies are critical for public health when dealing with heat waves and heat islands, emergency response plans cannot single-handedly save all of the most vulnerable populations. Such plans cannot help residents during summer months when the temperature is simply hot and not depicted as an emergency [24]. Moreover, emergency response plans are not holistic because they fail to address baseline causes of urban heat including air pollution and economic costs of cooling mechanisms. Thus, emergency response must be paired with urban design and planning strategy.

Climate Action Plan. The (US) National Science Academy[25] defines resilience as "the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events." A city's climate action plan can be broad to encompass the other effects of climate change (e.g., sea level rise), but should have strategies dedicated to all climate-related events. Given the difficulties cities face when attempting to pursue UHI mitigation strategies, this analysis suggests more cities adopt a cross-sectoral approach to planning for heat emergencies. Once all viewpoints are taken into account, a climate action plan can be pursued.

Chicago, famous for its deadly 1995 heat wave, has a Climate Action Plan that outlines five strategies to mitigate and plan for intense heat events: (1) energy efficient buildings, (2) clean and renewable energy sources, (3) improved transportation options, (4) reduced waste and industrial pollution, and (5) adaptation. In addition to the strategies mentioned in

Figure 9: Millennium Park in Chicago, Illinois, with the Lurie Garden, BP Pedestrian Bridge, and part of the Jay Pritzker Pavilion visible. Photo credit: Carolyn Torma

this paper, Chicago's plan not only includes the support of UHI research and mitigation strategies, but also includes an emphasis on public engagement. Chicago's plan includes details steps for the city itself, for organizations within the city, and for residents. Thus, as all entities of a city are stakeholders, each can be informed of how they can play a part of mitigating and preparing for any future heat events. ◆

ENDNOTES

1 Center for Disease Control & Prevention, 2014

2 Robine, Cheung, Le Roy, Van Oyen, Griffiths, Michel, and Herrmann, 2008

3 WHO, 2016

4 Schell and Ulijaszek, 1999

5 Environmental Protection Agency, 2008

6 Akbari & Konopacki, 2005

7 Solecki, Rosenzweig, Parshall, Pope, Clark, Cox, & Wiencke, 2005

8 Takebayashi & Moriyama, 2007; Luber & McGeehin, 2008; Imhoff, Zhang, Wolfe, & Bounoua, 2010

9 Retrieved 19 July 2016 from https://lternet.edu/research/keyfindings/urban-heat-island-effects

10 Konopacki and Akbari, 2002

11 Rosenfeld et al., 1998

12 Changnon et al., 1996

13 CDC, 2014

14 Ibid

15 Hoverter, 2012; CDC, 2014

16 Taha, 1997

17 Retrieved 19 July 21016 from https://www.flickr.com/photos/sookie/156954114/

18 Takebayashi and Moriyama, 2007

19 Oberndorfer, Lundholm, Bass, Coffman, Doshi, Dunnett, Gaffin, Köhler, Liu, & Rowe, 2007

20 Saiz, Kennedy, Bass, Pressnail, 2006

21 Castleton, Stovin, Beck, & Davison, 2010; Johnston & Newton, 1996

22 Environmental Protection Agency, 2011

23 Retrieved on 19 July 2016 from http://www.theblaze.com/stories/2015/08/03/one-of-the-most-extreme-readings-ever-in-the-world-iranian-city-records-insanely-high-heat-index/

24 Hoverter, 2012

25 Cutter, Ahearn, Amadei, Crawford, Eide, Galloway, & Zoback, 2013

REFERENCES

Akbari, H., Shea Rose, L., & Taha, H. (2003). Analyzing the land cover of an urban environment using high-resolution orthophotos. *Landscape and urban planning*, *63*(1), 1-14.

Akbari, H., & Konopacki, S. (2005). Calculating energy-saving potentials of heat-island reduction strategies. *Energy Policy*, *33*(6), 721-756.

Castleton, H. F., Stovin, V., Beck, S. B. M., & Davison, J. B. (2010). Green roofs; building energy savings and the potential for retrofit. *Energy and Buildings*, *42*(10), 1582-1591.

Center for Disease Control & Prevention (CDC), *Extreme Heat: A Prevention Guide to Promote Your Personal Health and Safety*, http://www.bt.cdc.gov/disasters/extremeheat/heat_guide.asp, 2014

City of Chicago. Climate Adaption Report. *available at http://www.chicagoclimateaction.org/pages/adaptation/11.php (Last visited on Nov. 30, 2014)*

Cutter, S. L., Ahearn, J. A., Amadei, B., Crawford, P., Eide, E. A., Galloway, G. E., & Zoback, M. L. (2013). Disaster resilience: A national imperative. *Environment: Science and Policy for Sustainable Development*, *55*(2), 25-29.

Hoverter, S. P. (2012). Adapting to Urban Heat: A Tool Kit for Local Governments. *Georgetown Climate Center (August 2012) http://www.georgetownclimate. org/resources/adapting-to-urban-heat-a-tool-kit-for-local-governments*.

Imhoff, M. L., Zhang, P., Wolfe, R. E., & Bounoua, L. (2010). Remote sensing of the urban heat island effect across biomes in the continental USA. *Remote Sensing of Environment*, *114*(3), 504-513.

Intergovernmental Panel on Climate Change (IPCC) (2007), *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, edited by S. Solomon et al., Cambridge Univ. Press, Cambridge, U. K.

Johnston, J., Newton, J., (1996). *Building Green: A Guide for Using Plants on Roofs, Walls and Pavements*. The London Ecology Unit, London.

Li, F., Wang, R., Paulussen, J., & Liu, X. (2005). Comprehensive concept planning of urban greening based on ecological principles: a case study in Beijing, China. *Landscape and urban planning*, *72*(4), 325-336.

Luber, G., & McGeehin, M. (2008). Climate change and extreme heat events. *American journal of preventive medicine*, *35*(5), 429-435.

Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R. R., Doshi, H., Dunnett, N., Gaffin, S., Köhler, M., Liu, K., & Rowe, B. (2007). Green roofs as urban ecosystems: ecological structures, functions, and services. *BioScience*, *57*(10), 823-833.

Robine, J. M., Cheung, S. L. K., Le Roy, S., Van Oyen, H., Griffiths, C., Michel, J. P., & Herrmann, F. R. (2008). Death toll exceeded 70,000 in Europe during the summer of 2003. *Comptes rendus biologies*, *331*(2), 171-178.

Saiz. S., Kennedy, C., Bass, B., Pressnail, K., (2006). Comparative life cycle assessment of standard and green roofs. Environmental Science and Technology 40: 4312–4316.

Schell, L. M., & Ulijaszek, S. J. (Eds.). (1999). *Urbanism, health and human biology in industrialized countries* (Vol. 40). Cambridge University Press.

Solecki, W. D., Rosenzweig, C., Parshall, L., Pope, G., Clark, M., Cox, J., & Wiencke, M. (2005). Mitigation of the heat island effect in urban New Jersey. *Global Environmental Change Part B: Environmental Hazards*, *6*(1), 39-49.

Susca, T., Gaffin, S. R., & Dell'Osso, G. R. (2011). Positive effects of vegetation: Urban heat island and green roofs. *Environmental Pollution*, *159*(8), 2119-2126.

Takebayashi, H., & Moriyama, M. (2007). Surface heat budget on green roof and high reflection roof for mitigation of urban heat island. *Building and Environment*, *42*(8), 2971-2979.

United States Environmental Protection Agency. (2008) *Reducing Urban Heat Islands: Compendium of Strategies. available at* http://www.epa.gov/heatisland/resources/pdf/BasicsCompendium.pdf (last visited Nov. 23, 2014)

United States Environmental Protection Agency. *(2011). Excessive Heat Events Guidebook* at 26 (Philadelphia), *available at* http://www.epa.gov/heatisld/about/pdf/EHEguide_final.pdf (last visited Jan. 24, 2012); *Id* at 32 (Phoenix); City of Milwaukee Health Department And Milwaukee Heat Task Force, *Plan for Excessive Heat Conditions 2011*

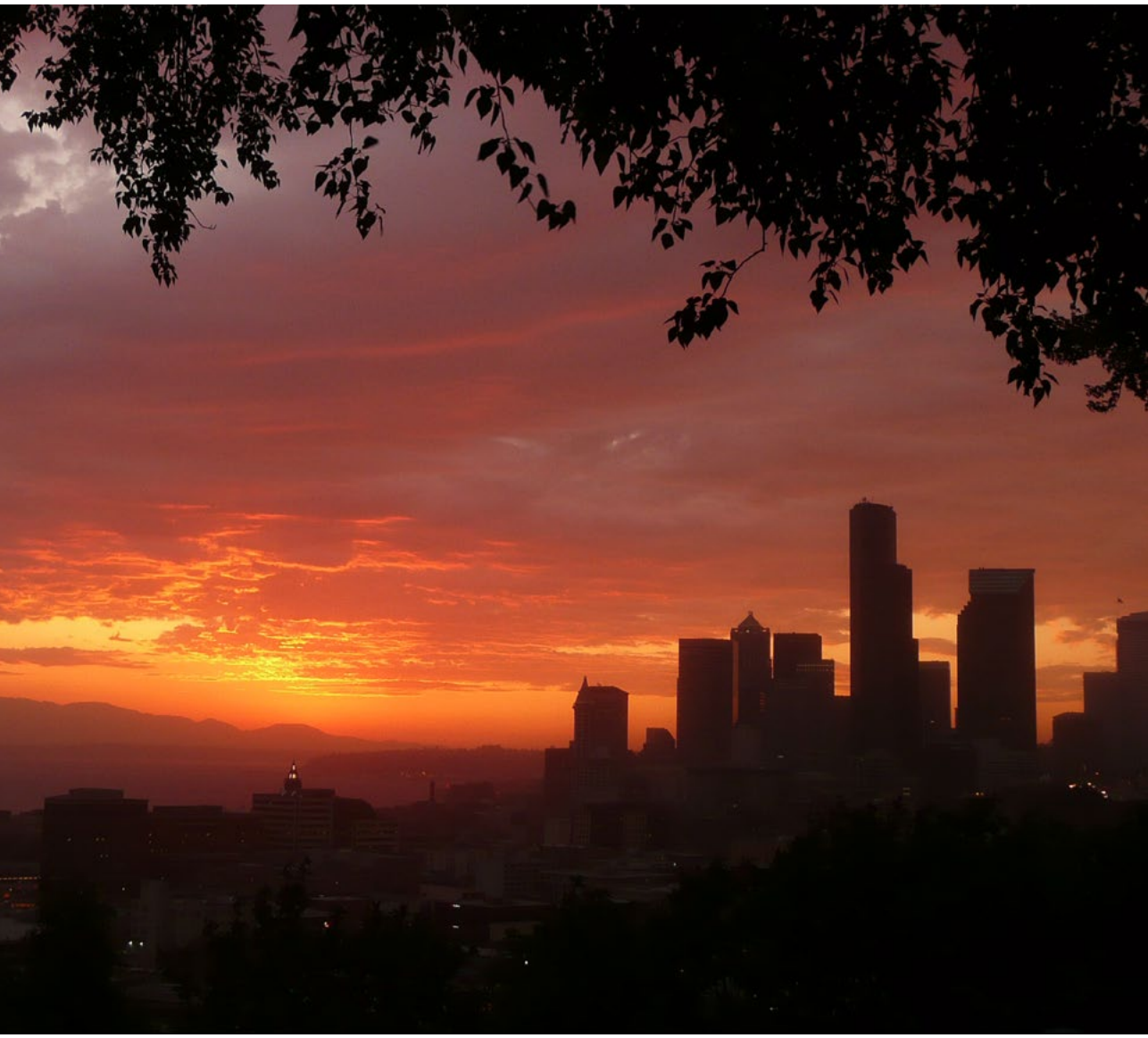


Figure 10: Heat over city

FINDING OUT WHAT'S WORKING IN AMERICA AND BEYOND

SIMONE BRODY

» *What Works Cities collaborates with participating municipalities to review their current use of data and evidence, understand where they are utilizing best practices and identify areas for growth. Through its expert partners, What Works Cities then designs a customized approach to help mayors address a variety of local issues including economic development and job creation, public health, and social services.* «

"When I became Mayor of this city, we decided that we were going to be a group of people who made decisions based on facts and data".

Declarations like these – in this case, by Kansas City, Missouri Mayor Sly James - are the underpinning of a growing movement in City Halls across America and throughout the world. These cities are dedicated to the expanded use of data and evidence as a method to improve outcomes for their residents.

James' statement could be attributed to one of any of the 39 city leaders currently engaged with What Works Cities (WWC), the Bloomberg Philanthropies national initiative helping American cities enhance their use of data and evidence to engage residents, make government more effective and improve lives.

How did Mayor James, as one example, turn his commitment to data into action after his 2011 election? Among other acts, Kansas City launched KCStat, a performance management system that monitors the City's progress toward its five-year citywide business plan; established Open Data KC, Kansas City's robust open data portal; and established a regular, closely-watched citizen survey conducted annually to assess residents' level of satisfaction with city services as well as their priorities for improvement.

Figure 1: Blight is a problem on both sides of the state line. Kansas City, Missouri, recently auctioned off $1 homes. Now Kansas City, Kansas, is trying a data-driven approach[1]

DEFINING THE NEED

An April 2015 Pew Foundation survey[2] showed that fewer than 1 in 20 Americans could produce a single example of how government used data to improve lives. In an era of increasing distrust in institutions, can cultivating a culture of transparency help rebuild that trust from constituents and increase civic engagement? Many city leaders believe it can.

As it turns out, while cities are awash in data, local governments need support to "transform their data into action." This was the theme of the first WWC Summit in April, 2016 held in NYC to bring together 200 city leaders and experts from 53 cities for a brainstorming session and an opportunity for city leaders to meet their peers. A recent analysis by The Bridgespan Group of the first What Works Cities applications, representing 40 percent of mid-sized cities in the United States, revealed that while 64% of cities track progress towards key goals, only 30% have a process in place for analyzing and following up on that information. Similarly, while 70% indicated their commitment to using data and evidence to make decisions, only 28% currently modify existing programs based on the results of evaluations.

THE WHAT WORKS CITIES PROGRAM

Turning cities' commitment to data and evidence into practice that makes effective use of data is at the heart of What Works Cities, which celebrated its 1-year anniversary in April, 2016. The What Works Cities initiative is a three-year, $42 million effort to support mayors and local leaders in 100 mid-sized U.S. cities with technical assistance and peer-to-peer learning opportunities to make government more effective. The program helps cities:

1. Create sustainable open data programs and policies that promote transparency and robust citizen engagement;
2. Better incorporate data into budget, operational, and policy decision making;
3. Conduct low-cost, rapid evaluations that allow cities to continually improve programs; and
4. Focus funding on approaches that deliver results for citizens.

Applicants apply to join the program on-line (www.whatworkscities.org). Bloomberg Philanthropies has assembled a world-class group of expert practitioners to work directly with city leaders and front-line staff.

What Works Cities collaborates with participating municipalities to review their current use of data and evidence, understand where they are utilizing best practices and identify areas for growth. Through its expert partners, What Works Cities then designs a customized approach to help mayors address a variety of local issues including economic development and job creation, public health, and social services.

A consortium of leading organizations has been assembled to inspire, challenge, and support cities. Together, these partners are delivering a comprehensive program of support, promoting tested as well as innovative new approaches.

- Results for America is leading and coordinating the What Works Cities partner consortium and advancing a nationwide dialogue on the need for cities to use data and evidence in decision making.
- The Center for Government Excellence at Johns Hopkins University is working with cities to assess the current state of What Works practices, and supporting implementation and enhancement of open data and performance management programs.
- The Government Performance Lab at the Harvard Kennedy School is supporting cities in improving the results they achieve with their contracted dollars.
- Sunlight Foundation is helping cities craft meaningful and sustainable open data policies.
- The Behavioral Insights Team is helping cities conduct real time, low-cost evaluations of programs so they can continually improve city services.

People often ask: how do you define a What Works City? The What Works Cities Standard reflects a set of aspirations and activities that create a strong foundation for the effective use of data and evidence within city government. The four components - Commit, Measure, Take Stock and Act – build on each other and reflect the practices that city leaders have taken on across the United States to advance the effectiveness of their governments.

1. COMMIT

What Works Cities leaders make powerful, public commitments to getting better results for their residents by using data and evidence.

→ DEFINE GOALS AND PROGRESS: The Mayor and city leaders work collaboratively to define city goals and the measurable progress they intend to see toward meeting those goals.
→ STATE COMMITMENT PUBLICLY: The Mayor speaks publicly about using data and evidence to inform policy, funding, and management decisions.
→ ENGAGE RESIDENTS: The Mayor engages residents regularly about progress on city priorities, and provides data and evidence to discuss achievements and challenges.
→ COLLABORATE AND GALVANIZE: The Mayor builds buy-in around using data and evidence and empowers city leaders to effectively harness these resources.

2. MEASURE

What Works Cities leaders use the data and tools at their disposal to measure progress and engage residents along the way.

→ COLLECT DATA: The city systematically collects high-quality, relevant, administrative and performance data.
→ FOCUS ON RESULTS: The city uses outcome-based performance measures to determine the impact of its core operations and contracted services.
→ SHARE OPENLY AND OFTEN: Through the public release of accessible data, the city enables residents and other decision-makers to track and discuss progress on important public services and programs—and promotes a culture of government transparency and accountability.

3. TAKE STOCK

What Works Cities leaders consistently review and reflect to measure progress, learn, and make corrections and improvements.

→ UNDERSTAND PERFORMANCE: The Mayor uses a citywide performance management system to enable decision-makers to understand trends, spot opportunities, advance citywide goals, and improve outcomes for residents.
→ ASSESS PROGRESS: The city uses data and evidence on an ongoing basis to assess progress toward goals and support continuous improvement.
→ EVALUATE IMPACT: The city regularly evaluates programs and services to determine and improve their impact.

4. ACT

What Works Cities leaders use data and evidence to inform major decisions and take action.

→ USE DATA AND EVIDENCE TO INFORM DECISIONS: The city's review of data and evidence informs the city's planning, budget, funding, and management decisions.
→ FACILITATE PUBLIC USE OF DATA: The city empowers the public—including citizens, journalists, local institutions, researchers, and entrepreneurs— to use city data to create value for residents and communities.
→ USE EVIDENCE OF IMPACT: The city uses evidence of impact from a range of evaluation methods to inform new and improve existing policies and programs.
→ REDIRECT FUNDS: The city redirects funds away from policies and programs that do not show measurable impact or contribute to city goals.

Figure 2: The What Works Cities standard[3]

PROGRESS TO DATE

“Using data and being able to show the data, changed what could be perceived as something subjective to something that’s openly objective,” said Doug Robertson, City Manager of Little Rock, Arkansas, during April’s WWC Summit.

Jackson, Mississippi Mayor Tony Yarber was elected to office in April, 2014, after waging a campaign focused on creating an "environment of transparency" within government. In the year since being named a What Works city, Jackson has established a new Office of Innovation and Performance, inventoried city data, signed an open data policy, and in early April announced the launch of an open data portal.

Yarber explained that having its data accessible to the public went beyond a symbolic act of transparency to “creating an environment where the community, citizens, anybody around the world or around the country had an opportunity to interface with the City of Jackson. And to do that in a way that actually told the story the way that the story should be told: using real data, using data to be able to influence how we get things done, using data to drive discussions, and at the end of the day using the data to improve the city."

Cities report that effectively using data enables them to make progress combatting some of their biggest challenges:

- By crunching the numbers, Jackson realized it could achieve faster compliance from landlords of blighted properties if the oversight responsibility was moved to the Jackson Police Department from the city’s Planning Department; the city increased the number of blighted buildings that were destroyed from just five buildings in 2014 to 115 in 2015 - and realized a savings of more than $600,000 (a fact disclosed at one of the city’s first “JackStat” performance management meetings bringing together the city departments).
- In Las Vegas, the city targeted intersections with the greatest number of traffic accidents, deployed additional resources to those areas, and decreased crashes by 26%, left-turn accidents by 61%, and congestion by 25%.
- In Saint Paul, Minnesota, where government’s response to snow emergencies is a critical indicator of City Hall efficacy, Saint Paul’s use of data analytics enabled the Public Works department to more nimbly deploy snow removal trucks to the neighborhoods that needed it most, effecting a 20% decrease in residents’ complaints and a 40% savings in road salt.

In their collaboration with the What Works Cities experts, many cities are learning to make use of their data through open data portals and by conducting a thorough inventory of the city’s data. The inventories often bring to light for the first time the location of key data sets, breaking down silos among departments in City Hall, and encouraging more effective collaboration and problem solving. And by making the city’s accessible and updated information available on

Figure 3 (left): City of Providence joined WWC in June 2016. The City of Providence will establish open data practices to make data more accessible to residents and community stakeholders[4]

Figure 4 (right): Snow removal truck on the streets of St. Paul

an open data portal, cities are inviting collaboration with residents as well as with local app developers, academics, businesses, and others who can collaborate with the city to address critical challenges. Cities are also working to establish key metrics that enable leaders to chart their progress toward strategic goals, and more.

Seattle, for example, is partnering with the Government Performance Lab at the Harvard Kennedy School to improve the results they achieve with their contracted dollars – in Seattle's case, the city is focusing its homeless provider contracts on reducing homelessness, not just providing daily services to its homeless population.

Kansas City expanded its existing performance management practice through its work with WWC partner the Center for Government Excellence at Johns Hopkins University by embedding data-driven management practices throughout city departments.

Other cities, such as Louisville, Kentucky and New Orleans, Louisiana are working with What Works Cities partner The Behavioral Insights Team (BIT) to utilize behavioral science to design low-cost randomized control trials. These trials, or evaluations, are sent out to city residents via text message or letter, and are designed to determine how best to encourage residents' participation and compliance with the city in actions such as showing up for free medical exams, paying taxes, and following through on their applications to become police officers.

Luckily, this work isn't happening in a vacuum and is designed to be shared. In addition to the game-changing on-the-ground support that WWC is providing cities, we're cultivating a powerful learning community that is allowing leaders from all of our cities to exchange ideas, share solutions to challenges, and illustrate the power made possible when we use data and evidence to get results.

Michael Baskin, Chief Policy Officer in the city of Chattanooga, Tennessee, says budget directors are often "wary of big dollar saving promises that never pan out," while departments are frustrated by not having the ability to invest in new ideas. Baskin found one possible answer at the recent WWC Summit while taking an early morning run with a practitioner from a city across the country who manages an innovation fund that provides revolving loans to departments that are testing new ideas. "We connected with like-minded city-doers to swap solutions."

NEXT STEPS

At the inaugural What Works Cities Summit, former Mayor Michael Bloomberg urged the group to: "Copy other people's ideas. Who cares where they come from?"

We have good reason to believe cities are eager to develop their capacity to fully utilize data and evidence and to learn from each other. In the one year since its launch, What Works Cities received applications from 145 cities in 41 states, nearly half of all eligible cities in the country. With the current 39 cities we've select-

ed, What Works Cities is now partnering with cities with annual municipal budgets exceeding a combined $48 billion, representing 14 million Americans. In just one year, these cities are already making measurable progress:

- What Works Cities has worked with cities to enact and expand 14 Open Data policies to establish sustainable open data practices;
- Cities have launched 15 low-cost evaluations, allowing governments to quickly test the best methods of encouraging citizen participation in programs and services; and
- The Government Performance Lab is helping cities improve the results they achieve through their contracts related to homeless services, workforce development, minority vendors and street construction, worth a total of $135 million.

But this is only the beginning. What Works Cities will expand to 100 cities in the next two years. In that time, we will continue to nurture the developing community that is allowing these leaders to learn from a constantly-growing peer network. We will also be launching a certification program to recognize and celebrate cities for their achievements in data and evidence usage; motivate city staff and leaders, and advance a national movement of cities that are eager and equipped to make progress with their use of data and evidence in decision-making.

While our current focus is US cities, the possibilities are endless with regard to future collaboration with world-class cities across the globe. "Results for All," an initiative of What Works Cities partner Results for America (RFA) is undertaking a landscape study to better understand the infrastructure that governments around the world are building to support use of evidence and data to inform policy and funding decisions. RFA is conducting this global scan with an eye towards bringing together the policymakers, practitioners, and experts from countries around the world with the capacity to scale the deployment of evidence-informed policymaking to improve results. This work could lead to additional opportunities for WWC to build relationships in other countries with like-minded mayors and policymakers.

In America, Bloomberg Philanthropies and its partners are working with cities to create a blueprint for how to help cities use data and evidence to improve lives and engage residents, but we know that similar good work is happening in cities and countries around the world.

In the words of Michael Bloomberg: "Cities have a lot more in common with one another than they have differences...The problems come from the cities and the solutions come from the cities." ◆

ENDNOTES

1 Retrieved July 19, 2016 from http://kcur.org/post/tackle-blight-kansas-city-kansas-will-crunch-numbers#stream/0

2 http://www.pewinternet.org/2015/04/21/open-government-data/

3 Retrieved July 19, 2016 from http://whatworkscities.bloomberg.org/about/

4 Retrieved 23 July 2016 from http://whatworkscities.bloomberg.org/cities/

5 Retrieved July 19, 2016 from http://results4america.org/press-room/twelve-cities-join-works-cities-expanding-wave-local-government-leaders-accelerating-use-data-evidence-improve-lives/

Figure 5 (right top): According to the results from June 13, 2016[5] 39 cities in 25 states are now part of the initiative

Figure 6 (right bottom): Michael Bloomberg welcomed Mayors and city leaders to the first What Works Cities Summit in April, 2016 in New York City. Left to right: WWC Executive Director Simone Brody; Victorville, California Mayor Gloria Garcia; Mesa, Arizona Mayor John Giles; Denton, Texas Mayor Chris Watts; Michael Bloomberg; Tacoma, Washington Mayor Marilyn Strickland; Cape Coral, Florida Mayor Marni Retzer; Kansas City, Missouri Mayor Sly James; Jim Anderson, Bloomberg Philanthropies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PLAN WITH NATURE
JINAN REGIONAL STUDY

ZHUOJIAN PENG · YANTAO CUI
JIANGYAN WANG · PETER CALTHORPE

Figure 1: Panoramic view of Jinan

» *One thing caught the planners' attention: with continuous heavy investments in hydrological engineering, the Yellow River has now become well maintained and the flooding possibility is greatly dropped. The lush and spacious flood buffer with views to the river could become a major open space amenity.* «

OVERVIEW OF JINAN

Jinan, a major city in eastern China, has a population around 7 million of which around 4.5 million live in the central (or metro) area. The City serves several major roles. Politically, it is the capital of Shandong Province. Jinan also is one of the 7 major military regions of China, hosting the command headquarters in charge of Shandong and Henan Province, resulting in heavy government spending on transportation infrastructure.

All the advantages and crucial roles Jinan now enjoys are related to the two natural elements: its river front location and Mt. Taishan. The city developed as a trading post reliant on river transportation of salt from the east coast. This important trade gradually evolved the city's military role. Until the late 19th century, the river serving the city was the Jishui, but then the mighty Yellow River changed it course northward usurping the Jishui streambed as its own channel. Now Jinan is located along the Yellow River.

The Taishan Mountain bestowed Jinan with other gifts. The mountain established its own water cycle in the region. It collects storm water that

Figure 2: Yellow River and Taishan Mountain

become both streams and aquifer feed springs in the city. Jinan became known as the "Spring City" for its abundance of springs within the urban area. In a generally dry region, Jinan's numerous waterways and springs, making it a unique place that attracted poets, nobles and scholars. This role was further enhanced by Confucius. Culturally, it is the birthplace of Confucianism as he developed his philosophy in this region, which attracted generation of followers. Finally, as the only large mountain standing amid the flat North China Plain, Taishan Mountain served as the royal ritual location for ancient emperors.

EXISTING PROBLEMS

The Yellow River and Taishan Mountain keeps exerting influence on the city. In recent years, however, the interplay between the city, the river and the mountain changed. After the Yellow River took over the riverbank of Jishui River, it caused frequent floods. Meanwhile, with its lush vegetation and better view, the mountain keeps attracting development towards

Figure 3: Sequence 1
Yellow River and Mt Taishan

Figure 4: Sequence 2
Waterway Network

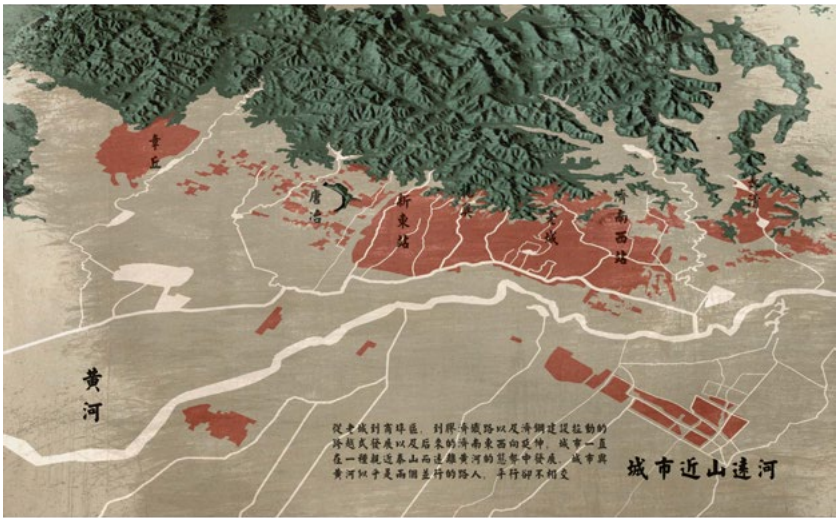


Figure 5: Sequence 3
Existing city footprint

it. Thus the city gradually shied away from the river and spreads into the mountain. Several negative impacts resulted from this growth shift.

First, there were serious environmental impacts. As urban development eroded into the mountain and reduced ecologically sensitive zones, the aquifers that feed the springs were affected and many stopped flowing.

Transportation-wise, as the city keeps expanding to the east and west following the foothill, the urban form stretched into a ribbon. The traffic demand between the east and west over-burdened the infrastructure and cause exacerbating gridlock. Adding to this problem, Jinan developed a strong and growing industrial base on the east, causing increasing number of blue-collar workers to commute to the center, further burdening the already overloaded roads.

Lastly, there were issues implementing previous master plans. An effort to encourage development across the Yellow River to the north (named "Cross River Strategy"), was not succeeded due to the formidable costs of new bridges to cross the river and the high cost of building infrastructure on the north shore. Also the fast urbanization in Jinan often outran the targets set in the existing plan, even with their relative short 15 year planning horizon. As a result, actual progress was far from ideal. Today, paradoxically, growth forecasts predicted a growth slow down.

All of these existing problems encouraged the city to revise its plan and to rethink its growth strategies. As a result, the city decided to revise its master plan and to carry out a regional study. The team of Calthorpe Associates and China Sustainable Transportation Center was commissioned to perform the study.

DEVELOPMENT OF THE PLAN

With compact development in mind, the plan looked for growth opportunities close to the existing built area. One thing caught the planners' attention: with continuous heavy investments in hydrological engineering, the Yellow River has now become well maintained and the flooding possibility is greatly dropped. The lush and spacious flood buffer with views to the river could become a major open space amenity. Also the land south of the river that is vacant or under-utilized, due to prior flood concerns, could serve as a prime land for future growth. Thus the regional study proposed the first strategy (a grand vision): "Yellow River Parkway" & "Yellow River District".

The strategy comes with several benefits. First, the vision can redirect the urban growth northward to the bank of the Yellow River, relieving environment pressure on the southern part of the city where the aquifers lie. Secondly, unlike the Cross River Strategy, the "Yellow River District" is right next to the existing downtown where infrastructure and developable land already are available. Thirdly, the parkway will add an identity to the city. Besides, given the reputation of the Yellow River, the grand vision can be easily understood and remembered by Jinan citizens.

A second strategy involves land use changes and application of TOD planning methods to shape future growth. This will have several positive results. First, by setting up the green buffers (community separators) ecologically sensitive areas are reinforced. Second, land use recommendations have been modified so each growth area will have a more bal-

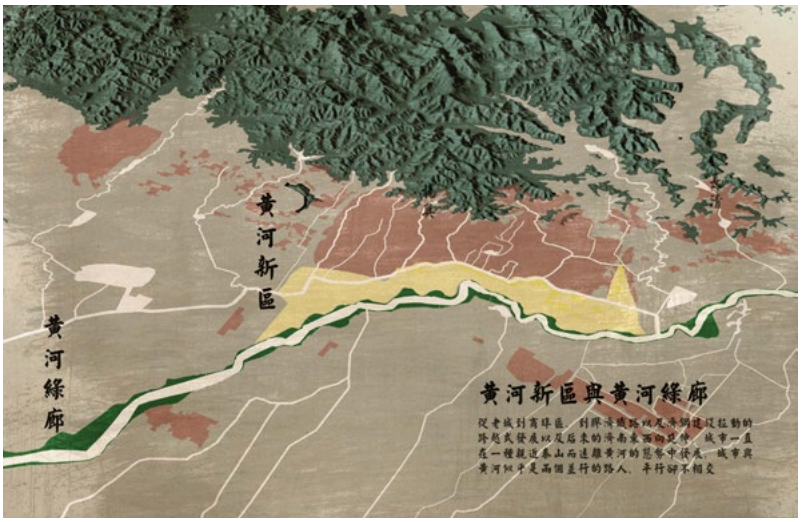


Figure 6: Sequence 4
Vision Yellow River Parkway and Yellow River District

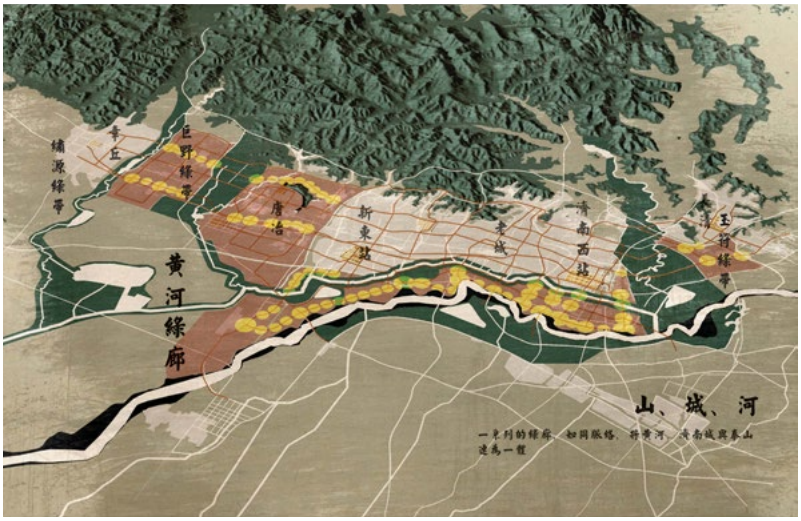


Figure 7: Sequence 5
Strategy Transit Oriented Development

anced job housing ratio, reducing long commute and relieving burdens on road infrastructure. Third, the plan calls for transit to be extended and used as the framework for organizing land use. This also benefits overall transit efficiency.

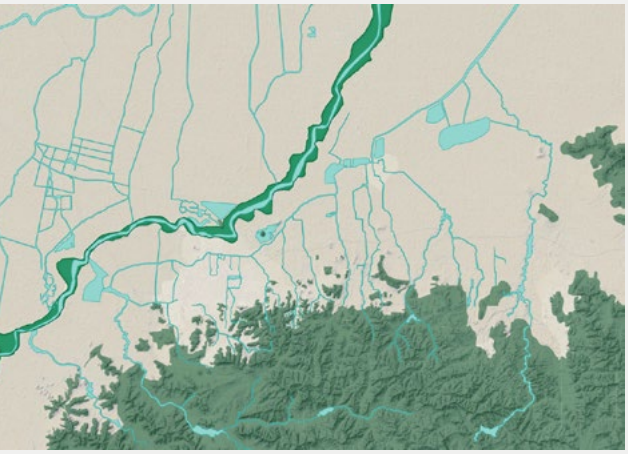
TECHNICAL DETAILS ON THE REGIONAL STRATEGIES

The above paragraphs briefly introduced the evolution of the plan; technical details and main procedures will be covered next.

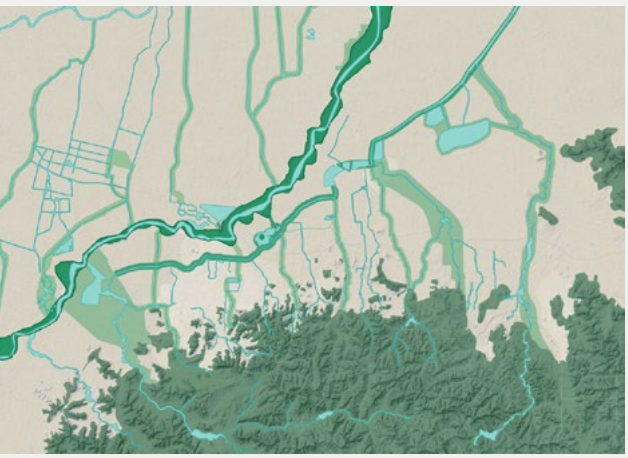
SITE ANALYSIS · DELINEATE OPPORTUNITY SITES

The first major step involves a focused site analysis to identify opportunity sites for redevelopment and future growth. This process involves the mapping of key site features, successively layered on top of the preceding data, resulting in clearly demarcated zones that are appropriate for the development of growth areas.

REGIONAL PLANS
GROWTH STRATEGIES FOR OPPORTUNITY SITES



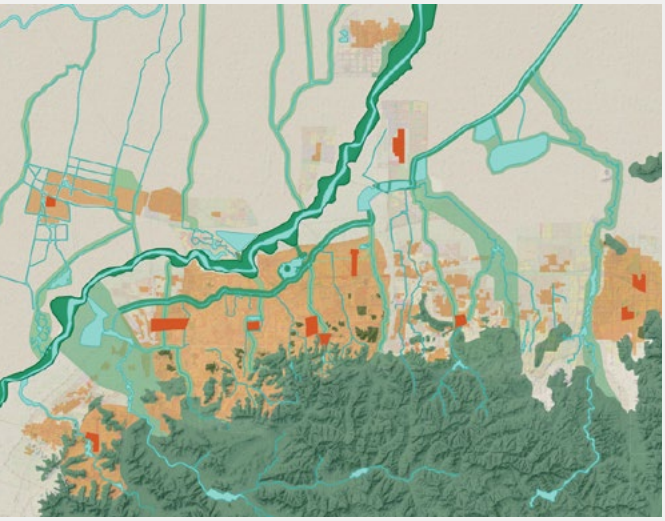
The starting point for the analysis is to understand the site within its natural setting. With an objective of designating areas for growth that do not disrupt ecological systems in the region. This step involves mapping environmental features and constraints using aerial maps, slope and elevation studies, and similar data. In the case of Jinan, the most valuable natural assets include the Yellow River, set within its levees and green buffer; the extensive riparian network of streams and rivers; the mountains including Taishan, one of the most important cultural sites in the country; and the numerous springs that Jinan is famous for.



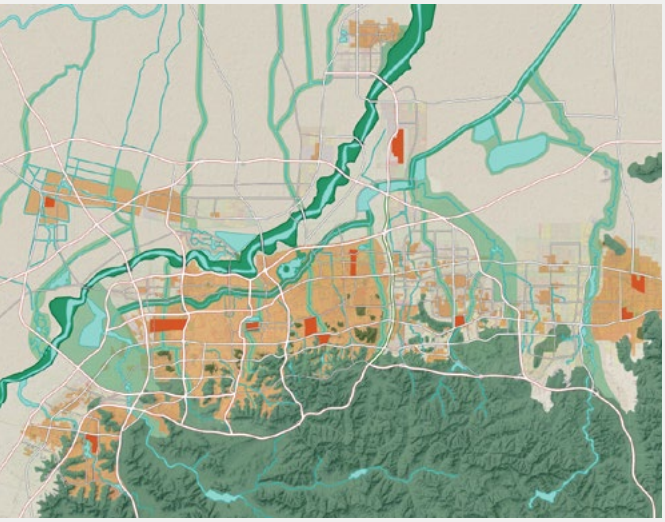
An analysis of the natural setting helped identify prominent ecological assets that should be preserved. These include the Yellow River, Baotu and Heihu springs, Xiaoqing River, Xiuyuan River and other rivers and streams; floodplains, reservoirs, farmland and the mountains that should be kept in their natural state to the extent possible. This is done by designating Eco Corridors - preservation zones that should not be part of future development. They also act as buffers between communities, and help shape growth areas. The Eco Corridors play a critical role in maintaining riparian connections, drainage patterns and habitat for local flora and fauna as a comprehensive, interconnected system.

REGIONAL PLANS

GROWTH STRATEGIES FOR OPPORTUNITY SITES



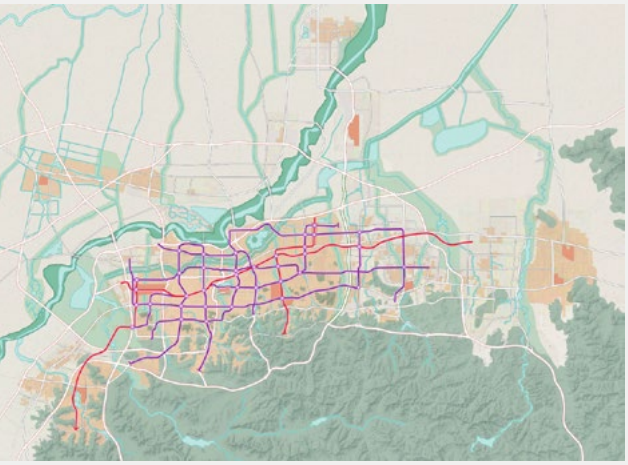
Once the Eco Corridors have been located, the next step is to identify built areas. This includes existing settlements and land parcels that have been sold or planned for special uses. When mapping existing development, it is important to consider existing centers and destinations that will influence future development as well as circulation and transit connections. These include existing and planned Central Business Districts (CBDs), retail centers, transportation hubs, employment nodes, tourist attractions, etc. Awareness of these destinations and centers will help guide future development as well as transit and highway connections, and strengthen linkages between the existing and future communities.



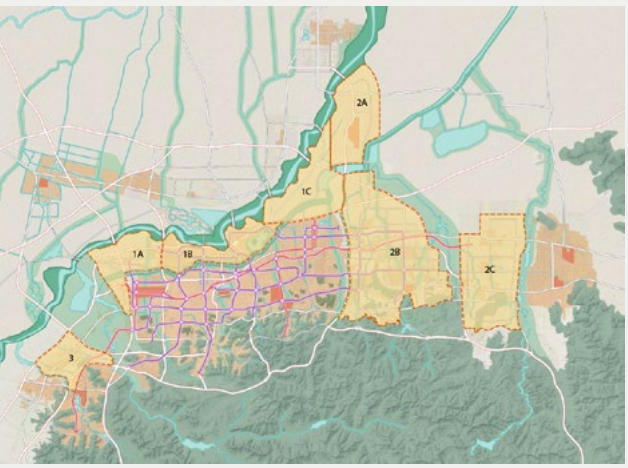
Freeways and expressways are an essential part of a region's circulation network, but also act as pedestrian barriers, in particular those that are grade-separated. In this step, major roads that are regional connectors, and will have fast-moving traffic, have been highlighted. It is important to note that in some cases, wide arterial streets (that are at-grade) may not necessarily act as barriers if they can be modified.

REGIONAL PLANS

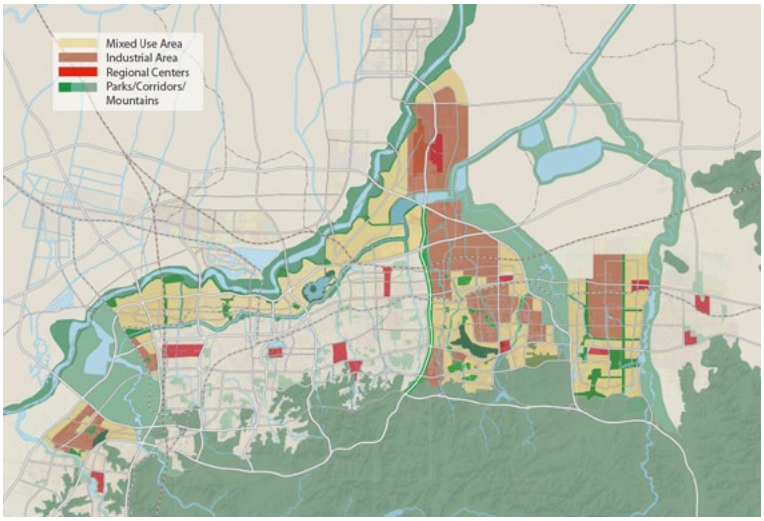
GROWTH STRATEGIES FOR OPPORTUNITY SITES



The fifth step after locating major roads is to map another critical part of the circulation network - transit routes, stations and transfer hubs. This includes High Speed rail, passenger and cargo rail, commuter rail, metro, light rail as well as BRT. Transit plays a vital role in the success of future centers and destinations, and is an important factor in determining future development densities as well as phasing.



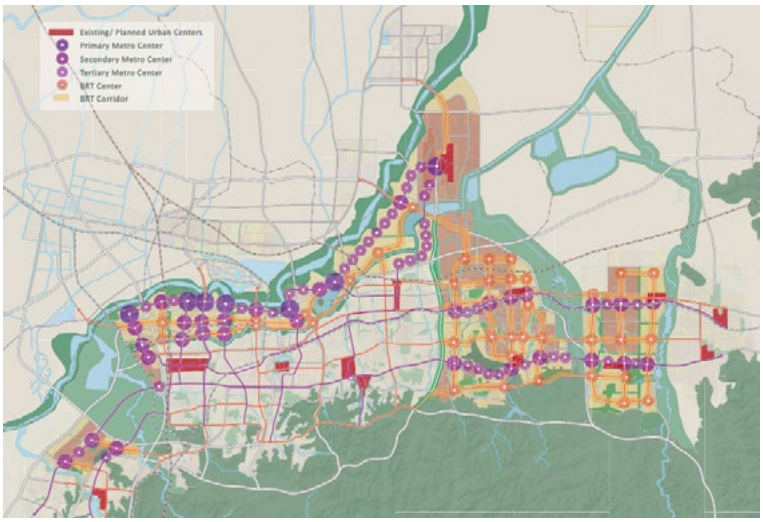
After layering relevant elements, suitable sites for future growth emerge. Most of these areas are at the periphery close to the existing development. Leapfrog pattern is avoided and infill opportunities are carefully considered.



REGIONAL PLANS · GROWTH STRATEGIES FOR OPPORTUNITY SITES

The planning process involves two stages. First it builds on the results of the Site Analysis and uses that information to propose transit extensions, modify elements of the circulation network and suggest land use changes if required. Secondly, the opportunity sites are further classified into Placetypes. Existing and planned regional destinations are taken into consideration as well.

The existing and planned land uses in the study area are analyzed to identify areas that will be retained as per the original master plan, and areas that have potential for renewal or redevelopment. The analysis also helps to shape future land uses in vacant or underdeveloped areas. To get a holistic understanding of the region, the detailed land uses are simplified into four categories: Mixed Use Areas (consisting mainly of residential, commercial and supporting uses), Industrial Zones, Parks and Recreation; and Preservation/Special Function Areas (including eco-corridors, reservoirs, heritage sites, etc.). Thus a clear picture is obtained of how residential and non-residential areas are distributed; and also open space amenities and corridors that can act as Community Separators.



The final stage of the plan process is to locate Placetypes, the size and densities of which will be decided on the basis of transit capacity and access. Minimum density criteria have been established for each Placetypes with the aim of maintaining a jobs-housing balance at the city and regional scale. There are in total 7 Placetypes, including Mixed Use Area and Industrial Areas, as well as five types of Transit Centers:

- Primary Metro: located at a Metro-Metro transfer station; 1000 m walk radius
- Secondary Metro: located at a Metro-BRT transfer station; 800 m walk radius
- Tertiary Metro: located at a BRT-BRT transfer station; 600 m walk radius
- BRT Center: located at a single Metro station; 600 m walk radius
- BRT Corridor: located along a BRT route, 800 m total width (400 m on either side of BRT route)

The standard for each of the Transit Centers are generated through comparable cases in Jinan and the numbers are listed below:

ASSUMPTIONS FOR NEW GROWTH AREAS Place - type	Radius & Area	Population Density (People per hectare)	Jobs Density (Jobs per hectare)	Sq m per capita
Primary Metro Center | Metro-Metro Transfer Station	1000 m | 314 ha	300	150	33
Secondary Metro Center | Metro-BRT Transfer Station	800 m | 201 ha	300	150	33
Tertiary Metro Center | Metro Station	600 m | 113 ha	250	75	40
BRT Center | BRT-BRT Transfer Station	600 m | 113 ha	250	75	40
BRT Transit Corridor	800 m | Varies	200	50	50
Mixed Use	Varies	150	30	67
Industrial	Varies	10	100	

Figure 8: The existing levee roads flanking the river will be converted to a trail for pedestrian and bikes. Dense development will be encouraged south of the river (Yellow River District) to allow residents a grand view of the river and open spaces in the north

Figure 9: The high speed rail crosses the Yellow River before entering the city, and the bridge serves as a key gateway. By creating a sculpture park near the bridge, a welcome & arrival feature is created for high speed rail passengers

Figure 10: The Luokou Rail Bridge is one of the earliest rail bridges in China, dating back to 1909. It witnessed the late Qing Dynasty, the Republic of China, the Anti-Japanese War, the Civil War, the founding of People's Republic of China and it still serves the city today. By creating a park here, citizens and visitors will be invited to celebrate its history

Figure 11: Huashan Mountain holds the highest ground in the future Yellow River District, providing a panoramic view of the city. The park will be surrounded by high density development, allowing more residents to enjoy the feature

Figure 12: There exists a series of ponds along the river for aquaculture uses, which could be converted to wetland parks for education and recreation purposes

Figure 13: Spacious flood buffers are maintained along the river, especially at the curves. These areas offer opportunities for people to get close to the water

This method is different from conventional regional plans, where a target number of jobs and population would be arrived at through growth projection or environmental capacity evaluation. Basically what the plan tells the city is: If the future growth is guided by transit and developed in a compact way similar to chosen comparable, then the growth area could accommodate this number of jobs and population.

LANDSCAPE CONCEPT

The highlight of the regional study is the vision of "Yellow River Parkway". In order to visually communicate the idea, a team of landscape architects from China Sustainable Transportation Center was brought in to perform an illustrative landscape study (see Figure 8 - 13).

SUMMARY

The Jinan we have today is a city that enjoys the natural gifts of springs and mountain, but leaves behind the Yellow River. It is a city with strong growth momentum but in need of a right direction, without which traffic condition, infrastructure efficiencies and quality of life would suffer and ecology may deteriorate. It is also a city without a clear vision or identity.

The strategies applied in this regional study could be a cure that creates a better Jinan. It enables citizens to celebrate all the natural gifts, including springs, mountains and the Yellow River. It provides for a place where eco-corridors identify districts of suitable size that can support themselves with sub-centers and a healthy balance between jobs and housing. It re-establishes and strengthens the linkage between the city's growth and the Yellow River. ◆

DESIGNING FOR ORIENTAL ENVIRONMENTALLY FRIENDLY CITIES

SELECTED TYPICAL CASES FROM URBAN DESIGN PRACTICES IN CHINA SINCE 1980S

WANG JIANGUO · CHEN HAINING

Figure 1: Bird View of Niushou Hill Tourist Service Center Design Project, Nanjing. Photo credit: Xu Haohao

URBAN DESIGN DEVELOPMENT IN CHINA SINCE 1980S

Urban design is rooted deeply in the long and broad history of Chinese civilization. Geomantic omen, arts and culture, poetry and literature; the wisdom of creating human settlement environments on the earth totem has long been blended into city building activities by Chinese ancestors. Today, in the scenes from those famous ancient Chinese paintings, such as *Dwelling in the Fuchun Mountains* by Huang Gongwang and *Along the River during the Qingming Festival* by Zhang Zeduan, we still can have a glimpse of life-scene scrolls blooming harmonious dialogues between mountains, waters and human settlements. These paintings illustrate the ancient oriental idea that "man is an integral part of nature". Beijing, Nanjing, Xi'an and other national historic and cultural cities have all embodied this Chinese traditional ideology and philosophy of urban design. Although this idea is shared by other ancient capital cities, the methods of building these cities vary to reflect their diversity rooted in regional culture and differentiate their collective aesthetic cognition. For example, Beijing and Xi'an were built to follow ritual urban design principles where the imperial palaces were located in the centers of the cities, while Nanjing was built with a more organic and flexible form in response to the special natural environment.

Generally speaking, modern urban design originated in the United States, but studies have also established China's own theoretical and methodological framework (Wu, 1999; Qi, 1997; Wang, 1991 & 1999; Lu, 2005). The discipline of urban design in China originated in the 1980s and was further developed in the 1990s. Meanwhile urban design practices have rapidly developed with three new development trends: 1) increased emphasis on low-carbon society and sustainable development; 2) the improvement of design methods thanks to digital technology advancement; and 3) the influence of changing ideological trends from contemporary arts.

The contemporary rise of urban design started in the western countries. However, with the dynamic process of urbanization on a global

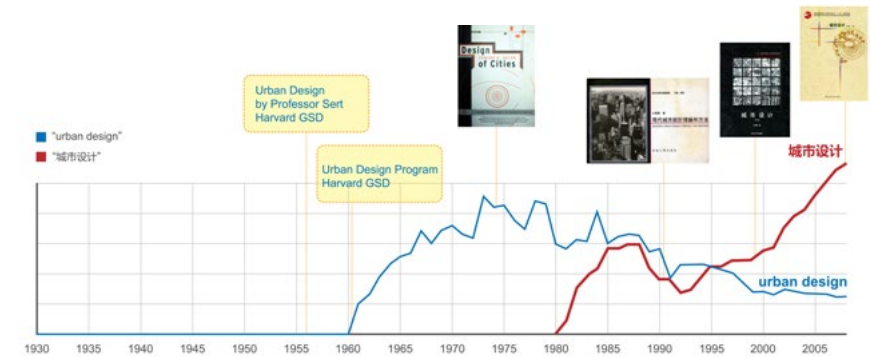


Figure 2: Key Words Search Results of "城市设计" ("Urban Design" in Chinese) and "Urban Design" in Google Book Database (Up till 2008)

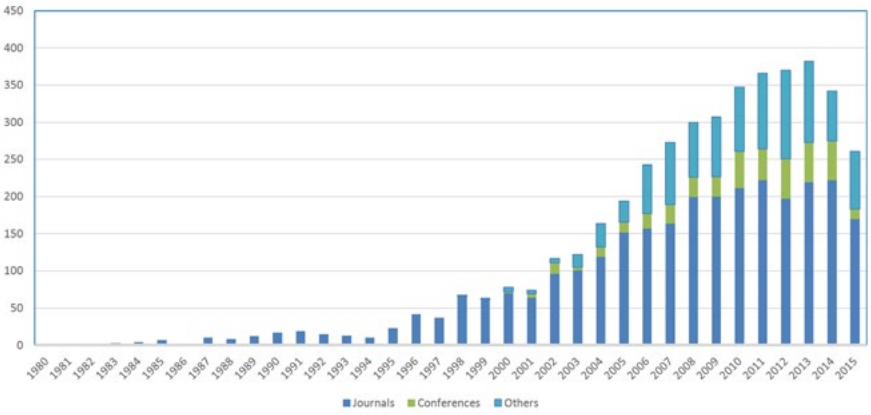


Figure 3: CNKI Literature Index by the Key Word "Urban Design" in Chinese

context, urban design has gradually become the new hot point and an opportunity especially for China. The vitality and popularity of urban design in China, in spite of its late arrival, could be distinctly seen in Figure 2 and Figure 3. Reflecting a phase-difference, there is a gap in the development of urban design practices in China and the West, where changing characteristics and trends are clearly shown in the chart. In the mid-1990s, urban design in China was characterized by "vast acreage and large quantities". During this period, a large number of projects had the potential to be implemented and a part of conceptual urban design projects proposed realistic requirement to be quickly implemented simultaneously.

More recently, European and American countries have entered a stable phase of urbanization in recent decades. Consequently, few new large-scale projects have been implemented in the West. Correspondingly, most urban renovation projects were industrial transformation (eg. Gantry Park in New York City) or urban regeneration (eg. Big Dig in Boston). These projects were usually small in scale and located in a quite completed urban structure. Therefore, the urban design schemes mainly focused on the physical environment with particular concerns on scale and form that are related to people's activities and visual perception. In comparison, less attention was paid to study urban form at the macro level. Many architects were involved in these projects with the aim of stimulating local vitality. For instance, Rem Koolhaas completed the development plan for the Zollverein XII Colliery on the outskirts of Essen in Germany, and his urban design scheme for reconstruction of the central area of Almere, Netherlands was partly implemented as a catalyst to activate the old area. Norman Foster won the bid with his urban design proposals for urban renovation of Duisburg Inner Harbor. Jean Nouvel was involved in the regeneration of the Winterthur Industrial Zone next to Zurich, Switzerland.

Going back to the context of China, the Central Urban Work Conference was held in Beijing on December 20th and 21st, 2015. It was only the second time that Chinese leaders had held such a conference in 37 years (Xinhuanet, 2015). Several key points were highlighted in this conference and as a result the national importance of urban design entered a new era:

- It insisted on intensive development to establish the concepts of "smart growth" and "compact city", and delimited the development boundaries of cities scientifically in order to drive urban development from "denotation expansion" to "connotation promotion", namely the "new normal".
- It enhanced urban design, advocated city repair, and enhanced publicity and mandatory regulatory detailed planning.
- It enhanced planning and management on spatial stereoscopic, planar compatibility, feature integrity and cultural continuity so as to retain the specific "genes" of regional environment, cultural characteristics, architectural styles etc.
- It promoted efforts to build city spirit by preserving the historical context and cultural heritage, combing it with the historic inheritance, regional cultural and era requirements.
- Finally, it promoted planning levels while affirming the scientificity and authority of urban planning to accelerate "unity of diversified planning", as well as comprehensively carrying out urban design and improving architectural policies in the new period to scientifically draw schemes of "growth coordinates" for the cities.

Above all, since the middle of the 20th century, the international development of urban design peaked between the 1970s until the 1980s, then the attention on it gradually declined. Comparatively, development of urban design in China emerged a small climax in 1985; later after some fluctuations, the attention on it kept rising until December 2015, when "enhancing urban design" was proposed in the Central Urban Work Conference. So far most urban design projects in China were orchestrated and implemented based on various levels in the nation's specific statutory urban planning hierarchy. However, in the last thirty years of its evolution, while absorbing traditional characteristics and the successful experiences internationally, urban design in China also incorporated Chinese urban design characteristics and Chinese ways of social practice. That is to say, it has developed its own framework of urban design in terms of

both theory and practice, which is multilayered, multi-dimensional, and multi-model that integrates urban design with statutory urban planning (Wang, 2013), ranging from overall urban design to district urban design and plot urban design, along with ranging from preposition to the same time and postposition.

TYPES OF URBAN DESIGN IN CHINA WITHIN ITS OWN FRAMEWORK

After more than sixty years of development, urban planning in China has formed a comprehensive framework of laws and regulations, management system, and technical methods which created work contents at several levels including overall urban planning, district urban planning and regulatory detailed planning. Nevertheless, there still exists some problems that urban design is absence, it is unique worldwide and has achieved great success depending on particular development opportunities. In brief, besides its controlling and guiding roles, with close connections and interfaces to statutory planning in urban management, Chinese urban design practices, since 1980s and especially since the new millennium, could be roughly categorized to the following types:

Conceptual urban design which is a visionary design for future cities based on independent assessments. It is most frequently used in urban area that do not have explicit possibilities and it usually takes the form of a competition whose focus might be ecology, locality and etc. The possibilities of these cities are then discovered by evaluating all of the proposals at different levels. A good example of a conceptual urban design is the *Planning and Design Proposal for World EXPO 2010, Shanghai.*

Thematic urban design which is more flexible with distinct referring, mostly focuses on one or two aspects of a systematic issue. There are mainly two types; one *gives priority to ecological concerns*, and the other *aims at heritage preservation*. A good example of the thematic urban design giving priority to ecological concerns is *Planning and Design Project for the Philanthropy Park in Sun Yat-sen's Mausoleum, Nanjing.* Another good example of the thematic urban design aiming at heritage preservation is the *Urban Landscape Design Project for the East Bank of the West Lake, Hangzhou.*

Practical urban design focuses on spatial construction, restructuring and optimization, including the development of a unifying design for a group of buildings. The *Niushou Hill Tourist Service Center Design Project* in Nanjing is an example.

Moreover, several universal propositions are presented in urban design in China. Our cities are experiencing the new historical period characterized by a shift "from denotation to connotation, from quantity to quality, and from increment to stock". It is a period when urban development is more likely to be driven by innovation, therefore the role of urban design or architectural design in this environment is to create high quality human settlement environments with urban attributes. "Catalyst" projects and pilot projects are set in cities to stimulate citizens' imagination for the sake of generating urban vitality. Green urban design based on the idea of "ecological priority" is comprehensively carried forward. Creativity of urban design plays an increasingly important role in historic heritage preservation and regeneration to retain collective memories of "urban nostalgia" and "rural nostalgia". Innovative practices of large-scale urban design on the general level blossom into new hot points, and there is more and more emphasis on urban growth and the guidance of citizens' social needs as opposed to a design emphasis focused on squares, wide roads or street spaces.

SELECTED TYPICAL CASES FROM URBAN DESIGN PRACTICES

PLANNING AND DESIGN PROPOSAL FOR WORLD EXPO 2010, SHANGHAI

The Planning and Design Proposal for World EXPO 2010 in Shanghai is a representative case of conceptual urban design. It is a "catalyst" project which aims to stimulate citizens' imaginations and to enhance the city's vitality. Spanning both riversides of the Huangpu River and located at its bends between the Lupu Bridge

Figure 4: Bird View of Planning and Design Proposal for World EXPO 2010, Shanghai

and the Nanpu Bridge, the Planning and Design Proposal for World EXPO 2010 in Shanghai covers a total area of 6.68km^2 with an enclosed zone of 3km^2 in planning. Four exhibition areas were planned on the cross structure formed by the Huangpu River as the horizontal axis and a central EXPO axis rectangular to it, which were to be constructed between the Pudong and the Puxi EXPO parks. In Pudong, the International Exhibition Area and a separate Exhibition Island of China were to be built, the major functions of which were exhibitions, communication and mega-events. In Puxi, the Exhibition Area of Corporate Pavilions and the Urban Practice Area were to be set up to highlight China's industrial development in modern times and to unfold the culture and life of the port city. The site's transportation network was planned and designed with full consideration of traffic characteristics and intensity during the period of EXPO, as well as demands from post-EXPO development. The transportation system was multi-modal, including subways, light rails, buses, vaporettos (water taxis), bicycles and walking.

The architectural design embodied the idea that "harmony is most precious", which is the traditional Chinese idea of landscape philosophy. It adopted the design strategies of "urban topography" and "architectural topography" which would suffice to form earth landscape. It also comprehensively took into account the issues such as how to plan the pos-EXPO utilization of the venue, how to handle the relationship between the retained structures and the removed structures, how to organize the comprehensive transportation system, and how to achieve an anti-terrorism design. Green technologies which include passive insolation and ventilation were to be incorporated within the architectural design of the China Pavilion. The China Pavilion and some of the rental pavilions would adopt the giant steel reticulated shell structure to simulate shapes of mountains, forming spacious exhibition spaces inside. The crust of the mountain-shape structure had characteristics from ecological technologies with multifunc-

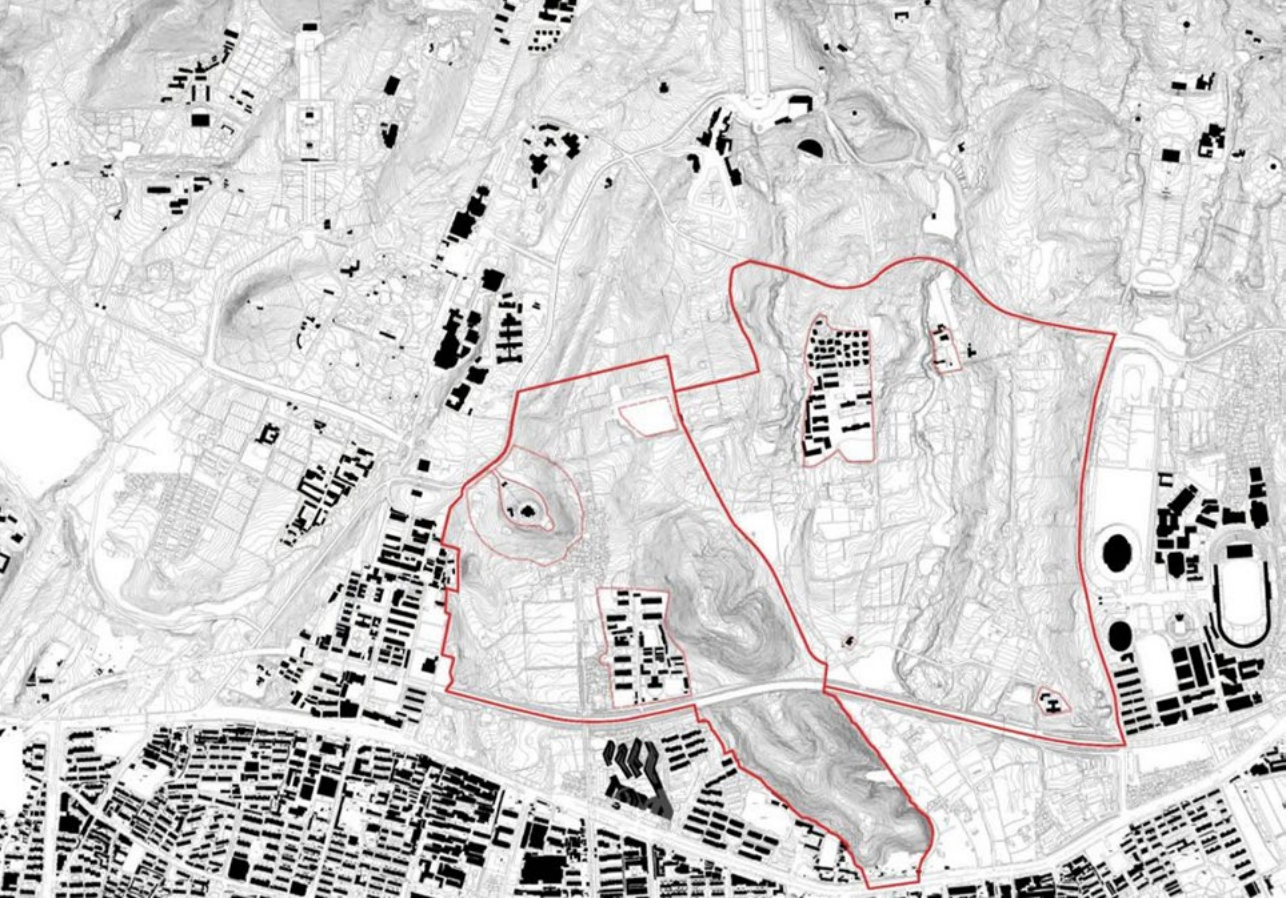


Figure 5: Figure-Ground Relation Pattern in Planning and Design Project for the Philanthropy Park in Sun Yat-sen's Mausoleum, Nanjing

tional and sustainable utilization values, giving a nice interpretation to the design idea of "scenic cities" with duality from both sides of form and technology. The planning and design was aimed at setting up a philosophy of ecological human settlements in accordance with the idea of sustainable development and an urban paradigm of a new Shanghai, expressing the principles of peace, progress, equity and efficiency.

PLANNING AND DESIGN PROJECT FOR THE PHILANTHROPY PARK IN SUN YAT-SEN'S MAUSOLEUM, NANJING

Under the common sense of sustainable development, there are some major concerns for contemporary urban design, for example, bioclimatic condition and natural situation. By creating a pleasant environment and giving reasonable utilization of natural resources, urban design could effectively facilitate sustainable urban development (Wang, 2013). Nowadays, influential factors on sustainable urban development related to urban design include environmental protection, energy utilization, etc. The Planning and Design Project for the Philanthropy Park in Sun Yat-sen's Mausoleum in Nanjing is a typical case belonging to thematic urban design which gives priority to ecological concerns. It is an example of the ecological practice in green urban design based on "ecology priority" principles.

The Philanthropy Park is located in the southern part of the core scenic area in the Scenic and Historic Area of Zhongshan (also known as the Purple Mountain) in Nanjing, near to the south of Sun Yat-sen's Mausoleum. The park is an integral part of the scenic area and is also the important node for the east portal of the main city. There are abundant natural resources in the 231.78hm^2 large scenic area which also has profound historical and cultural accumulation.

Prior to the park's development, the site contained a mix of land uses, with several villages and a driving school built on rented farmland. Such a kind of situation did not match the national scenic area as they create problems in

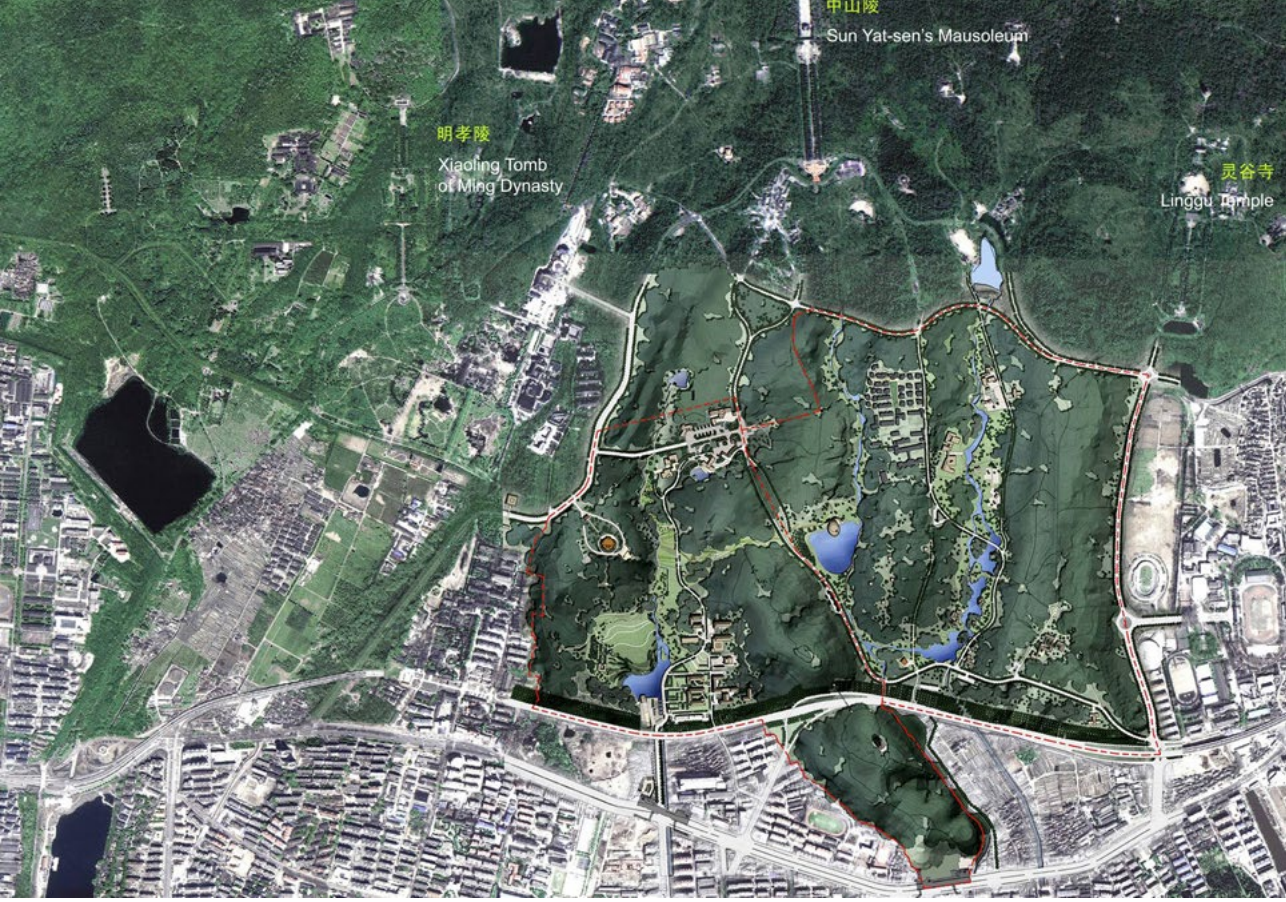


Figure 6 (top):Master Plan of Planning and Design Project for the Philanthropy Park in Sun Yat-sen's Mausoleum, Nanjing

Figure 7 (bottom): On-site Photo of the Philanthropy Park in Sun Yat-sen's Mausoleum, Nanjing

Figure 8: Comprehensive Analysis of Vegetation Map (From Left to Right: Analysis of Tree Species in Vegetation, Analysis of Tree Ages in Vegetation, Analysis of Canopy Density in Vegetation)

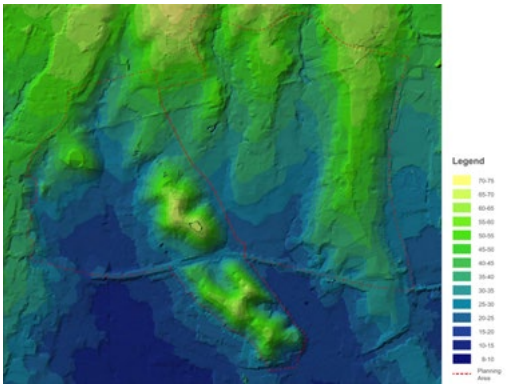


Figure 9: Terrain Elevation Analysis

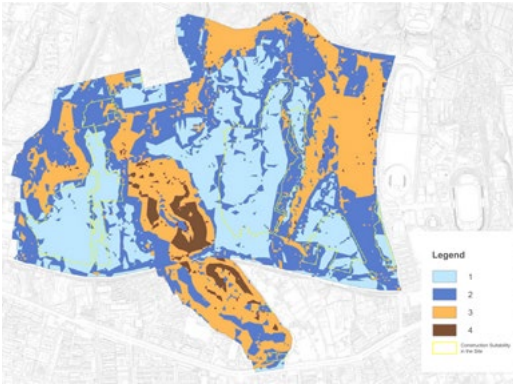


Figure 10: Comprehensive Analysis of Construction Suitability in the Site

functional organization as well as planning problems related to planning administration on land uses. Besides, the site consisted an extraordinarily complicated natural environment consisting of conditions covering terrain and topography of the site, vegetation and forest form, geological and hydrogeological conditions, and catchment areas. As a result, the project adopted the working method to integrate urban planning, architecture, history, ecological landscape, transportation, tourism planning and computer technology using multidisciplinary collaboration. The technology of GIS was comprehensively applied as the analytical approach to conduct terrain elevation analysis and slope analysis, and to map attributes of the site, such as the distribution of tree species, tree ages and canopy density in vegetation. Superimposition analysis through the "multi-layer cake" way aggregating all comprehensive analysis came to the conclusion of construction suitability on the basis of natural and environmental sensitivity in the site. Using this analysis, project planning and design was accomplished with a moderate environmental impact.

The planning and design efforts resulted in the careful locations of new buildings in the sensitive natural environment. Historic architecture design methods were analyzed and applied to influence the design of new buildings, learning from traditional and classical architectural works that have harmonious relationship with mountains and waters in the surrounding areas. The project has established an information inquiry and management database to be used in planning and design together with management of the scenic area. Doing this effectively guarantees that the achievement of the project would be foresighted, scientific and feasible, providing the necessary technical support for future renovation and well-organized construction of the environment in the scenic area.

URBAN LANDSCAPE DESIGN PROJECT FOR THE EAST BANK OF THE WEST LAKE, HANGZHOU

West Lake is an exceptional example of traditional Chinese landscape gardens combining with a long history and great cultural connotations. The Urban Landscape Design Project for

Figure 11: Bird View of Urban Landscape Design Project for the East Bank of the West Lake, Hangzhou

the East Bank of the West Lake in Hangzhou is another typical thematic urban design but this one focuses on heritage preservation. It is an innovative large-scale overall urban design as well as an urban landscape promotion project intended to have West Lake designated as a World Cultural Heritage Site by UNESCO. The project won the first prize in an international design competition and has been adopted to deepen and carried out. The scope of the project includes research about the 168km^2 large main city of Hangzhou, and the focused renovation area which is the 45km^2 large area on the east bank of the West Lake.

The planning and design began with the study of maps showing the formative evolution of the West Lake and the study of historic maps which document the evolution of the banks of the lake with both its natural history and cultural history. These studies were undertaken to clearly understand and document its scenic values and the reasons why it has wide-ranging influences both domestically and internationally. The research was driven by the core values judgment of the West Lake landscape system which are: 1) natural paragon of oriental mountains and waters; 2) humanistic paragon of building activities for thousands of years; 3) aesthetic paragon of delicate beauty and grace; and 4.) place paragon of public activities. The relationship between "city, lake and people" and the 5.9km2 large open water surface which is the "dynamic random sightseeing face" to enjoy the urban landscape were the key entry points of the project.

Discussing about the "dynamic random sightseeing face" as the key entry point, the new method of urban landscape design based on dynamic random viewpoints supported by GPS and GIS techniques in this project is going to be elaborated. The classical method of urban landscape design is more about the analysis of the relationship between architecture and horizons, while urban landscape is mainly realized through visual medium (more than 60%). Some examples are the classical analysis of square sizes following the perspective of classical aesthetics by Rob Krier, and the

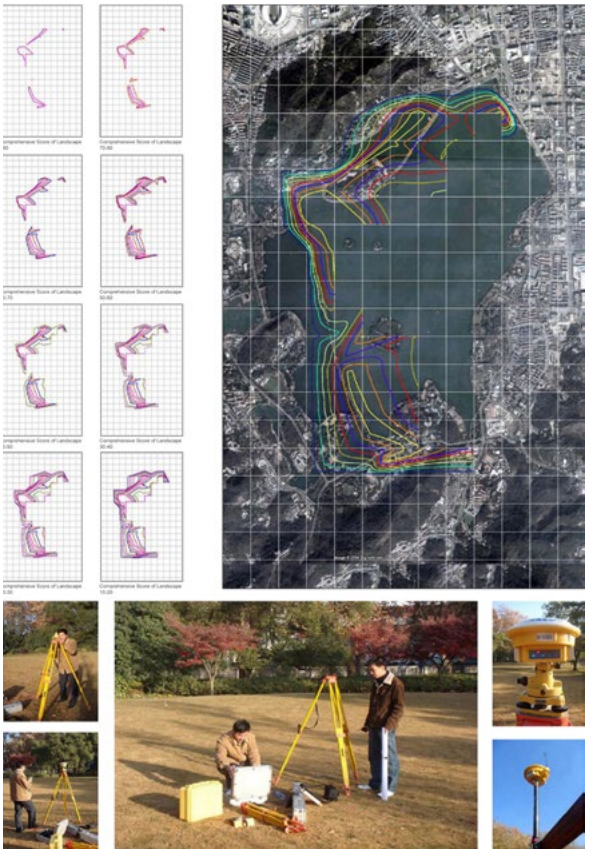


Figure 12: Selection of the Viewpoints and Determination of the Visual Isopter

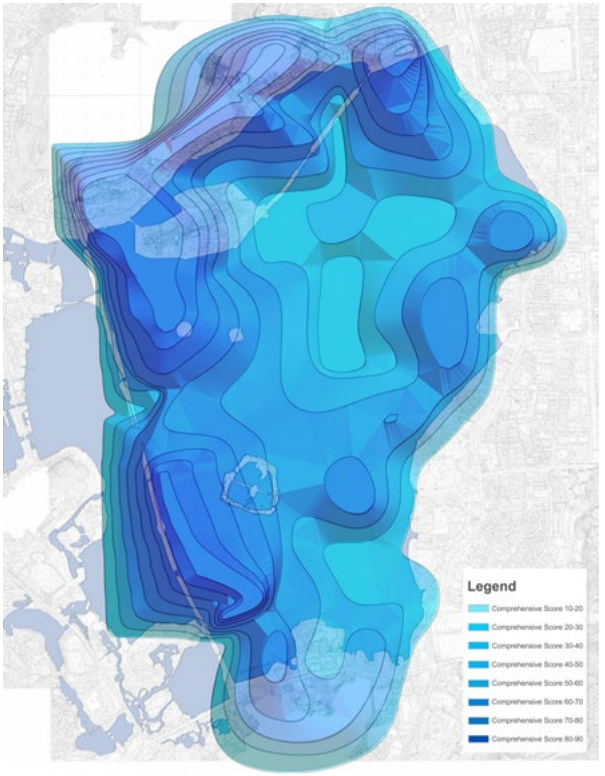


Figure 13: Visual Isopter Generation in Computer

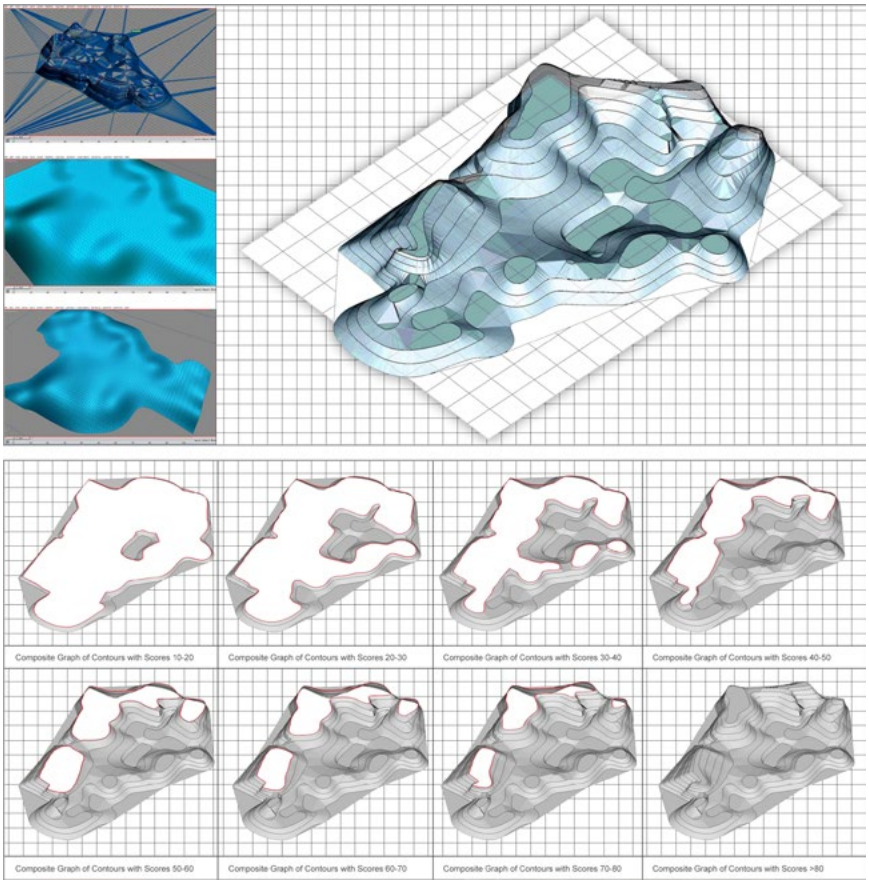


Figure 14: Contour Generation in Computer

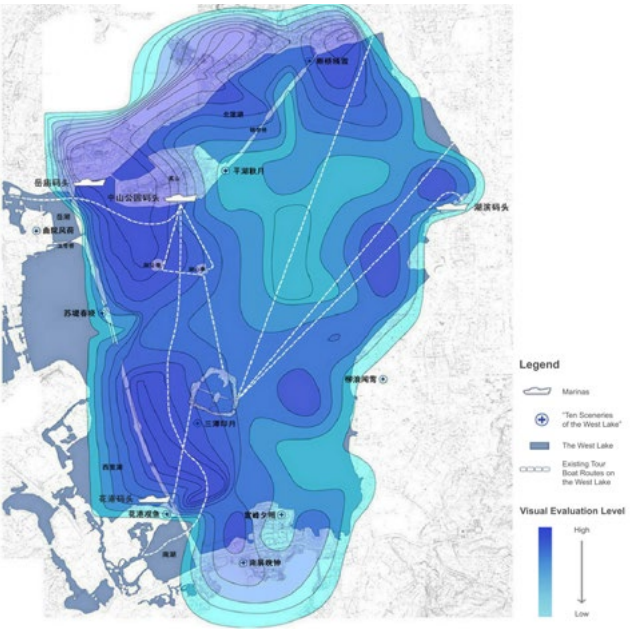


Figure 15: Superimposition of the Existing Tour Boat Routes on the West Lake and the Landscape Visual Isopter

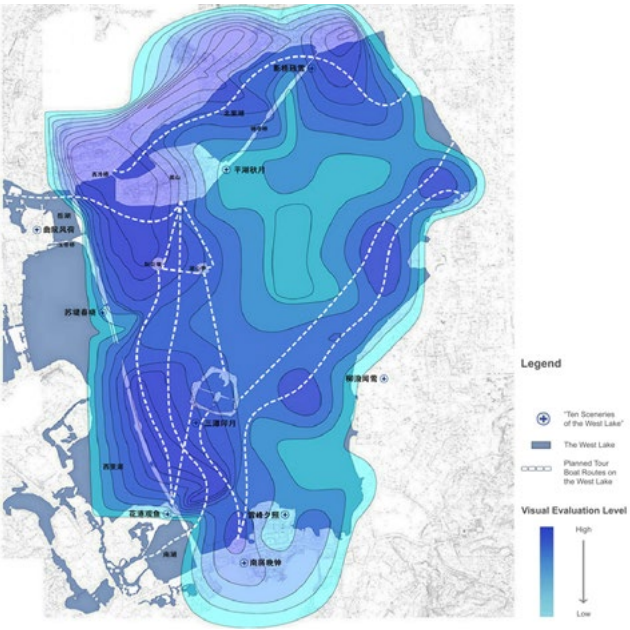


Figure 16: Superimposition of the Planned Tour Boat Routes on the West Lake and the Landscape Visual Isopter

analysis of sizes of renaissance plazas in the book Civil Art (Hegemann and Peets; 1922, 1988). Cullen (1961) mentioned "series visions analysis" as understanding space is not only at viewing, but also at passing it through movement. People can consciously use a group of moving viewpoints and some static viewpoints to choose suitable routes (usually the routes where people assembled) for doing observation of visual characteristics and properties of space, and for doing simultaneous real scene records in correspondence with the plans (Cullen, 1961). In reality, there are also many classical examples of series visions analysis; the design for the group of buildings in Acropolis of Athens follows the basic principles of static classical visual aesthetics, so does the Rome City Hall and the Capitol Square designed by Michelangelo. Urban design for the central area of Washington, D.C. was implemented through the method with a combination of landscape viewpoints and linear series visions from static classical aesthetics.

In a word, previous researches of Western landscape features mostly employ static viewpoints or linear series visions as the basis for designs. It is the dynamic sightseeing sequence that unfolds following a given route, driven by knowledge. However, in reality, people's ornamental activities have the essential characteristics of roaming. This is because roaming is a random and dynamic activity with "wandering", following one's inclinations and sense of discovery. It is the sightseeing activity that is easy to happen, pristine and decided by people's real-time characters. Essentially, random roaming is more important than static gaze, especially in an environment with planar viewpoints. Wandering routes were always set in traditional gardens, but most of them were preset in the design beforehand. Accordingly, landscape is formed with "scenery" and "sightseeing"; "scenery" is relatively static, while "sightseeing" is closely related to people's viewpoints, sight lines, sight places and activities. The relationship between static scenery and dynamic sightseeing has been an important unsolved question in academia for a long time.

The previous urban landscape design for the West Lake mainly depended on people's static landscape visual laws. In the new project, GPS and GIS techniques were applied to identify the coordinate positions of viewpoints in order to focus on solving scientific correlations between the random viewpoints of the West Lake landscape and the urban landscape. Generally, four steps were taken to establish the sightseeing relationship between the West Lake landscape and the tour route on the surface of the lake. Firstly, we identified sampling points on the surface (250m spacing grids), along the banks of the West Lake and at the commanding heights in surrounding areas. Secondly, we numbered the sampling points, then photographed the urban landscape of the east bank from each sampling point. We did sample evaluation for each one of them for the sake of measurement, rating and scoring based on landscape quality. Thirdly, we input data from all of the sampling points into computer to establish a digital model. The points with the same ratings and scores would generate "contours" in the computer to form a three-dimensional image which vividly reflected the ratings and scores which was then superimposition over the topography of the West Lake and surrounding areas. Fourth and last, we superimposed the splicing results with graphic expression to get the comprehensive evaluation charts which identify views from the lake surface towards the urban landscape on the east bank, namely the "visual isopter chart".

The next stage was to understand how tourist used the West Lake. The design team prepared a questionnaire and administered it to domestic and foreign tourists in order to gain various subjective information, such as tourists' usual sightseeing ways, sightseeing contents, staying time and sightseeing routes. From this information we did bayonet statistics on tourists visits to the West Lake including locational statistics on tourists' behavior. We then superimposed the "visual isopter chart" with the existing tour boat routes on the surface of the West Lake and considered the promotion effects of those routes for enjoying the "Ten Sceneries of the West Lake". Based on the preceding information, the optimal tour boat route was planned and designed, where it would pass the peak points on the visual isopter to the best of its ability. On the basis of optimizing the tour boat routes, the design proposed

Figure 17: Night Scene of Niushou Hill Tourist Service Center Design Project, Nanjing. Photo credit: Xu Haohao

the construction of “ecological floating islands” in the areas with the lowest landscape quality based on our comprehensive visual evaluation. This design idea followed the principle that “limit one's vision through a leaf to see the Mountain Tai”, keeping unfavorable landscape out while augmenting landscape layers and even adding new scenic spots.

Another important innovation in planning and design was the consideration of elevation in the park based on visual and air visibility analysis. The design divided the West Lake and the east bank area to four sightseeing distance levels[1]: less than 2 kilometers, 2 to 3.5 kilometers, 3.5 to 6 kilometers, and more than 6 kilometers. Using the Hangzhou meteorological data statistics as important references during the process, it did statistics on weather visibility conditions as a function of the year and the tourism golden months. Then the height guidance model was developed based on land attributes factors. Finally, air visibility isobars were superimposed on to the height guidance mode to determine the landscape security pattern used to control building heights in the visible range on the east bank of the West Lake. Finally, urban skylines were controlled on the basis of the skyline appearance distribution map, and the short distance, medium distance and long distance landscape distribution map.

The planning and design used scientific information such as GPS viewpoints positioning, landscape digital modeling, air visibility analysis techniques, and GIS height analysis scientifically, to reveal the relevance between "static scenery" and "dynamic sightseeing". Our approach overcame the deficiencies caused by designing through only a single viewpoint and a single sightseeing, which we discovered could not solve the scientific problems of dynamic random viewpoints and sightseeing roaming. The development of the composite sightseeing models contributed to the rational decision-making for successful urban design based on landscape features while acquiring the preliminary scientific "controllability”. Combining with other planning schemes, the outcomes have been implemented by Hangzhou Municipal Government, and had made a direct contribution to the West Lake's application as a UNESCO World Cultural Heritage Site.

NIUSHOU HILL TOURIST SERVICE CENTER DESIGN PROJECT, NANJING

The Niushou Hill Tourist Service Center Design Project in Nanjing is a good example of practical urban design. It is an example of architectural design with urban attributes, aiming to create a high quality human settlement environment through urban design. In China, there are mainly two legal approaches for implementing urban design; one is through the architectural design of building complexes for specific owners, the other is under the premise of urban planning implementation. This project is a building complex of a specific owner with site design based on urban design principles.

The building complex is located on the east side at the foot of the Scenic Area of Niushou Hill in Nanjing. Acting as the main entrance of the Scenic Area of Niushou Hill in the east, the Niushou Hill Tourist Service Center serves as the reception center for 50 to 60% of the total tourists to the Scenic Area, which means an average reception capacity of 10,000 visitors per day in normal peak days (weekends). The functions of the building complex include ticketing, exhibition, teahouses, sales, small-scale theatres and underground garages. The total area of the complex is around 95,000m^2.

The scenery of the Niushou Hill with rolling clouds and wreathing mists was one of the historic "Forty-eight Sceneries of Jinling (the ancient place name of Nanjing)", which described the natural scenery from hilly topography on the Niushou Hill. These views appeared indistinctly due to clouds and mists caused by the humid climate in Jiangnan (the region in south of the Yangtze River). During the conceptual design process, it was clearly recognized that what the building complex relied on were not some great mountains or precipitous cliffs, but the hilly natural base with its exquisite and graceful sceneries. Hence it was more important to have this conceptual expression reflected into the architectural subject values and to integrate the architecture into the environment. In fact, the building complex’s spatial design strategy had already highly respected the natural conditions of the Niushou Hill. It reasonably utilized the elevation difference in the site to shape the relationship between architecture and the hill while the archi-

tectural form is harmoniously blended in environment, to set the environment as the leading role while architecture is background for nature.

On the basis of reasonable utilization of the elevation difference in the site, the project tries to integrate Zen Buddhism's cultural elements and ideas as design elements into both public spaces and the tourists' routes for stepping into the Niushou Hill. Wind chimes ring on the tower, lotus flower patterns blossom on the ground of squares; all these Buddhist landscape design elements embody the sense of satisfaction. As a spatial guide, the design associates the tourists by means of vision stimulus, sense of hearing and psychological activities, with the Buddha Palace which is the main scenic spot on top of the hill. In this way, an identified building complex located at the east entrance accomplished form generation. The project has also made contribution to cultural context continuation. The whole building complex creates an atmosphere of religion and cultural tourism by incorporating the concise style of the Tang Dynasty, which was a glorious time and golden age for Buddhist cultural development in ancient China. With the folding dark grey titanium-zinc panel roofs and overhanging steel beams, the dialogue between tradition and modernity is interpreted. In the mood of the Tang Dynasty style, the graceful temperament that fits the locality is displayed.

By the way, in actual use the building has been a success. Given a reception task of around 5000 tourists on weekdays, around 10,000 tourists on weekends, and around 35,000 tourists on peak days, the project has shown effective pedestrian circulation and has a reasonable arrangement for the flow of traffic, which are the necessary supporting conditions for the operation of a tourist service center.

CONCLUDING REMARKS AND DISCUSSION

Sustainable development has already become a global consensus. Based on elaboration of urban design development in China since 1980s, China has established and developed its own theoretical and methodological framework of urban design, which has expressed itself with its typical types into urban design practices in the nation. It could be seen explicitly that there are some universal propositions and core values in Chinese urban design, which could be summarized as:

1) The cities in China are experiencing a new historical period of development "from denotation expansion to connotation promotion, from quantity to quality, and from increment to stock", and this has become the "new normal". The concepts of "compact city" and "smart growth" have been officially recognized which has resulted in delimiting the scientifically defined development boundaries of cities, as well as intensive development and efficient utilization of heritage.
2) There has been extensive attention on urban design from the national level to issues promoting local identities. At the same time, due attention in urban design has not only been given to the "grand urban narratives", but also to the "civilian narration".

3) Reasonable utilization of "catalyst" projects and pilot projects in urban design could help to stimulate citizens' imagination and generate urban vitality.

4) Urban design could be an important complement to the comprehensive framework of urban planning covering laws and regulations, management system, and technical methods to improve various levels of a city with specific themes. Especially, it could generate constructive guidelines for protection and recovery of large-scale urban spaces through the approaches such as green urban design based on "ecology priority" principles.

5) Urban design highlights the creation of human-oriented amiable spaces, focusing on the importance of historical and cultural connotations and urban collective memories.

6) Urban design, also includes architectural design with urban attributes, could be used to formulate creative schemes to improve the quality of the physical environment. For urban design projects at the micro-level, architects could have more advantages in spatial organization, form creation, aesthetic control and cultural manifestation.

All in all, urban design should develop on the basis of the national conditions, concerning total amount, capacity, stock, increment and quality. Concentrating the efforts from the government, the market and the citizens, urban design should more forward to build livable, vibrant and characterized modern cities. During such a process, the sustainable way of development should always be remembered. The Chinese ancestors never forgot to seek for telepathy and connections between cities and the natural environment during the process of creating cities. They observed those manners and orders from the laws from nature by designing a sense of breathing and relaxation in street spaces. The lessons created a human settlement environment on the earth totem.

Today, urban design practices rooting in China are becoming more and more mature from both of theory construction and technique methods, but they are still connected with their ancestry in the oriental scroll of natural mountains and waters. The ancestors in ancient China firstly got to know soil quality and water quality before building a city, and then to observe the night view of heaven and feng shui[2], showing great respect to nature. The urban designers in today's China are also exploring and making efforts on ways of design practices to insure oriental environmentally friendly cities. We sincerely hope all of the efforts could help to leave our descendants "with sights towards mountains and waters to remember rural nostalgia". ◆

ENDNOTES

1 According to accessibility and hierarchical laws of people's visual range.

2 "Feng shui" which literally translates as "wind-water", is a philosophical system in China since a long time ago, emphasizing harmonization between everyone and the surrounding environment. It is widely used to oriental buildings in an auspicious manner, always spiritually significant structures but also dwellings and other structures sometimes.

REFERENCES

Cullen, Gordon (1961) *The Concise Townscape*. New Ed edition. London; New York: Routledge.

Hegemann, Werner and Peets, Elbert (1922, 1988) *The American Vitruvius: An Architects' Handbook of Civil Art*. New York: Princeton Architectural Press.

Lu, Jiwei (2005) *Urban Design Mechanism and Practice*. Nanjing: Southeast University Press.

Qi, Kang (1997) *Urban Environmental Planning Design and Methods*. Beijing: China Architecture and Building Press.

Wang, Jianguo (1991) *Modern Urban Design Theories and Methods*. Nanjing: Southeast University Press.

Wang, Jianguo (1999) *Urban Design*. Nanjing: Southeast University Press.

Wang, Jianguo (2013) *Inheritance and Innovation, Selected Research Achievements from Urban and Architectural Design*. Nanjing: Southeast University Press.

Wang, Jianguo (2013) "Urban Design in China: A Retrospective on Its Development in the Early Twenty-First Century", *China City Planning Review*, Vol. 22, No. 4, pp. 26-35.

Wu, Liangyong (1999). *Meditation at Turn of the Century: The Future of Architecture*. Beijing: Tsinghua University Press.

Xinhuanet (2015) *Central Urban Work Conference Lays out City Development Guidelines*. Available at: http://news.xinhuanet.com/english/video/2015-12/23/c_134943090.htm (Accessed March 30th, 2016).

Figure 18: Night Scene of Niushou Hill Tourist Service Center Design Project, Nanjing. Photo credit: Xu Haohao

SPECIAL SECTION
INTEGRATING FOOD ONTO URBAN PLANNING

CO-EDITORS: YVES CABANNES
AND CECILIA MAROCCHINO

PREFACE

Mindful of the fact that food insecurity exists in all cities of the world, we propose the goal that existing and future cities must be adapted to ensure that all citizens are provided with proper nutrition. We propose that food, in all its various manifestations, must be a central element of all cities and that food considerations must be integrated into all future urban plans to insure the achievement of environmental, social and economic sustainability.

The reader of this special section will see that cities which have integrated food into their urban fabric are providing insights about how to enable other cities to feed all their citizens with nutritious, affordable and accessible food. The five articles presented in this section, taken from the book **Integrating food into urban planning** *coordinated by the Food and Agriculture Organization of the United Nations (FAO) and the Bartlett Development Planning Unit (DPU) of University College London* [to be launched early 2017]. The articles illuminate how food can shape our cities and what planners should consider to better integrating food into their practices.

The articles are interesting for several reasons. First they bring planning practices and solutions for cities and metropolitan regions with quite different cultures and sizes. The cases include: Bangkok with 8.2 million inhabitants in a Metropolitan Region (MR) of close to 15 million; Toronto with 2.6 million in a MR of 6.2; Belo Horizonte with its population of 2.5 million in a MR of 5.8 million; two cities in Indonesia: Yogyakarta, an intermediate city of 0.6 million with a MR of 3.5 and Surakarta [Solo] of about the same size with 0.5 and 2.6 million; and, finally Providence, a smaller size city of about 200,000 inhabitants in an urban region of 1.6 million inhabitants.

Second, our cases demonstrate that innovative food planning practices occur in places with quite different economic and demographic dynamics: in shrinking cities such as Providence where land voids existed and in fully urbanized regional capitals with stable population embedded in a Metropolis that are absorbing most of the demographic growth, such as Belo Horizonte. They take place as well in fast growing Metropolitan Regions such as Bangkok.

Third, they demonstrate that food security is a global concern. Even if food security challenges are more pressing and dramatic in Asian and African fast-growing cities of all sizes, food planning practices are more common in the Global North, primarily North America, UK or Australia. However, even in those countries, where food planning is more common, there still is a lot to be done.

Finally, our cases will show that the integration of food into urban planning is an emerging topic. We have selected the five cases reported in this section to provide the reader with a good cross-section of food planning activities. The professional planners reading these article will recognize that techniques available to traditional planners might be incorporated into the toolbox of food planning.

Despite the importance of feeding people properly, food planning is an underappreciated topic. For example, food is rarely part of planning agendas, be the planners from cities and local governments, United Cities and Local Government (UCLG) members, or international organizations such as the Cities Alliance, funded by a wide array of bilateral and multilateral organizations. Even the UN Habitat, the Agency of Cities, does not mention food as one of the persistent issues. While Habitat recognizes emerging urban challenges due to increased urban population in its State of the World Cities for 2016, food system planning does not appear as a programmatic element integrated in its vision of "*a city that plans*". To resolve this short-coming, and under the drive of the Food and Agriculture Organization of the United Nations (FAO), an expert group meeting took place in May 2016 in New York. Attendees included various of the authors from the book. As a result of this meeting one section on food security and its importance in cities could be included in the Revised Zero Draft of the New Urban Agenda that governments of the world will endorse during the next City Summit, Habitat III, in Quito in October 2016.

We are certain that readers will agree that there is an enormous synergist benefit through an integrated, multi-sectorial and multi-stakeholders approach to urban planning contributing to urban food security and nutrition challenges. With this in mind we are hopeful that this is the first of many food planning special sections in the ISOCARP Review.

Figure 1: The annual food fair in Lisbon, Portugal, on the Avenida da Liberdade. During this fair food producers display crops along the pedestrian walkways.
Photo credit: Yves Cabannes

INTEGRATING FOOD INTO URBAN PLANNING

YVES CABANNES · CECILIA MAROCCHINO

» Our central argument here is that the experiences contained in this volume, and in our upcoming book, contribute one way or another to each one of the ten principles for sustainable cities. «

Figure 2: Local market inMacao. Photo credit: Yves Cabannes

INTRODUCTION: CONTRIBUTION OF FOOD SYSTEMS TO SOME OF THE 10 PRINCIPLES ON SUSTAINABLE CITIES

In this introduction we would like to illustrate that food planning can contribute to the *eco-city we want* based on the ten key principles proposed by J.R Kenworthy in this volume. To do this we have selected articles from the DPU-UCL and FAO co-edited book to be launched in 2017 describing five food planning efforts from around the world which provide the reader with an overview of this emerging profession and which highlight successful emerging food planning tools. In this introduction we will also be enriching the discussion by referencing some food planning examples found in our forthcoming book. We feel that lessons from these projects could be usefully employed in other locations.

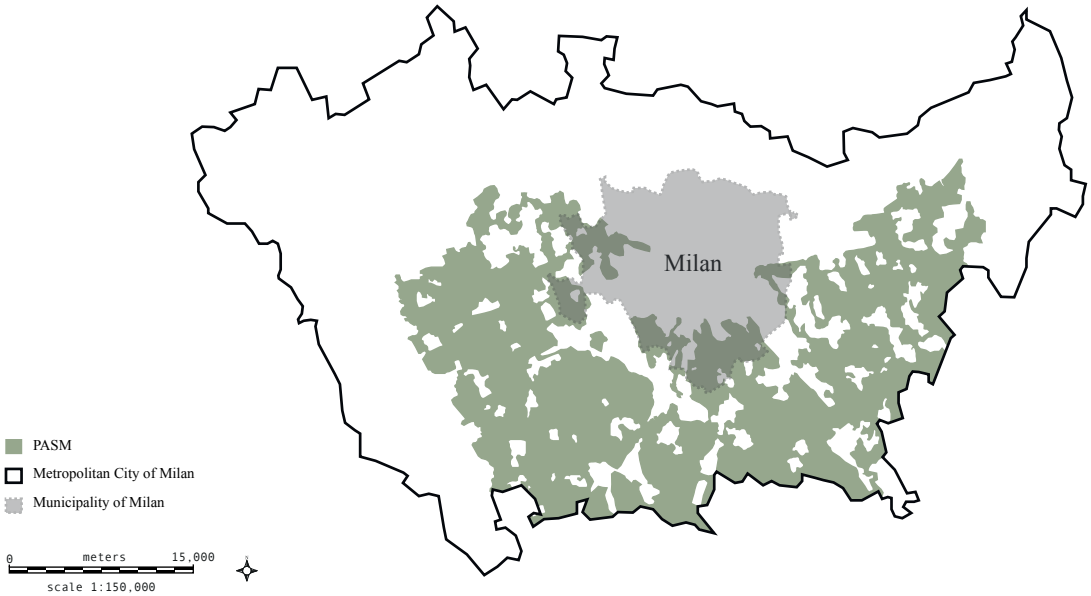
A first benefit shared by integrating food into urban planning is to **increase urban food security and nutrition.** This is achieved by addressing the entire food system in relation to supply, agro-processing, transportation and distribution through formal and informal channels. More specifically, several of these experiences show that integrating food into urban planning means: 1.) incorporating mechanisms for making nutritious and fresh food more accessible, mainly to the urban poor, and reducing overall inequalities in access (e.g. zoning promoting healthy food access and restricting fast food outlets); 2.) improving the functionality of food markets and distribution through spatial planning of cities and territories; 3.) promoting the use of public spaces and services for small food vendors/ entrepreneurs both formal and informal; 4.) improving the connectivity between urban and rural areas; and, 5.) prioritizing protective mechanisms for the preservation and expansion of urban and peri- urban agricultural land, promoting productive public spaces and improving the use of urban and peri-urban agriculture.

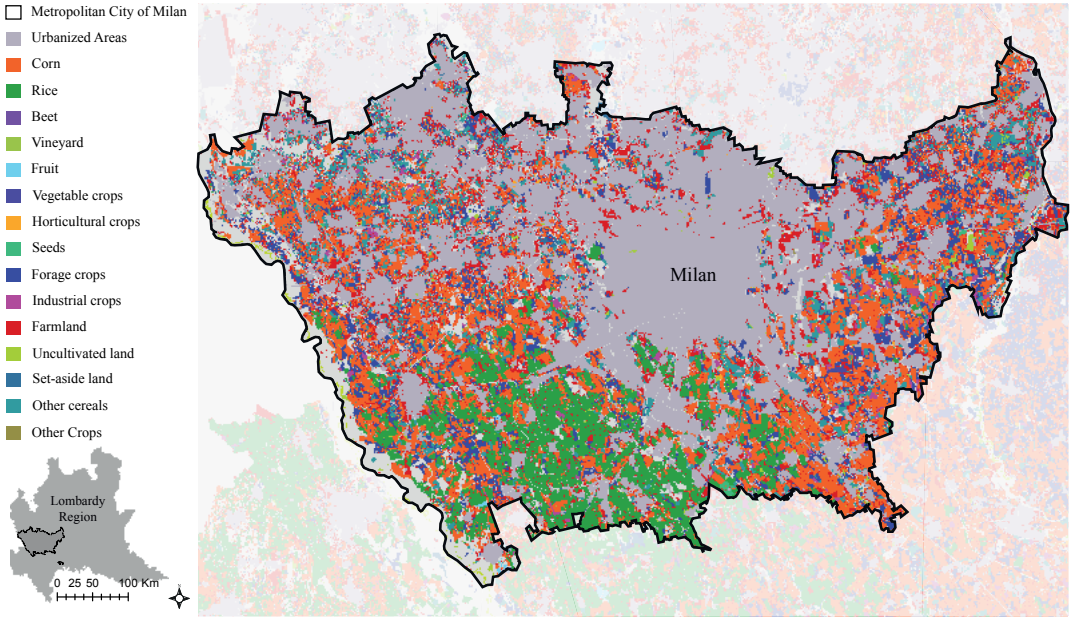
However, the benefits of integrating food into urban planning and developing regional food systems go way beyond the mere increase of nutritious food security levels. Key contributions relate well to the following dimensions of urban sustainability: 1.) *environment* (climate change adaptation, reduction of greenhouse gas emission and carbon food print, greening of cities, adequate and rational use of land and water, water treatment and recycling; 2.) *social* inclusion of a wide array of diverse social groups through urban agriculture, farmers' markets, mobile food vendors, allotments; and, 3.) *economic* development (numerous cheap and green jobs along the food chain, food related jobs from production, agro-processing, markets and waste management, both formal and informal with great potential for women and young entrepreneurs.

Our central argument here is that the experiences contained in this volume, and in our upcoming book, contribute one way or another to each one of the ten principles for sustainable cities, but with quite strong relations with four of them. Our initial comments will refer to the first two: Principle 1. *"Compact, mixed-use urban form that uses land efficiently and protects the natural environment, biodiversity and food producing areas"* and Principle 2 *"Natural environments permeate the city's spaces and embrace the city, while the city and its hinterland provide a major proportion of its food needs".*

Some cities are providing a significant proportion of food and it is important to note that food proportion is growing, along with the population and the economy. Cities such as Portland, Oregon or Toronto and its Horseshoe Region, or quite interestingly the Milan Metropolitan Region are demonstrating that economic growth and increase of land prices can go hand in hand with a strong agricultural productive sector, primarily in the hinterland. Planning here plays a key role, and the concept of *Regional Food System Planning* is gaining grounds as a successful planning approach. In addition to planning, the various narratives, primarily Milan (found in our book) are insisting on the need for an administrative reform and a strong political will in order to have natural productive and non-productive environments embracing the city.

Milan usually evokes fashion, design and a high tech pole that makes it an extremely dynamic, rich city. It is one of the engines of the Italian economy. What is less well known is that one third of its territory is still cultivated, guided by quite an innovative set of planning rules and developments[1]. [The Agricultural Park of South





Milan (Parco Agricolo Sud di Milano – PASM) with its 47,000 hectares [see figure 3 and 4] is one of the main agricultural park in Europe and covers one third of the Milan Metropolitan Region encompassing 61 municipalities. Within this Park 1,400 commercial farms are productive. The productive nature of this space is different from the "green belts" of other cities such as the London one and the peri-urban parks of Paris. The Milan Agricultural District (Distretto Agricolo Milanese) with its 1500 hectares of cultivated land, under the responsibility of Milan,

Figure 3 (top): Map of Parco Agricolo Sud di Milano – PASM. Source: Elaborated by Stefano Quaglia on Metropolitan City of Milan data, 2010

Figure 4 (bottom): Milan metropolitan rural system – Agricultural land use. Source: Elaborated by Massimiliano Granceri on ERSAF data, 2012

complements the PASM and contributes as well to what is named the *neo-ruralization* of the city. The strategic plan "Piano del Distretto Rurale di Milano" is oriented towards the promotion of production, marketing, territorial protection and safety and ecosystem and landscape services improvement. Milan Metropolitan Region and Milan Municipality clearly demonstrate that a solid food production sector and Economic Growth are compatible.

In Bangkok, a case presented in this section, the Green Space Action Plan 2009 highlights the idea of edible green space and the Bangkok Environmental Quality Management Plan promotes community gardens. The Global warming reduction action plan 2013-2018 proposes measures to increase the planting of trees, including fruit trees, along the roads. The Bangkok 2020 plan addresses the role of peri-urban farming areas to enhance urban resilience and envisions that such areas can be an emergency food source and floodways for drainage water to the sea in the time of severe flooding.

FROM FOOD NEEDS TO ADDRESSING NUTRITIOUS FOOD NEEDS OF THE POOR

What C. Delgado describes in the Belo Horizonte article, included in this section, is the planning processes and the municipal policies which enabled the city to both provide an increased proportion of its food needs, but more importantly, to increase the affordability and the accessibility of nutritious food, primarily for the low income families, living in the most deprived areas. This is rare enough in cities from the global south to be underlined. Here are some of the facilities that resulted from the late 1990's Plan: restaurants offering 17,000 nutritional meals a day at affordable prices in various neighbourhoods, including poor ones; meals provided to public institutions such as primary schools; food stores selling basic food items at affordable regulating prices of; and, food banks connected to the zero hunger national strategy.

The experience of New York City (NYC) described in Nevin Cohen's chapter, in our forthcoming book, also addresses the provision of nutritious food to the poor. However, the emphasis of this article is an analysis of the effects that zoning and rezoning process can play in the achievement of this objective. Early efforts at food planning in NYC focused on reducing diet-related diseases. Out of a population of approximately 8.5 million, approximately 1.36 million New Yorkers are food insecure and 1.8 million depend on federal supplemental nutrition assistance program (SNAP) benefits to buy food. More than half of adult New Yorkers are overweight or obese and 20% of kindergartven students are obese, with rates significantly higher among African Americans and Latinos than Whites. To provide more nutritious food options to neighbourhoods poorly supplied with retail food stores, zoning and strategic neighbourhood development plans were used to provide incentives for grocers to locate in neighbourhoods lacking access to fruits and vegetables and other healthy food. In 2009 the New York City Department of City Planning (DCP) created a programme called food retail expansion to support health (FRESH) which combined financial and zoning incentives for supermarkets in such neighbourhoods. The financial incentives include tax abatements and exemptions, while the zoning incentives allow property developers to build larger building that otherwise permitted under the existing zoning (one additional square foot of residential floor area for each square foot of grocery store space, up to 20,000 more square feet) by including a neighbourhood grocer on the ground floor. The rezoning process brought quite significant effects on the food environment, even when food was not an explicit consideration.

FOOD AS AN ECONOMIC DRIVER

[SEE PRINCIPLE 8]

Another key finding is that the food sector is an essential part of any urban economy. Our articles document how the simple integration of food into urban planning can *"maximize the economic performance of a city and employment"*. Analysis of experiences clearly shows that food contributes to "*innovation, creativity and the uniqueness of the local environment, culture and history, as well as the high environmental and social quality of the city's public environments"*[2].

Food activities make impressive contributions to job generation and increase the wealth in the city. Interestingly enough, and this is particularly

the case for the global south[3]. Food-related jobs include farmers, transporters and intermediaries that supply formal and informal markets, small scale and big scale companies and enterprises employees that transform food into commodities sold on markets and supermarkets. They also include street cooked food traders whose numbers are increasing in many cities. If one considers the whole food system (including, for instance, water supply at each stage of the food chain, or food waste treatment), food is for sure a major contributor to urban economies. Planning could play a much more positive role in facilitating the development and the optimization of these activities and the generation of appropriate spaces for each one of these activities to flourish in a healthful manner. This is what some of the cities included here are aiming to do. Both Indonesian cities presented here are giving an account of the quantity of low-end jobs that are generated through street food trade. One threads linking most of the cases is the crucial and vital importance of planning and developing the food supply segment of the food chain, with appropriated places and policies for fresh food markets, storages for occasional ones, rules and regulations to adapt food supply systems to the timings of the urban life and rhythm, for instance authorizing selling places early morning and late in the afternoon when people are going to work or from work to home.

GOOD NEWS – FOOD PLANNING TOOLS ARE BEING DEVELOPED AND REFINED

The good news is that over the past 25 years a solid set of food planning tools have been designed, experimented and adapted to local realities. They would deserve to be better documented and integrated into a manual illustrated with their applications and adaptations in cities. All these tools can be organized into five blocks and most probably would deserve further refinement.

The first one refers to food asset mapping well explained and illustrated by L. Baker in the case of Toronto and Greater Golden Horseshoe Region. The interesting contribution here is that two complementary mapping methods were devised, one at Metropolitan region and the other

at Ward level for the City of Toronto. Asset mapping at various levels (Metropolitan or Regional / Municipal / Ward / Communities) is essential not only to "provide ... important baseline information to understand how the food sector changes overtime" but to allow for multi-scalar planning, and define (see Bangkok narrative) the respective roles and contributions of public, community and private actors.

In addition to Toronto described in this section, there have been other food-related mapping projects, not included for lack of space, which should be mentioned. These efforts, developed and tested in cities such as Cienfuegos [Cuba], Valladares [Brazil], Rosário [Argentina], [see figure 5 and 6] as well as Bristol and London in Britain, identified potentially cultivable areas or areas suited to facilitate the development of a coherent food system and food chains. In the case of Rosário, the land mapping not only helped to identify where food related activities should take place and become part of the municipal plan, but was the starting point for the establishment of a municipal land bank. This land bank enabled the land to be used by poor urban farmers, through fiscal incentives for the owners and temporary leases to the producers. At other locations land mapping was consolidated and systematized in the early 2000s as part of the Municipal Urban Agriculture and Food-related Program and the Master Plan for the Metropolitan Region. The method was further simplified for cities from the global North and tested in London as "Green mapping". In Bristol, mapping and audit of productive land, including identification of best agricultural land, and of risks and threats from impacts such as change of land use and flooding, is proposed as an effective baseline for supporting the preservation of the agricultural land towards a more sustainable and resilient food system. In the case of Rosário, the land mapping not only helped to identify where food related activities should take place and become part of the municipal plan, but was the starting point to the establishment of a municipal land bank, to turn land accessible for poor urban farmers, through fiscal incentives for the owners and temporary leases to the producers.

A second tool is the pioneering IQVU (Index of Quality of Life) presented as part of Belo Horizonte narrative. This is a methodology to graphically combine different data sets to determine the need for planning and/or programmatic intervention. Various methods have been developed and in a nutshell they consist in "spatializing" indicators by wards, communities, or even by census units in order to visualize better off areas and the most deprived ones. What is new is that one of the dimensions of these maps relate to food deprivation, or quality of access to food. Local actors usually select city specific set of indicators. They are very useful for: 1.) land use planning and for food zoning; 2.) channeling public or private

Figure 5: City of Rosário, Argentina one of the world references in integrating food into urban planning. Photo credit: Yves Cabannes

Figure 6 : One of the major achievements of Rosário Food Plan and Urban Agriculture Program was to include extremely poor families and offer them opportunities to become urban farmers producing accessible organic food. Photo credit: Yves Cabannes

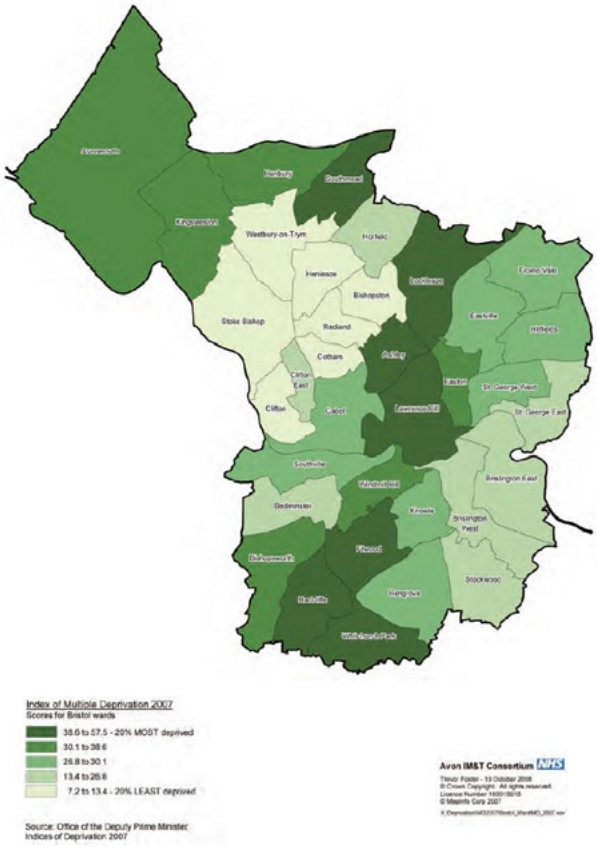


Figure 7 (right): Bristol. Index of multiple deprivation by ward. Source: Bristol City Council, Who feed Bristol? Towards a resilient food plan, 2011

investments, as brilliantly shown for Belo Horizonte; and, 3.) monitoring the implementation of programs to improve accessibility to nutritious food.

A third food planning tool, presented in this section, is the use of multi-stakeholder and community participatory planning of which Providence is an excellent example. Again, various methodologies have been designed, tested and refined for food planning. Probably the one that has been most widely implemented in different contexts is the multi-stakeholder policy formulation and action planning method (MPAP in short). It was developed by RUAF and its partners over the last ten years[4]. Among its innovative aspects it underscores the need to link policy formulation with concrete and immediate planning of actions, the importance of establishing a multi-stakeholder council or group that should become the owner of the planning process and its implementation.

A fourth and most familiar tool for planners consist of land regulations, such as zoning and the designation of development area planning, but with the difference that they consider land for cultivating food, for markets or agro-industrial zones. Our case from Indonesia illustrates how development pressure and poor planning lead to mixed results for informal food markets. The article about Bangkok illustrates more effective and successful land use regulation. To be noted is the fact that in many cities the cultivation of land for farming is not legal (even if sometimes tolerated).

A fifth set of instruments refers to monitoring tools. The food deprivation maps such as the ones used in Bristol [see figure 7, 8 , 9] or Belo Horizonte are excellent illustrative instruments. In a blink of an eye, the maps allow the progress made to reduce food access inequities to be recognized and map out the changes as they are occurring in the city. Bristol Map of community activity allows dynamic monitoring of additional food assets that have been implemented. In the case of Belo Horizonte, the IQVU map shows the location the various actions conducted by the municipality as part of its food plan. More importantly it gives clues to perceive to what extent food inequities have been reduced through time.

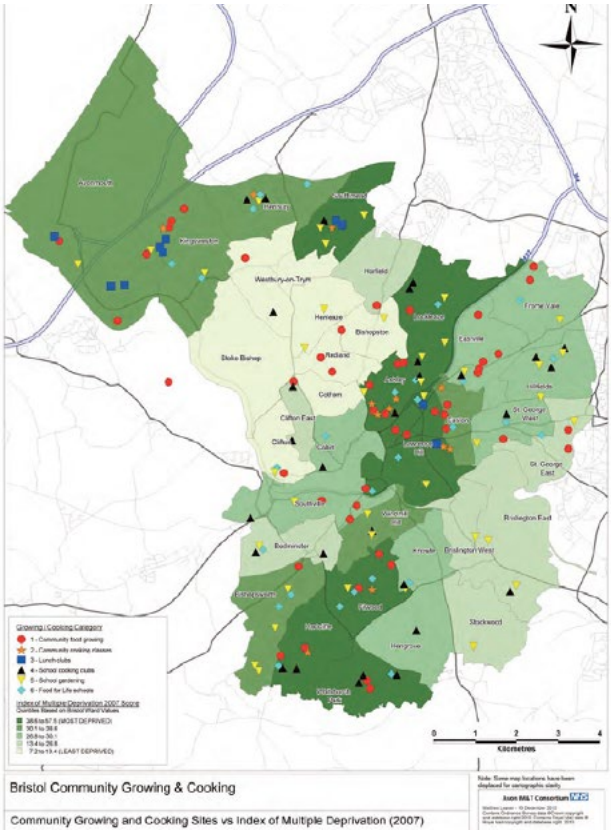


Figure 8 (top): Bristol. Map of community food activity. Source: Bristol City Council, Who feed Bristol? Towards a resilient food plan, 2011

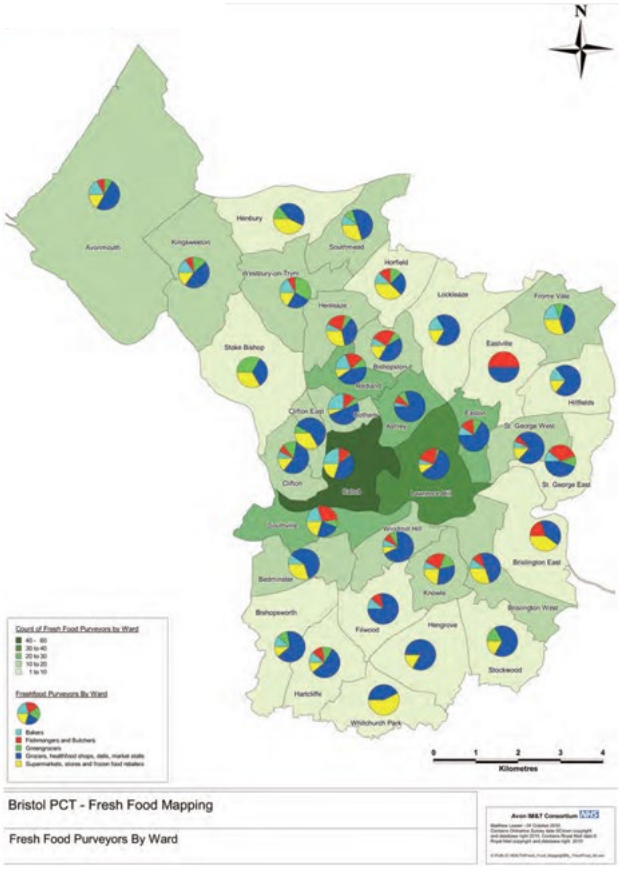


Figure 9 (bottom): Bristol. Fresh Food Provision. Source: Bristol City Council, Who feed Bristol? Towards a resilient food plan, 2011

All these instruments, put together, are de facto a fantastic illustration of the ninth principle of the ten key dimensions for Eco-City Development: *"Planning for the future of the city is a visionary 'debate and decide' process, not a 'predict and provide', computer-driven process".*

DECISIVE ROLE OF CITY FOOD COUNCILS FOR PLANNING "FEEDING CITIES WE WANT"

One of the major finding by the cities, included in this *Review 12* special section, is the critical role played by Food City Councils to generate urban food systemic plans, and just as importantly, to implement them. In other words, City Food Councils are making possible to shift from the city we have to the city that people, as actors, want. Three of the cities here, Providence, Belo Horizonte and Toronto have set up Food City Council. The other three, Bangkok, Yogyakarta and Surakarta [Solo] have not.

As explained by L. Baker the Toronto Food Policy Council, established in 1991, has made significant contribution to key documents such as the Toronto Food Charter or the Official Plan. Interestingly the City Council also plays another key role in planning as it links up with the Metropolitan level *"it facilitated City engagement with the Greater ... and Farming Alliance",* and with the community level through community asset mapping. Similarly, as described by C. Delgado, in order to capture why the first municipal master plan in Belo Horizonte, Brazil in 1996 included quite an innovative Food Supply and Distribution sub chapter, one needs recognize the critical role of the multi-stakeholder Municipal Council, called COMASA. This food council, composed of members from *"the municipal executive, the civil society, consumer's organizations, workers, inhabitants and entrepreneurs"* played a critical role in policy making. In both cases each Council, tailored the complex local institutional landscape, provided the conceptual guidance so that plans could be implemented over long time frames without losing the original visions and plans. The Providence narrative illuminates the progression through which local actors started by grouping together to advocate for local food systems, then created an Urban Agriculture Task Force in 2004 that became instrumental to formulate Providence Interim Comprehensive Plan. Later this task force guided the development of the final Comprehensive Plan approved in 2014 that "provided even more robust treatment of food systems and strategies related to various components of the food system". Food planning appears, in most narratives, not only as means to get a proper plan, but just as importantly as a catalyst for gathering local food champions and actors together into a formal entity, in most cases a Food Council.

Adversely, the lack of a strong and legitimate Food Council, involved in food planning and that remain a driving force when the Plans are implemented, largely contribute to the partial failure of street vendor relocations in Solo and Yogyakarta. What is remarkable is that in Solo, as narrated in this volume by John Taylor and Lily Song, a strong participatory process was put into place and *"over 50 open dialogue meetings were held between the municipality and the mayor with street traders and other stakeholders*". Despite this genuine and unique effort, a couple of years later, *"almost all of these relocated traders had abandoned the new market for the streets".* This points out the limits of participatory planning and it seems that new forms of collaborative governance such as the Food Councils can be a place where problems can be anticipated, discussed and solutions found. It goes without saying, and is noted in the several articles, that strong permanent political will is critical for successful implementation of "*feeding cities we want".*

In summary, positive experiences of food planning are fully in tune with the principle 9 proposed in this book by J.K Kenworthy for eco-city development: *"Planning for the future of the city is a visionary 'debate and decide' process, not a 'predict and provide', computer-driven process."* The only additional lesson from the cases is that innovative forms of collaborative governance, such as Food Councils are of crucial importance to implement plans formulated even as a "debate and decide "process or through participatory planning and design.

As a concluding remark, the integration of food into planning over the last twenty years has shaped a new generation of more sustainable cities better able to feed their citizens. Various challenges are still ahead of us. One of them,

largely unsolved, is how to deal, from a planning perspective and primarily for the booming cities from the global south, with the multiple informal food supply chains, that are still and for many years to come part of an urban food security network. The answers contained in cities such as Bangkok, Solo or Belo Horizonte trigger our imagination. ◆

Figure 10 : Market of Ouanaminthe, on the Haitian / Dominican border. Photo credit: Yves Cabannes

ENDNOTES

1 see Plan from the chapter on Milan from the book integrating food into urban planning, Stefano Quaglia The Agricultural Park of South Milan (Parco Agricolo Sud di Milano – PASM

2 see the key dimension number 8

3 In the Global South, food spending accounts for as much as 50 % of the monetary incomes

4 See RUAF web site (**http://www.ruaf.org/**) and the RUAF book Cities, Poverty and Food; Multi-stakeholder Policy and Planning in Urban Agriculture for further information

A BEAUTIFUL HORIZON FOR FOOD PLANNING · LESSONS FROM BELO HORIZONTE, BRAZIL

CECÍLIA DELGADO

Figure 1: Avenida Afonso Pena. The main Avenue of Belo Horizonte is a diagonal that cuts the city grid pattern, bordered by public buildings.
Credit: Cecilia Delgado, 2015

Locate in the highlands in Southern Brazil, Belo Horizonte [Beautiful Horizon] is a planned city designed, in 1897, to serve as the new Capital of Brazil's Minas Gerais State. The city plan, by the Civil Engineer, Ararao Reis, called for a gird organizational pattern with the addition overlay of diagonals in the government and business-focused core.

The plan envisioned a capacity of between 200,000 and 300,000 residents and included differentiated urban and peri-urban zoning as well as the designation of a productive rural belt, referred to as "sitios', or areas where food is produced and animal are raised. With economic success, the city swiftly expanded from 25,000 inhabitants in 1897 to population of close to 2.5 million today[1].

Today the vast majority of the original planned city is fully developed. In addition, the footprint of the original planned city today is referred to as the centre of today's city and covers less than 1% of the modern city's area of 331.4 square kilometres, composed by 282.3 km2 of urbanized areas and a reminiscent quota of 49.1Km2 of non-urbanized areas due to geomorphologic constrains.

Of particular note is the growth between 1950 and 1970, when the city population doubled each decade and the significant growth, which occurred between 1940 and 1950 and again between 1970 and 1980. Despite jobs growth, by the early 1990's the UN FAO "estimated that 38% of families in the metropolitan region lived below the poverty line and 18% of children aged less than three years were malnourished. Infant mortality was a high 35.3 per thousand live births[2]".

Since 1989, Belo Horizonte city expansion has been slower than its Metropolitan Region, which is composed by 34 municipalities and has a population of 5,829,923 inhabitants (IBGE, 2015). This is partially explained by the lack of space and higher prices found within Belo Horizonte city as well as the attractiveness of neighbourhood municipalities such as Contagem and Betim. Since the 1940's, the region's older metallurgical-related industries, food processing and textiles dominated employment has transitioned to include heavy manufacturing (including automobile parts) and steel production. Together, Belo Horizonte, Contagem and Betim Municipalities account almost 70% of Belo Horizonte Metropolitan PIB. In addition Contagem Municipality as a leading role on BH Metropolitan food supply due to its regional wholesale supply center – CEASA, a built area of 605,000 sq. mts, with 535 companies installed, and a public on busy days of 65,000 people[3], making its the largest food supply in Brazil. CEASA is the reference for SMASAN price control, as it will be seen afterward.

Today Belo Horizonte, a city with modern facilities and a good location, which has attracted economic growth from its inception and today attracts high tech industries (including Google), biotech trade and chemical industries. Of particular note is the finding that the service sector account for about 85% of the city's Gross Domestic Product[4]. The city also has become a tourism location known for restaurants and other hospitality facilities.

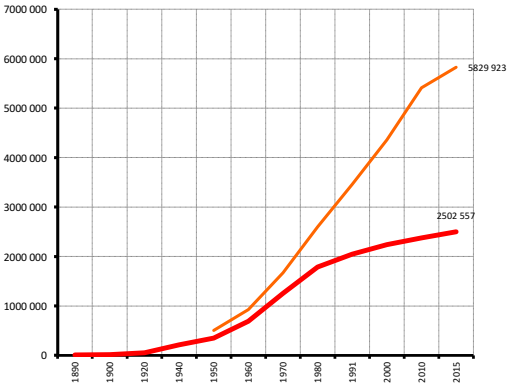
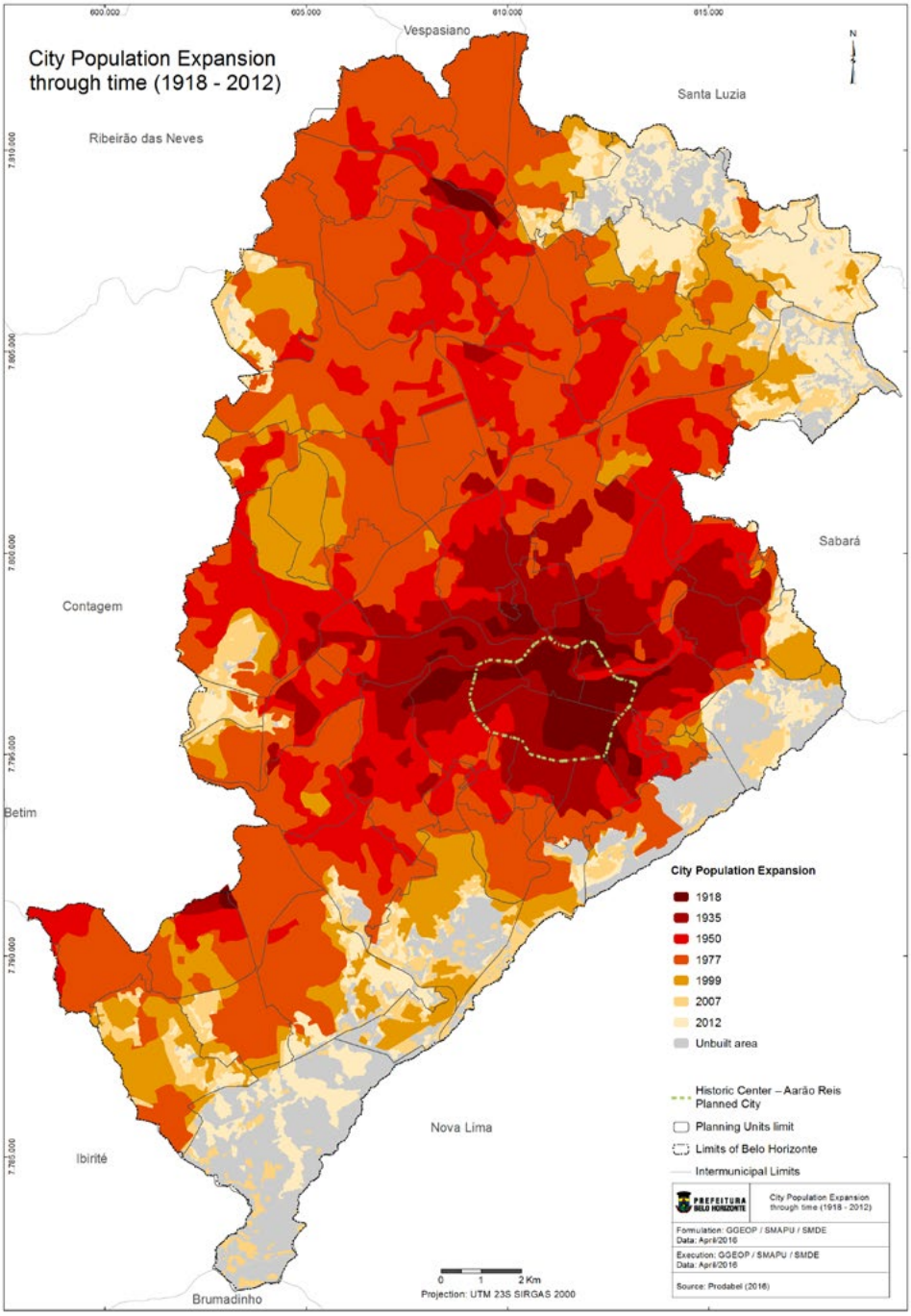


Table 1: Population of Belo Horizonte vs BH Metropolitan Area, 1890-2015

Table shows Belo Horizonte city and its metropolitan area population growth. Notably since the 80's the city is losing its attractiveness to neighbourhood Municipalities, namely Betim and Contagem. Credits: IBGE, elaboration by the author, 2016



Map 1: Map shows how BH city configuration was quite stable at the end of the 70`s decade. Credits: Elaborated by Ricardo Scott Varella Malta, 2016

FIRST INFORMAL FOOD INITIATIVES

The city's growth resulted in the loss of arable land and produced a dramatic impact on food production and informal distribution channels. In this context of hunger, the first municipal initiative to improve food supply and access to nutritious food took place in 1943, when the first popular restaurant was opened under Juscelino Kubitschek mandate. At that time the future president of Brazil [59-61] was the mayor. In addition, other initiatives were introduced in the 1950s and 1960s, such as a City Food Warehouses to regulate food prices and an itinerant Food Truck, without a fixed space schedule. These actions clearly indicated that, even in the early 60's, Belo Horizonte Municipality was already committed to increase food accessibility for low-income earners.

Unfortunately, such initiatives became less visible after the 1964 military coup and all through the dictatorship period (1964 to 1985). While little information from that period remain today, two studies reported the establishment of street fairs, called [feiras livres in Portuguese] and the establishement of permanent covered markets under public supervision from 1971 to 1977. This information clearly indicates the permanence of a strong food supply and distribution tradition over time.

FOOD AS A CONSTITUTIONAL SOCIAL RIGHT

With the end of the dictatorship period in the late 1980's, Brazil first Federal Constitution stated that food was a social right (Chapter 2 - Art. 6°). Two years after, the Belo Horizonte Municipal Organic Law identified food supply as a municipal duty (chapter II, Art. 13, VIII) as important as public transportation or housing. Indeed, Act 211 declared that the municipality, within the limits of its competence and in cooperation with the Union and the State, would organize the food supply in order to improve the access to food by the population, especially those with low incomes. These legislative acts established the political and social agenda for setting up a municipal food supply system under the Workers Party mandate in 1993. In addition, at that time BH began its Municipal Master Plan (the first after the Aarão Reis Plan) through a collaborative planning approach. This being said, it's our aim here to show that a strong and successful collaborative planning approach was the key factor that explains Belo Horizonte unique achievements in food supply and distribution policy.

Several key actions were undertaken to insure a successful Food program. The first action was to formally create an independent department (Law 6.352/1993). The Municipal Secretary for Supply, Food Security and Nutrition (SMASAN) was charged to manage food production, distribution, supply and food education. By taking this action, the city government transformed its previous informal system of food supply and distribution to a formal institutionalized food policy. A municipal council on food security, consisting of public and private sector members, mediated the process. This established a "systemic institutional design for collaborative planning" (Healey, 2006, p 284)[5].

Second, a collaborative planning process was established in 1994. The influences for this decision were: 1. the Federal Constitution (1988) which defined popular participation as mandatory (Bazolli and Delgado, 2015); 2. the rapid increase of neighbourhood associations[6]; and, 3. the establishment of Participatory Budgeting in 1989 in Porto Alegre creating a new local democratic sphere keen to social needs and welfare distribution.

Third, was the role of Municipal Councils [COMASA and COMPUR] on the collaborative planning process. COMASA was a municipal council charged with the role of food security advocacy headed by Maria Regina Nabuco, a ground-rooted expert with background on urban and regional economy. Nineteen members including the municipal executive the civil society, consumer's organizations, workers, inhabitants and entrepreneurs from the food production chain sat on the council[7]. (Machado, 2007 p: 122, 123, 233).

Fourth was the development and approval (1996) of the first Municipal Master Plan, directed by Mauricio Borges who is an urban economic expert. To insure popular participation another Municipal Council, this one on Urban Planning Policies (COMPUR), was created composed of 32 members from civil society, executive power, plus members representing

Figure 2 (top): BH pioneers' markets association is confirmed by the present photo representing an event organized by the association in the 60`s. Credits: APCBH / ASCOM

Figure 3 (bottom): Again, Food Trucks existence in the early 60's proves that on that time Belo Horizonte Municipality was already committed to increase food accessibility for low-income earners. Credits: APCBH / ASCOM

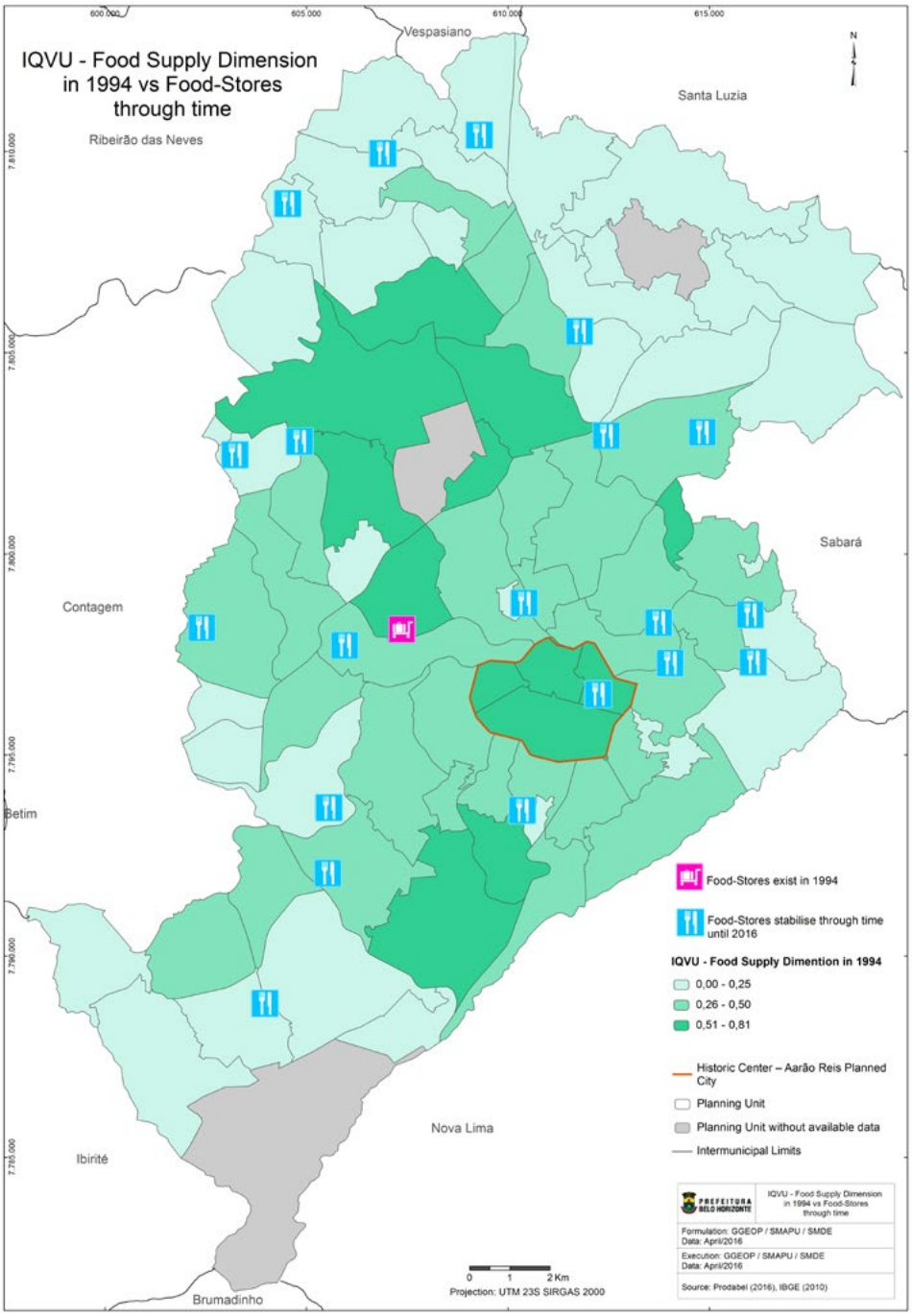
Figure 4: Also from the 60`s the City Food Regulator Warehouse demonstrates the presence of a public policy to control Food Price. Credits: APCBH / ASCOM

the economic and expert's organizations. Following plan preparation, public meetings were held for nine months (Prefeitura de Belo Horizonte, 2015). Under strong inter-sectorial collaboration, the Municipal Master Plan set up a Food Supply and Distribution sub-chapter - fair to say under the social policies umbrella - ensuring a food spatial frame into the future. Indeed, Article 40 mandated the Municipal Distribution Center location, the renewal of two permanent covered markets; the improvement of food-stores chain ongoing since 1992, and finally additional popular restaurants, in addition to the one operational since 1994. As well as it states the scale up of open-air food markets.

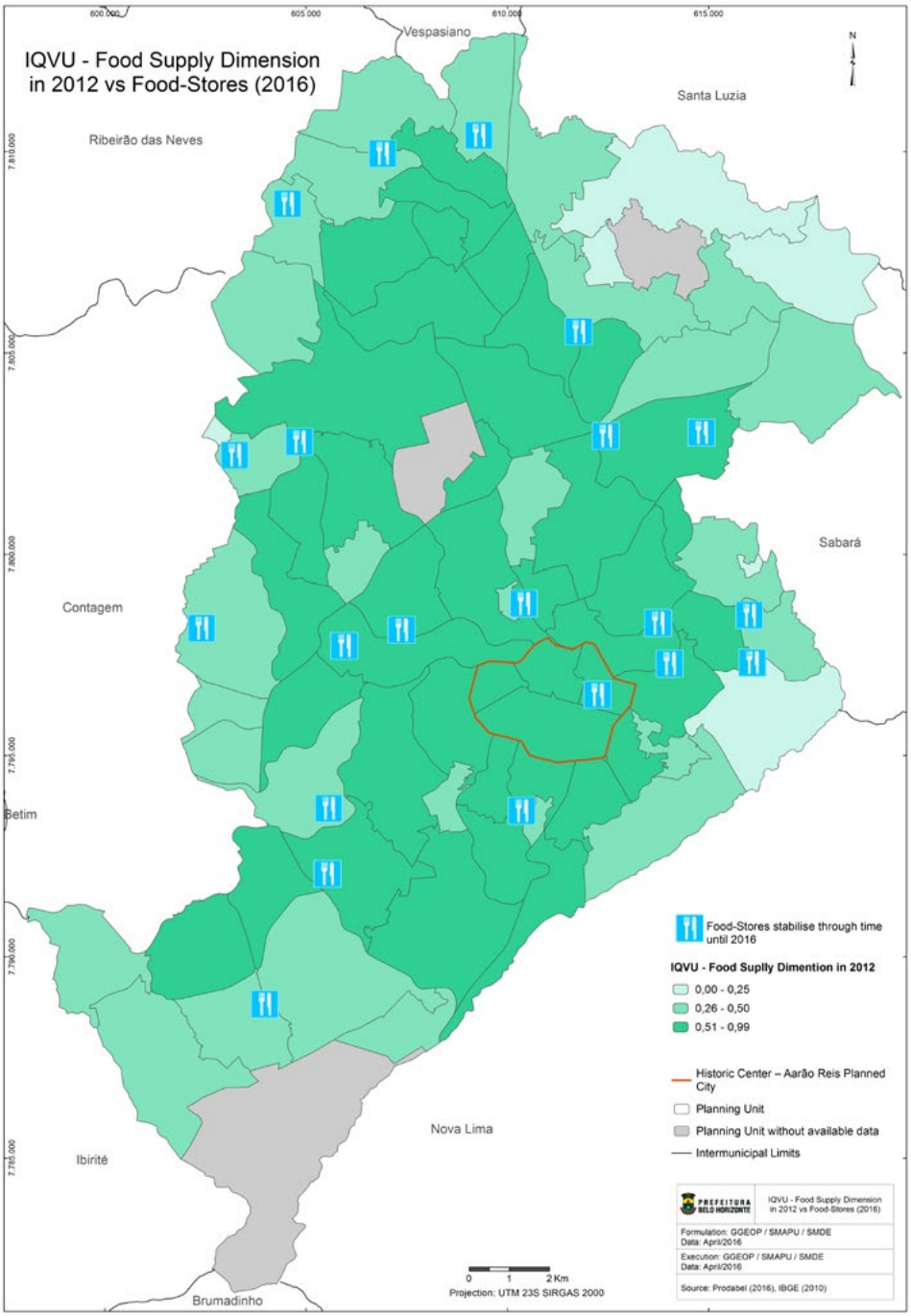
Finally, the City Assessment System, called the Urban Life Quality Index – IQVU (1994) which is under the umbrella of the participatory budgeting program, was amaneded to include "food supply and distribution". Food shortfalls were identified using qualitative and quantitative mapping methods, developed for this purpose. In a nutshell, the IQVU consists in a set of ten dimensions (New IQVU set) that give a spatial image of access to services that are enjoyed by each one of the 80 Planning Areas [UPs] in the city. Once collected, the data corresponding to each one of the dimensions are "spatialized", and when summed up, the maps allow policy makers to identify which zones are better served and those that need to be improved in priority. The UPs and IQVU were planning tools that were extremely important to channel resources from the participatory budgeting, another of the planning instruments develop in parallel by BH in the mid 90's. (Nahas et al., 2007).

Map 2 below indicates the visual impact and use of IQVU: The colour of each Planning Zone [UP], here in green scale would correspond to low, medium or high quality of urban life. Subsequently, the municipality and the various multi-stakeholder councils [concelhos] could debate and decide where to channel public resources in priority, in order to increase its spatial justice impact.

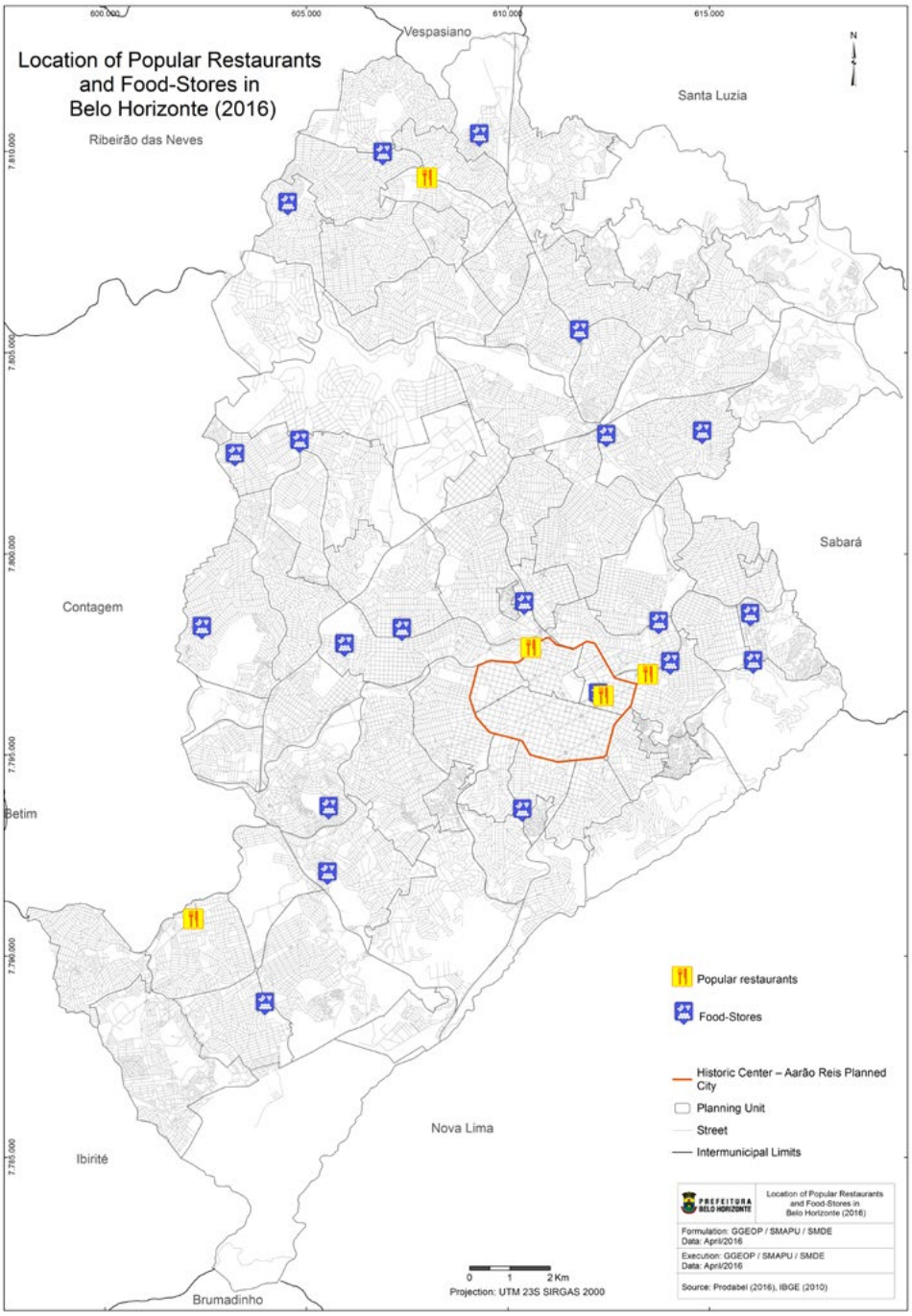
The following Map 3 shows the IQVU food supply dimension in 2012 (most recent results available). In 1994, when the IQVU assessment began only one Food Store existed. From 1992 to 2012, more than twenty Food Stores were established, as part of SMASAN Food Security Programme. This action improved access to food and food supply, especially in the city fringes, as shown in the next map.



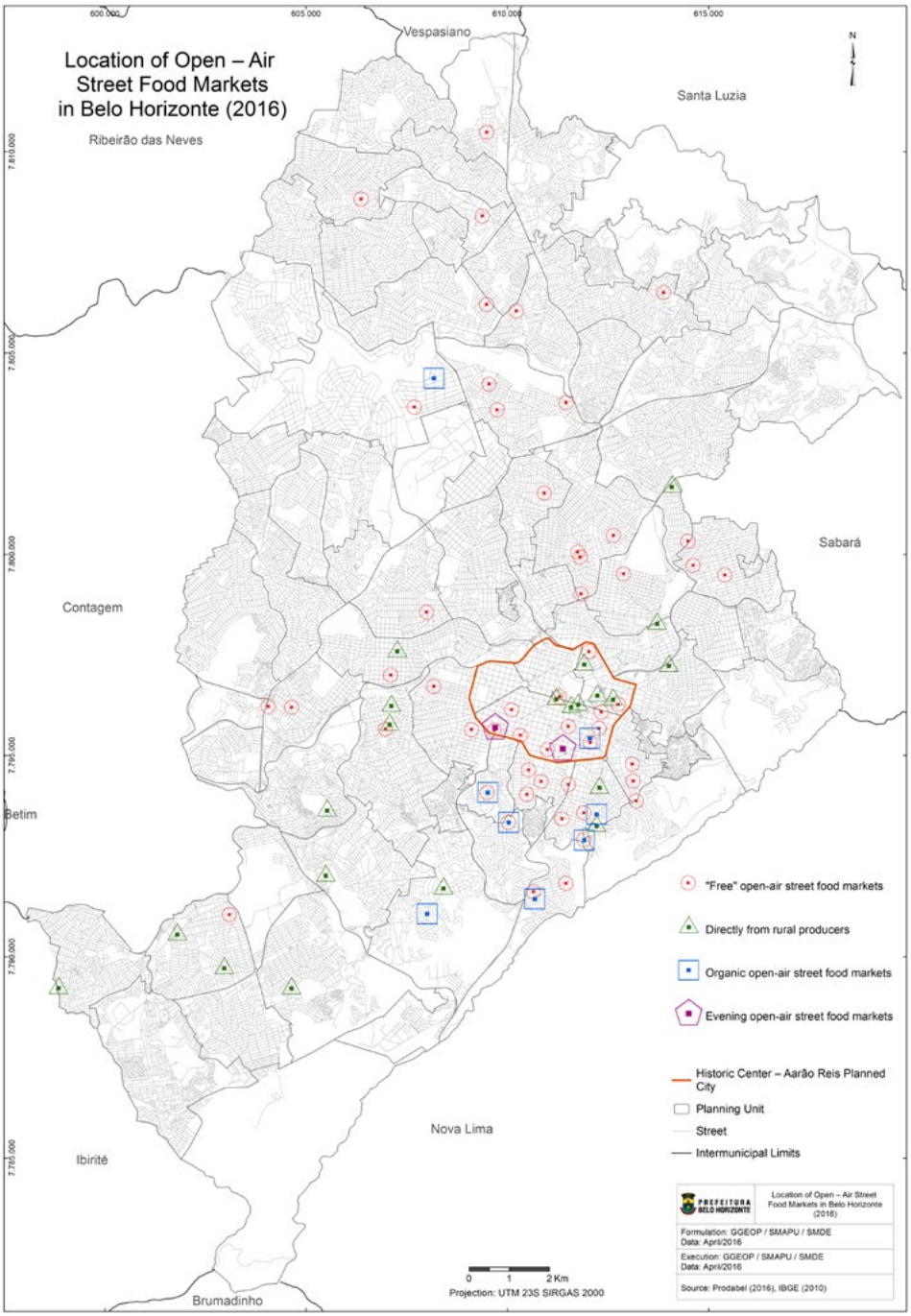
Map 2: In 1994, when the IQVU assessment began only one Food Store existed.
Credits: Elaborated by Ricardo Scott Varella Malta, 2016



Map 3: In 2012, a total of 21 Food Stores were implemented. Map green darkening shows IQVU food supply dimension improvement when compared with 1994. Credits: Elaborated by Ricardo Scott Varella Malta, 2016



Map 4: See how the Food - Stores [21] are taking place at the periphery. Popular restaurants [5] sadly not as widespread as vulnerable low-income population would need. Credits: Elaborated by Ricardo Scott Varella Malta, 2016



Map 5: See how the open-air food markets [83] are taking place at the periphery, still the center as more open-air Food Markets presence. Credits: Elaborated by Ricardo Scott Varella Malta, 2016

FOOD SUPPLY AND DISTRIBUTION SYSTEM (2016)

NON PERMANENT SPACES
Open-air Street Food Markets (weekly)
83 assets

- DIRECTLY FROM RURAL PRODUCERS
(open-air street food markets)
"Direto da Roça in Portuguese"
weekly or twice week · 21 assets
- "FREE" OPEN-AIR STREET FOOD MARKETS
"Feiras livres in Portuguese"
weekly or twice a week · 52 assets
- EVENING OPEN-AIR STREET FOOD MARKETS
"Feiras Modelo in Portugues"
weekly · 2 assets
- ORGANIC OPEN-AIR STREET FOOD MARKETS
"Feira dos Organicos in Portuguese"
weekly · 8 assets

PERMANENT SPACES
Permanent Markets and Restaurants, others
33 assets

- COVERED MUNICIPAL MARKETS AND INDOOR FAIR
"Mercados distritais e Feira coberta in Portuguese"
all day · 3 assets
- POPULAR RESTAURANTS, AND CANTEEN
"Restaurantes Populares e Refeitório in Portuguese"
all day · 5 assets
- FOOD-STORES
"Sacolão in Portuguese"
all day · 21 assets
- MUNICIPAL DISTRIBUTION CENTER "CENTRAL DE Abastecimento Municipal in Portuguese"
all day · 1 assets
- FOOD BANK
"Banco Alimentar in Portuguese"
all day · 1 asset
- PERMANENT SPACES TO "DIRECT FROM THE FIELD"
"Armazém Direto da Roça in Portuguese"
all day · 2 assets

Graph 1: The multiple activities of Municipal Food Supply and Distribution System in 2016. Source: SMASAN (2016), elaborated by the author, 2016

THE FOOD SUPPLY AND DISTRIBUTION SYSTEM TODAY

Belo Horizonte public food supply and distribution system, administered by SMASAN, covers several spatial levels. It main distribution asset is the Municipal Distribution Food Center which manages food reception from producers and the food distribution to all locations in the BH municipality. Another municipal facility is the Food Bank which receives donating food and distributes it all over BH. Under district level there are Food-stores and Popular Restaurants spread all over the city, and on the neighbourhood level the open-air food markets rooted on the planned city.

On the district level, we find food-stores, shown in map 5, serving outskirts and low-income neighbourhoods settlements. On the same level fits the popular restaurants, sadly not as widespread as vulnerable low-income population would need (Gonçalves, 2011, p 108).

Since it formal beginning in 1993, the Belo Horizonte food supply and distribution now is active in 116 different locations spread out over the city. Thirty-three are permanent assets, such as popular restaurants, markets and other covered spaces, while 83 are non-permanent, such as numerous open-air food markets mostly in the morning[8]. Under this simple division, as indicated in Table 1, various activities are taking place and will be briefly summarised.

Popular Restaurants - In 1994, SMASAN reopened the popular restaurant "Helbert de Souza" located in Avenida do Contorno. This location is at the limit of current city center and matches the first ring of Aarão Reis city plan (1895). In 2004, SMASAN opened the second popular restaurant "Josué de Castro" in "Região Hospitalar" and four years later it opened the third popular restaurant called "Maria Regina Nabuco" in Venda Nova district. Finally, a fifth popular restaurant, "Dom Mauro Bastos", was opened in 2010 in Barreiro.

The purpose of these restaurants is to offer nutritional meals at affordable prices at the five locations, including poor neighbourhoods. There also is a refectory, not open to the public, that provides meals to public institutions, such as primarily schools or shelters.

Permanent Covered Markets – They three Permanent Covered Markets are Lagoinha Distrit Market, Cruzeiro Distrit Market and Padre Eustáquio. Each facility consists of an indoor, open-air, permanent food market under SMASAN supervision. They exist prior to BH Food Security Program although they were renewed beneath Municipal Master Plan (1996) food supply strategy. Nowadays Lagoinha Market is partially a cooking training school and Padre Eustáquio includes a food-store and some restaurants as well as the covered market.

Food-stores – They represent one of the most innovative BH strategies, which is to regulate the price of food and increase low-income access to nutritional food. According to SMASAN, the first food store, located in Caiçara, opened in 1992 which was before its institutionalization (see Table 1). Nowadays there are 21 food-stores spread mainly in low-income districts. These stores sell 70 fresh products of which 20 are sold at, or below, prices establish by SAMASN, which maintains a strict price monitoring. Usually these stores are built on public land and the private trader will get a lease from the public sector. Figure 7 and 8 is showing products costing 0,99 cents (around 0,25 dollar) as part of the 20 price controlled products.

Municipal Distribution Food Center (CAM) – This mega structure, covering more than 10,000 square meters, was opened in 1997 on the outskirts of the city. CAM supplies most SMASAN related programs, primarily the five popular restaurants, school canteens, kinder gardens, shelters, etc. The place hosts a food-store, several restaurants and a flower retail trade. It is the beating heart of BH supply and distribution systems.

Food Bank – This project, started in 2003, is directly linked to the National Zero Hunger Strategy. Primarily the food bank receives fruits and vegetables not accepted by the formal retailing system for being too small or not exactly to the shape formatted by the market from the 21 BH food retails stores [sacolão]. This nutritious food is sent, free of charge, to several institutions such as school canteens or shelters.

Figure 5 and 6: Around 17,000 nutritious meals a day (2014), including lunch and dinner are served in BH Popular restaurants. Here depicted Popular Restaurant "Helbert de Souza" located in Avenida do Contorno (city center). Credits: Norma Duarte Gonçalves, 2015

Figure 7 and 8: Municipal Controlled Food Retail Stores [sacolão]. The selling price of the produces that are part of the official basic food basket [potatoes, rice, various local vegetables, etc.] is controlled by the municipality SMASAN and prices are easily visible. Credits: Norma Duarte Gonçalves, 2015

Open-air food markets – Since BH was created these open-air markets are part of the tradition of informal food distribution system. The municipality supported their shift and their inclusion into a formal and regulated Food supply and distribution system. They are primarily located along the streets of old neighbourhoods located in the original planned city, today the buzzling centre of BH. Once a week, traders set up their stands, marked with an institutionalized logo provided by SMASAN, to sell fresh fruits and vegetables not strictly organics.

Directly from rural producers, open-air food markets [Direto da roça] – This short food circuit started in 1998 and distributes locally produced food through 21 open-air food markets held either once or twice a week, located in streets and squares. Similar to the Open-air food markets previously referred to, these fairs are recognisable thanks to their SMASAN logo. It is interesting to note that this program was launched long back its institutionalisation and inclusion within BH policy.

As part of the program begin in 1995, two permanent spaces were created to sell products "Directly from rural producers". The main objective of this program was to link rural farmers with urban consumers. In addition to non-permanent open-air food markets, the activity is based on two permanent strategically locations, one near the main bus station and the other in city center.

Evening open-air food markets – This program started in 1995 and its entire outfit is similar to the previous listed open-air food markets. However it intention is to supply distinct consumers needs, so it is schedule to evening afternoon and provides prepared food as Figure 4 shows.

Organics open-air food market – This last open-air food markets program started in 2002 to target consumers aiming to by organic products. Similar outfit with its own logo as Figure 5 illustrate.

At the neighbourhood level we have the street open-air food markets, historically rooted on the planned city and later spread according to peoples' needs as Map 5 confirms.

Lastly on the BH Food system of today we want to underline its institutionalization through public policies as Table 1 shows. Regarding Table 1 we observed that activities as the "permanent covered markets", the food-stores and one popular restaurants began before its law/decree i.e. institutionalization. Even more important its open-airs food markets activities that started with city foundation, after Aarão Reis plan. We claim that BH food policy was institutionalized as a result of peoples' needs which lead to its formalization through public policies in almost half of the activities previous than specified in decree or in law.

Apart from the SMASAN program, there are others organizations involved in the city food supply and distribution chain. One of them is EMATER - MG, a state company founded in 1948, which gives technical and business-related support to 400 family farmers. Although food distribution and supply not EMATER's core business, they manage the Friday "Free Fair" at the Administrative City in Pampulha, where the state government is settled. Also worth mention is the emblematic Central Covered Market, as the story of this place goes back to 1929. Then the municipality defined an empty plot of 14.000 m2 as a city food distributor, merging two old assets. In 1964 under the dictatorship, the municipality decided to sell the land. Trying to fight the decision, two private trade entrepreneurs bought the land and build an impressive covered market. Nowadays the Market still sell fruits and vegetables in addition to local crafts and typical restaurants, being one of the main BH touristic city points.

Figure 9: Directly from rural producers (open-air food market). Example of non permanent space “Direto da roça” 21 points in the city - active since 1998. Credits: Norma Duarte Gonçalves, 2015

Figure 10: The evening open-air food markets are targeted to consumers after the busy day. Credits: Norma Duarte Gonçalves, 2015

Figure 11: Similar to others open-air food markets, yet only selling organic products. Credits: Norma Duarte Gonçalves, 2015

Table 2 : Institutionalization of the programmes

	Starting date	Institutionalization	Law / Decree (first)
Permanent Covered Markets	40´s, 1974, 1997	1984 1995	Decree 4799/1984 Decree 8373/1995
Food-Stores	1992 (first); 2008 (last)	1988	Law 5181/1988
Popular restaurants	40.s, reopened in 1994) 2004, 2008, 2010		
Permanent Spaces to sell "Direct from the field"	1997	1998	Decree 9538/1998
Municipal Distribution Food Center	1997	1995	Decree 8373/1995
Food Bank	2003	2003	Decree 11.446/2003
Fairs	1897	2003	Law 8616/2003
Direct from the field	1998	1998	Decree 9538/1998
Evening Fairs	1995	1995	Law 8251/1995
Organic Fairs	2002	2002	Decree 11044/2002

Legend Starting date before institutionalization

Source: SMASAN, elaborated by the author, 2016

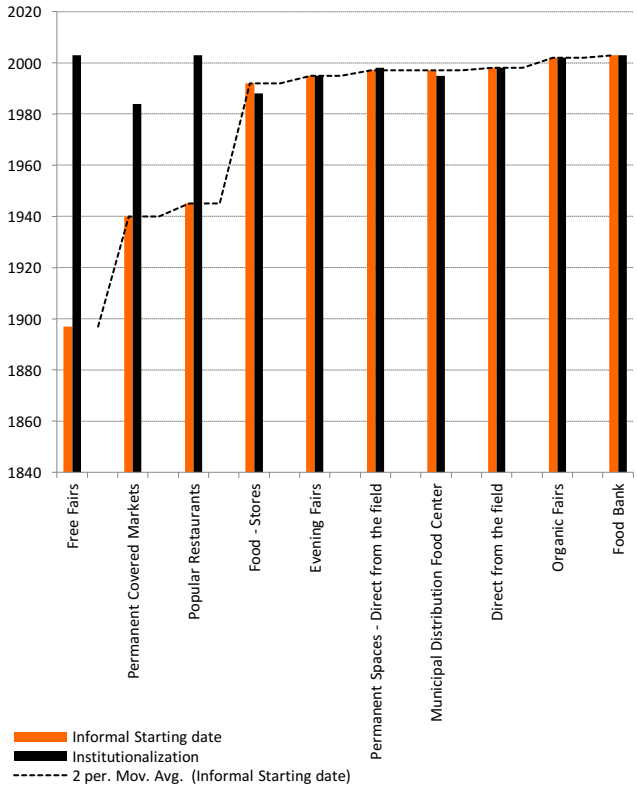


Table 2 shows that Free Fairs, Permanent Covered Markets and Popular restaurants were BH pioneer food distribution channels, although with Permanent Covered Markets exception they were the lasts to be institutionalized. However all the new channels are part of SMASAN Program and due to that, the institutionalization comes (almost) together with its start

Source: SMASAN (2016), elaborated by the author, 2016

ACHIEVEMENTS AND CHALLENGES

This paper concludes that twenty years of food planning and public policies were enough to consolidate the BH distribution and food supply system under multiple ways and channels. Under a "systemic institutional design for collaborative planning" (Healey, 2006:284), the city was able to mainstream food in its planning system and policies, reverting social and economic inequalities on low income and poor segments of its society.

Actually, since 1994 the area under low food supply rate (less than 0.25) decreased from 48.45% to 15.36% in 2012. The area under high supply distribution rate (more than 0.50) increase from 17.02% in 1994 to 48.81% (2012). Meanwhile the area scoring a medium IQVU Food supply rate (between 0.25 and 0.50) remains the same. Furthermore, from 1994 to 2012 food supply score improved from 0.31 to 0.50 points. Meaning that 54 of 80 planning units improved its food supply range (67.5%), yet 10 are still in the lowest range (12.5%).

This unique step-by-step achievement involved the institutionalization of the various distribution food channels, according to people needs, through public policies and the consolidation of the evolutionary design through collaborative processes and planning instruments. The key behind its consolidation was its collaborative planning process rooted on social engagement and political will since the 90´s and the fair balance between civil society, economic and political will, which is still the driving force[9]. At the same time, BH collaborative planning approach should be perceived as a time continuum, linking informality in the past to it formalization on the 90´s trough its special secretary - SMASAN in permanent exchange with Municipal City Councils.

Why is this important? First, because public policies must be supported on stakeholder's advocacy, and BH municipal councils are an outstanding example of this. Second, political will is central, since collaborative planning is time consuming for all the parties involved, so political awareness and goal permanence is key. Third, planning needs to be part of the question pushing the boundaries between a non-permanent and a permanent food supply system, and shifting from the informal to the formal. Fourth and last, assessment is essential as a self - learning tool, and BH did it since its beginning and today under municipal food council role. BH innovative approach testifies what Healey (2006) called the flow between planning and practices, here placed into practice.

Nowadays a new Municipal Master Plan is under approval – Draft law 1749/2015. Strikingly enough it is not addressing food supply, abandoning what was one of the most innovative aspects of BH planning proposal in 1996. Hence, it is unclear how the twenty years of food collaborative planning, consolidated BH distribution, and food supply system as city mainstream will be addressed in city-planning decision. Meanwhile urban agriculture is for the first time included in the city master plan. Although for the moment, urban agriculture is only an urban planning policy which lacking zoning. It is a encouraged zoning exception and therefore needs to be followed with careful attention.

Today, the city has a new challenge: to reduce its reliance from rural space. If in one hand the city managed to find the channels to supply and food distribution on the other hand is depending from rural fringes harvest. Let us wait and see how the new Municipal Master Plan (2016) will promote urban agriculture to feed, at least partially, the city. ◆

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A Post–PHD Grant - SFRH/BPD/94286/2013 from the Portuguese Government finances the author research project.

ENDNOTES

1 The original footprint of the city now part of a much larger metropolitan region, home, in 2014, to approximately 5.7 million (FAO, 2014).

2 http://www.fao.org/ag/agp/greenercities/en/GGCLAC/belo_horizonte.html

3 https://pt.wikipedia.org/wiki/Região_Metropolitana_de_Belo_Horizonte

4 http://www.globalurban.org/Belo_Horizonte_MES.pdf

5 The collaborative planning process, as proposed by Healey in 1996, differs from traditional planning by considering planning as a social process. Healey claims collaborative planning implies a systemic institutional design approach of a particular policy field, according to a particular phenomenon in question and social values about it (Healey, 2006 p: 287).

6 It is reported that the number of associations increased from 70 to 534 during the 1980´s (Avritzer, 2005).

7 COMASA was quite active until the beginning of 1998 when it was deactivated according to Nabucu and Souki (2004) due to low popular participation and operability. Interesting enough 1997 was also a municipal government shift.

8 Since its formalization only two programs had finished: Workers Train, a program that started in 1993 and ended in 2010, consisting on food trucks delivers in slums; Popular Basket which started in 1995 and ended up in 2011, similar to the previous yet like an itinerant fair. Fair to say that BH food system is being resilient over time.

9 As Avritzer (2005) confirmed regarding PB in BH decrease on participation due to stronger doubts about the continuation of the process in 1996/1997, the same year that COMASA finished.

Acronyms:

Acronyms	Portuguese	English translation
APCBH	Arquivo Público da Cidade de Belo Horizonte	Belo Horizonte Public Archives
ASCOM	Assessoria de Comunicação do Município de Belo Horizonte	Belo Horizonte Municipality Communications Department
BH	Belo Horizonte	Belo Horizonte
BH - FSP	BH – Programa de Segurança Alimentar	Belo Horizonte Food Security Plan
COMASA	Conselho Municipal de Abastecimento e Segurança Alimentar	Municipal Council to Food Supply and Security
COMPUR	Conselho Municipal de Politicas Urbanas	Municipal Council to Urban Policies
COMUSAN	Conselho Municipal de Segurança Alimentar e Nutricional	Municipal Council to Food Security and Nutrition
FSDS	Sistema de Distribuição e Abastecimento	Food supply and distribution system
GGEOP	Gerente de Geoprocessamento	Geoprocessing management
IBGE	Instituto Brasileiro de Geografia e Estatística	Brazil Institute of Geography and Statistic
IQVU	Índice de qualidade de vida urbana	Urban Life Quality Index
LNEC	Laboratório Nacional de Engenharia Civil	National Laboratory of Civil Engineering
SMAPU	Secretaria Municipal Adjunta de Planejamento Urbano	Municipal Assistant Secretary for Urban Planning
SMASAN	Secretaria Municipal Adjunta de Segurança Alimentar e Nutricional	Municipal Secretary for Supply, Food Security and Nutrition
SMED	Secretaria Municipal de Desenvolvimento	Municipal Secretary for Development

Avenida Afonso Pena, Belo Horizonte. Credit: Cecilia Delgado, 2015

ARTICULATING PUBLIC AGENCIES, EXPERTS, CORPORATIONS, CIVIL SOCIETY AND INFORMAL SECTOR IN PLANNING FOOD SYSTEMS IN BANGKOK

PIYAPONG BOOSSABONG

» *The key lesson learned from Bangkok is that food systems are too complex to be covered by a the single all-inclusive plan which addresses the multiple scales and mixes of formal and informal activities, which have been developed by the multiple stakeholders. We discovered that the best approach was to integrate and fa- cilitate an articulation of multi-scalar, sectorial, spatial and strategic planning practices from each of the various food actors. . «*

Photo 1: Damnoen Saduak in Bangkok is one of Thailand's largest floating market[1]

Bangkok is the capital of an agricultural producing country. There are full-time and part-time farmers, modern and conventional markets, and mainstream and alternative food chains. Roughly 13,800 full-time farming households cultivate about 71,200 acres in the peri-urban areas of the city (Policy and Planning Division 2012). While the full-time farmers are market oriented, the part-time farmers that grow small-scale food within the inner city are subsistence, leisure and recreation oriented. About 130 community gardens also exist, developed by these part-time farmers and play significant roles in building a sense of community as an interactive public space (City Farm Program 2014). There also are 3 main central fresh food markets. Retailers transport food from these facilities to sell at the 337 local traditional fresh food markets in the inner city. Some retailers also sell vegetables directly at customers' houses by carrying food on a truck as a mobile market while some become street venders. The amount of food actors in this informal sector is roughly 1,600 to 1,700 (Bangkok Soi Idex 2016). They improve the access to food for at least 225,907 urban poor households in 1,266 poor communities (Community Organisations Development Institute 2008).[2] Apart from that, fresh and frozen foods are also sold in modern trade markets. Instant foods, in particular, are easy to find at the approximately 1,109 convenience stores located in every corner of the city (Working Group on Food for Change 2012). For the customers seeking for

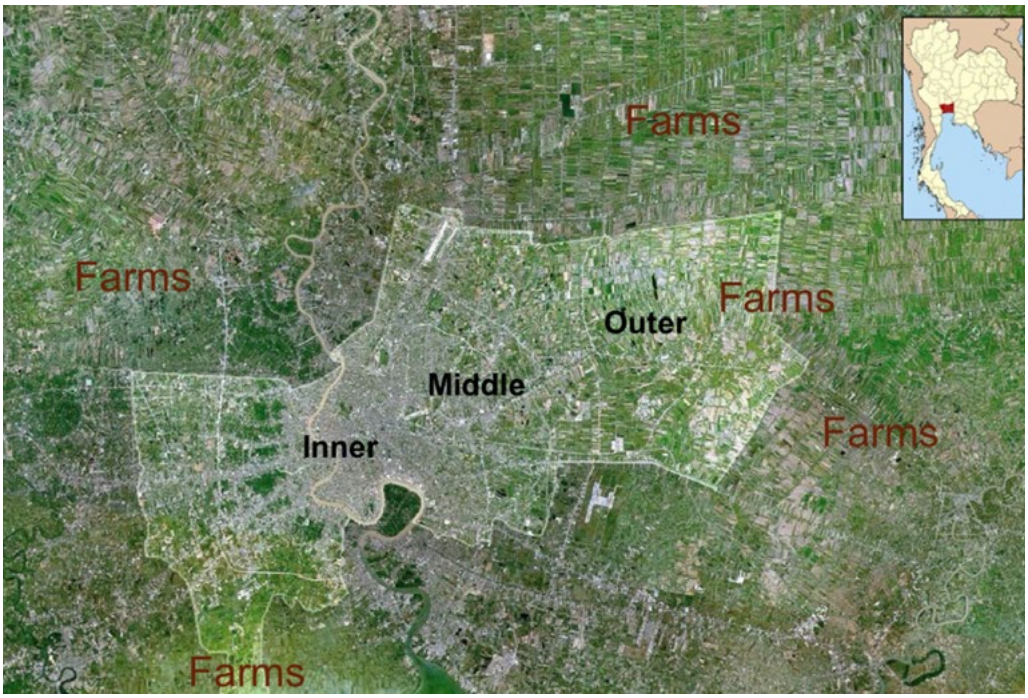


Figure 1: Peri-urban farming areas in Bangkok

alternative markets, the city has a lot of green markets, shops and food box delivery services[2]. The Bangkok food systems are shaped by various forces, and the different forces are driven by different actors through their planning exercises. Key actors include public agencies, planning experts, food corporations, civil society and informal sector. Their roles are played in multiple scales, and to see the articulation of difference actors and their planning practices is to understand how food systems of this city are created.

THE DIFFERENT FOOD ACTORS

STATE-LED PLANNING FOOD SYSTEMS: WORKING TOGETHER AMONG PUBLIC AGENCIES AND THINK TANKS

The planning of food systems in Bangkok is firstly driven by the cooperation of central, regional and local governments that are guided by self-sufficiency principles promoted by the King. The Bangkok Metropolitan Administration (BMA), which is the regional government, takes care of the whole Bangkok metropolitan region. BMA performs several food related tasks. It plays a role in analysing the importance of farm lands, in the peri-urban areas, to feed the city dwellers. It controls land use in order to maintain peri-urban farming areas as a green belt. BMA also develops and maintains agricultural infrastructure, particularly the irrigation systems.

BMA, in cooperation with the central government, also built central fresh food markets. These markets, including 'Talat Thai' and 'See Mum Moung', distribute fresh food from peri-urban farms enabling inner city retailers to transport food to sell within the city. Thus, the central markets also play an essential role in bridging rural, peri-urban and urban areas by providing good access to food provision.

The establishment of the central markets was done in parallel with the control of the quality of hundreds of local fresh food markets scattered within the inner city. The BMA rates the quality level of those local markets and provides incentives to local markets to improve their hygiene. BMA also plays a role in facilitating the investment of food corporations within the city by building hypermarkets, supermarkets and convenience stores that can be accessed by each urban community.

Photo 1: City farming training course provided by Laksi local government

Local urban communities are governed by the District Administration Offices (DAOs), which work under the BMA plans. These local governments[4] promote not only nutritious food, but also healthy food and the well-being of city dwellers. Building upon the King's ideas, 50 DAOs in Bangkok launched a variety of programmes to support farming in the city, such as the establishment of urban farming learning centres. Some DAOs also created their own initiatives, such as the development of a rooftop garden and organisation of city farming training courses. They promote organic food production and markets in their area. Some of them also link ordinary people to private sector businesses by facilitating the contract leasing of vacant private lands[5].

Professional urban planners and planning think tanks also played an important role. 'Smart Growth Thailand' was one of the agencies which supported academic and technical assistance to the food agenda planning process. This consultantcy proposed the idea that conserving peri-urban farmlands also protected against the problems related to urban sprawl. It influenced the BMA to consider zoning the centre of each urban community to enable the development of food markets (Bunyapravitra 2015). Planning think tanks from academic units in public universities advocated developing technologies to enable vertical farming in urban settings and promoted urban agriculture as a method to mitigate climate change. For example, Kasetsart University experimented with 'lightweight soil and food growing plants' for use with vertical gardening and created a vertical garden campus lab to be a model promoting green universities. Thammasat University, Chulalongkorn University and Mahidon University integrated urban farming and water governance agenda and supported the calculation of draught and floods compensation for urban farmers. With their supportive researches, the BMA has changed the focus from supporting rice production to support aquaculture. Farmers have agreed with the change as they can sell their soil, from digging pond, to the building sector.

CORPORATION-LED PLANNING FOOD SYSTEMS: CONNECTEDNESS OF AGRIBUSINESS, RETAILERS AND SOCIAL ENTERPRISES

Food corporations also play a large part of planning the production, process, and distribution of a variety of instant foods and some fresh foods. Large agribusinesses own the modern retal trade system throughout the whole country, including thousands of hypermarkets, supermarkets and convenience stores in Bangkok. The top 25 largest stores were built on a total land area of 1,157 acres, which is more than the total land used to build the 25 largest public parks in Bangkok[6] (Thai Climate Justice 2012). They also attempt to develop their own brands. Traditionally they cooperate rather than compete with one another and have established close links with the central government and BMA by supporting political parties. They have benefitted from national and regional policies throughout modern Thai history.

It should be noted that the Green Revolution has affected the Thai food regime since 1961 when the first Thai national development plan 1961-1966 included it as a strategy for development. The government changed the way people grow food; increasing productivity by supporting research about agricultural science and technology and by promoting chemical fertilisers (National Economic and Social Development Board 1961).

As a result of the Green Revolution, a few large agribusiness monopolising the majority of farming production, technologies, food process and distribution throughout the country (Leaunjumroon et al. 2011). These companies also control hybrid seeds valued at roughly 55 million US dollars per year amounting to 97% of the total Hybrid seeds used in Thailand (Thai Seed Trading Association 2011). Large agribusinesses also shaped consumer food culture and partly affected the reduction of local food variety as the growth and expansion of their modern trade system has gradually destroyed small and medium enterprises as well as the local food system within the city.

However, the importance of large agribusiness should be taken into account in parallel with the criticisms. It should be recognised that some large agribusiness promoted company training programs that everyone could access and which could lead to promotion (particularly '7-11'). In addition, they provided effective food distribution services which benefit small retail and wholesale food businesses; some of whom helped large agribusiness by distributing their products such as seeds, fertilisers and technologies to small-scale urban farmers.

Social enterprises also are a new type of food corporation which promotes a different approach. These private companies focus on sustainable agribusiness, such as organising green markets; opening green restaurants; publishing magazine providing farming experiences and know-how; and, opening farming training centres[7]. These companies both earn money from agribusiness and contribute to the promotion of alternative and more sustainable food production and markets. Although these initiatives could not challenge structural injustice of food regime, they contribute by proposing a pathway toward a more resilient food supply chains and more inclusive growth.

CIVIL SOCIETY-LED PLANNING FOOD SYSTEMS: THE COLLABORATION OF NON-GOVERNMENTAL AND COMMUNITY-BASED ORGANISATIONS

Non-governmental organisations and community-based organisations (referred to as civil society) also play a role in planning food systems by facilitating the expansion of household, community and institution gardens within the inner city especially in poorer communities. They complement rural agriculture by promoting safe, healthy and fair local food systems. They also support neighbourhood planning and the role of urban agriculture by raising environmental awareness, adapting to climate change, managing wastes (reuse and recycling) and facilitating learning for urban kids. They also propose alternative food sources and distribution by promoting short food supply chain through the development of weekly green markets, food fairs and vegetable box delivery directly from the producers to customers involved by social enterprises.

This civil society-led groups also promote community building practices. For example, a

Photo 2 (top): The backyard of 'Health-Me' green restaurant

Photo 3 (bottom): Weekly green food market

sense of community was instilled through the development of common edible green spaces. These collective gradens were planned and developed by the collaboration of communities and the Sustainable Agriculture Foundation, the Media Centre for Development, the Working Group on Food for Change, and the City Farm Association. Larger collaboration was present in the cases where poor communities were the target, such as the ones where the Slum Dwellers Network and the Informal Labour Network were engaged. These civil society organisations start by advocating alternative food movements and then began to promote local food systems. They have strengthened various part-time farmers through resources provision, knowledge transfer, network development, and the facilitation of their exchanges. At least 98 well-organised collective gardens from about 130 are active in the network (see Figure 2). These collective vegetable gardens are involved by roughly 4,900 people. They commonly grow vegetables and herbs that are used in cooking Thai foods, such as holy basil, sweet basil, Chinese kale, chili, eggplant, spring onion, lemon, morning glory, mushroom, peppermint, lettuce, coriander, cucumber, cabbage, ginger, and galanga. Some fruit trees are also planted, such as banana, guava, mango, tammareen and papaya (Mahasarakham University 2013).

EVERYDAY PLANNING FOOD SYSTEMS: THE EMERGENCE AND TRANSFORMATION OF STREET FOOD AND MOBILE MARKETS

The Bangkok food system also is characterised by the daily life practices of street food venders and mobile markets (including floating markets). This everyday service has no specific pattern and yet it plays a role in making Bangkok a lively city with plenty of food. The amount of street food vendors and mobile markets is not static, but responses to stimulus such as the changing seasons, food demands and economic conditions. The vendors in each street can change at any time as a result of decisions to move to other places or changes in employment. There are more than 30 vendors along some streets especially in commercial zones, such as Khawsarn, Sukhumvit and Sealom roads. It can be estimated that each small street would have about 10 street vendors and mobile markets. So, as there are 166 small streets in Bangkok (http://th.soidb.com/ bangkok/soi/index.html), the estimated total number of street vendors and mobile markets in Bangkok can reach 1,660.

Most of these people make decision on a daily basis, especially those who sell food on trucks *(Rod-Kub-Khaw/ Rod-Pum-Poung)* and food on boats. These everyday food distribution practices go beyond the limitations of other methods as they can access at the household scale and make pro-poor food distribution by proposing cheap food. Their activities can makes some middle and upper classes feel irritated by their loud voices, messy food arrangement and unfashionable food types. However, no one can deny that they play an important role in enhancing food diversity as they provide a variety of food from different sources apart from those of the modern trade system. They also distribute local vegetables and seeds. Their role also includes that of local food guardians; conserving the local traditional food types and species in the same time that they create and protect unintentionally biodiversity in the city.

PLANNING APPROACHES AND INSTRUMENTS

Public Agency Planning - Planning food systems in Bangkok is firstly driven by the cooperation of public agencies and professional planning think tanks. This state-led planning includes the conservation of the peri-urban agriculture as a green belt and the development of irrigation systems by using physical land-use planning as the instrument. They also support food distribution by developing central fresh food markets that facilitate retailers to distribute food within the inner city.

The state-led planning is based mostly on physical land-use planning accomplished by professional planners. Supportive data is collected by the Policy and Planning Division working under BMA in cooperation with academic units from public universities. Some information is delivered by DAOs, but the comprehensive plan was made at the regional scale before each DAO needed to make its operational plan, which focus on implementing the objectives in

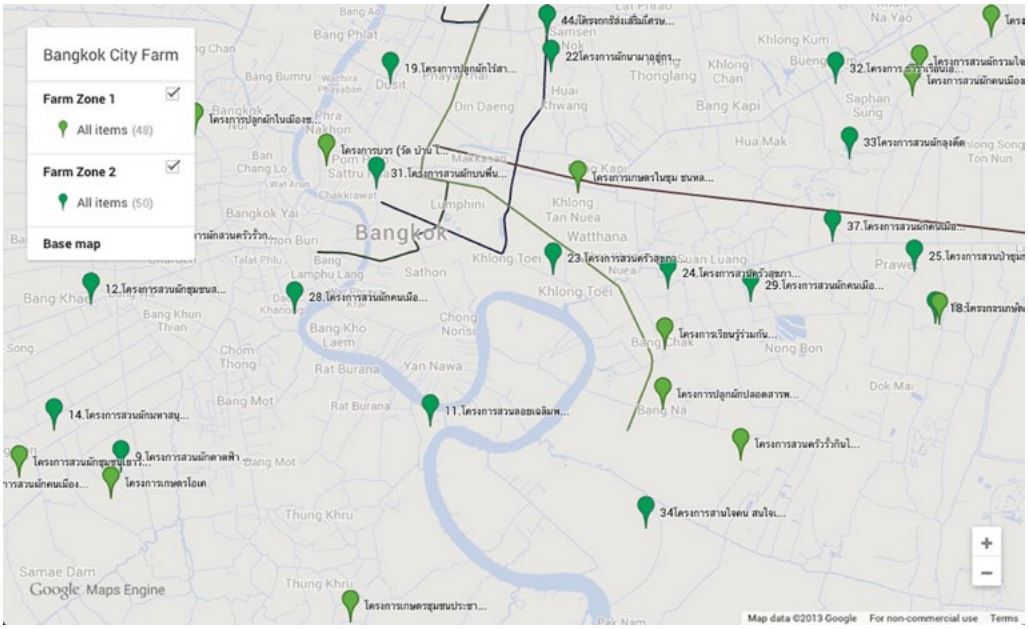


Figure 2: Collective vegetable gardens in Bangkok

Photo 4: Mobile markets. Credit: Photo by Kisnaphol Wattanawanyoo

the comprehensive one within their authority and territory.

Technical and legal planning documents that directly relate to the promotion of food systems include the City Planning Act 1975, the Land Development Act 1982 and the Bangkok's Comprehensive Plan 2013. The City Planning Act 1975 establishes the foundation of urban planning culture in Thailand by which peri-urban agriculture is conserved as a cultural heritage of Thai cities (Department of Public Works and Town & Country Planning 2016). Since then agriculture has not been alienated from the city characteristics. Regarding the Land Development Act 1982, it's article 16 influences the protection of farmlands in the fringe of Bangkok and the development of irrigation systems, as such fertile lands proved to be best for growing foods (Land Development Department 2016). Although this act then has been replaced by the Land Development Act 2008, the language of article 16 remained. For the Bangkok's Comprehensive Plan 2013, the previous two acts and the Building Control Act 1992/ 2015 are enforced at the same time that food markets and silos, for storing agricultural products, are zoned within the inner city. The comprehensive plan also promotes small-scale farming in the inner city particularly where it is zoned for housing (Department of City Planning 2013).

Apart from that, there are other planning approaches and instruments that relate to food systems promotion either indirectlty, or which have spatial implications which affect food systems. To begin with, there are the four year strategic plans adopted by BMA and DAOs. Some of these strategic plans aimed to control the quality of food and market hygiene using specific measurable outcomes (Bangkok Metropolitan Administration 2013; Klongtoei District Administration Office 2015; Laksi District Administration Office 2015). They also framed follow-up action plans related to the urban food agenda, such as the Environmental Quality Management Plan, the Global Warming Reduction Action Plan, and the Green Space Action Plan. The idea of edible green space is recognized by the Bangkok Green Space Action Plan 2009, while community gardens are promoted formally by the Bangkok Environmental Quality Management Plan 2012-2016 (Environment Department 2012, 2009). The Global Warming Reduction Action Plan 2013-2018, on the other hand, proposes measures to increase the number of public gardens and trees along the roads and green buildings. One strategy is to promote the planting of fruit trees, such as tamareen and mango. Another one promotes the reuse of organic wastes in gardening and farming activities (Environment Department 2013). Another state plan, called 'Bangkok 2020', looks forward to the future Bangkok and requires sustainable urban food systems[8]. This plan addresses the role of peri-urban farming areas to enhance urban resilience and envisions that such areas can be an emergency food source and floodways for draining water to the sea in the time of severe flooding (Policy and Planning Division 2015).

Agribusiness planning – Secondly, Bangkok food systems are planned by large food corporations. While agribusiness influences state-led planning, they also have their own strategeic business plans. These plans control agricultural industries and the modern trade system which dominate the city food chains and seize the largest portion of food distribution.

In general these plans are coordinated with state-led plans and other business plans. For example, they planned to enhance profits from the market shares ruled by the state-led plans and those market segments influenced by other food corporations' plans. They also identify desired changes to new governmental regulations, such as the changes of Bangkok's comprehensive plan. After a terrible flood that affected 72% of the whole Bangkok area in 2011, it was found that some large agribusiness planned to adapt by learning the lessons from the interruption of food supply. They propose to increase distributive units to manage risks; an action which benefits the whole Bangkok food regime by enhancing the resilience of the existing urban food systems.

Civil Society Planning – Thirdly, civil society organisations also play a role in planning food systems by bringing about the expansion of household, community and institution gardens within the inner city. Civil society-led planning

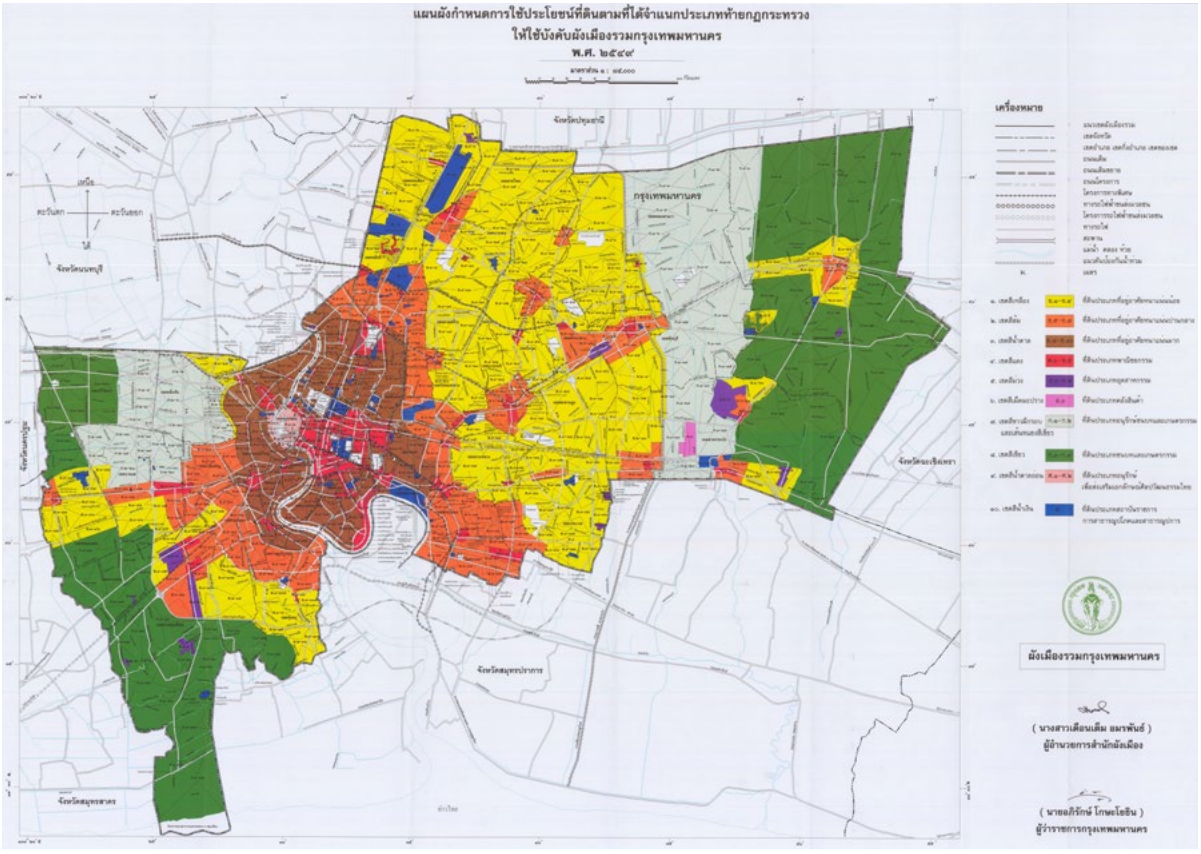


Figure 3: Bangkok's Comprehensive Plan 2013

Planning tools	To promote									
	Peri- urban farming	Agri cultural infra-structure	Collective/ community garden/ vacant land lease contract	Fruit tree planting	Green build-ing/ Vertical farming	Organ-ic-healthy food/ reuse/ training	Food market/ silo/ transport./ hygiene	Green/ farmer mar-ket/ shop/ restaurant	Produc-er-custom-er relations (eg. CSA/ PGS)	Pro-poor food distri-bution/ local seeds/ food diversity
City Planning Act 1975	/									
Land Development Act 1982/2008	/	/								
Building Control Act 1992/2015					/					
Comprehensive Plan 2013	/		/				/			
Environmental Quality Man-agement Plan 2012-2016			/	/	/					
Green Space Action Plan 2009				/	/					
Global Warming Reduction Action Plan 2013-2018				/	/					
Bangkok 2020	/		/	/	/					
BMA strategic plan	/	/		/	/	/	/			
DAOs strategic plans			/	/	/	/	/	/		/
Large food corporations' business plans							/			
Strategies of social enterprises					/	/		/	/	
Scenario 2033 of NGOs			/	/	/	/		/	/	/
Community/ neighbourhood plans			/	/	/	/			/	

Table 1: Key focuses and the connection of various planning tools

proposes alternative food sources and distribution that promotes both safety local food and fair food supply chain. They also support spatial neighbourhood planning to highlight the role of urban agriculture in enhancing social cohesion, raising environmental awareness, and managing wastes.

Civil society-led planning adopted scenario and participatory planning approaches but in their own way. They made a plan called 'Thailand desired food and agricultural system 2033' by brainstorming experiences and visions of different civil society organisations using deliberative panels. So, it can be claimed that this plan is a shared vision of a network of civil society organisations. They dream to see the expansion of organic food production to 50% of the total farmlands, to see 50% use of local seeds, and food portion produced in the city grow until it can feed the total Thai population by 2033 (BioThai 2013).

To make the scenarios possible, civil society organisations also stimulate communities to do spatial community and neighbourhood planning. This approach encourages advocacy and collaborative planning. In their planning vision, community empowerment is one of key goals to be achieved to reach others. The network of civil society organisations expect that urban communities will be the main agent in reforming food and agricultural systems. The civil society organisations support community planning as a tool for raising awareness using a bottom up approach to creation the local food systems. They encourage farming communities to keep their lands, to strengthen their co-operatives, to change their production to be more sustainable, to develop farmer markets, and to think about their alternative energy (BioThai 2013).

Aside from the highlights of each key planning instrument above, the connection of various planning tools is that they share some focuses and complement each other as shown in the Table 1.

Informal foods vendors, a lack of long range planning – Lastly, the Bangkok food systems is characterised by the daily life practices of street food venders and mobile markets. This everyday planning has no specific patterns and particular instruments, but plays a role in promoting food diversity and making Bangkok as a lively city with abundance of food

THE CITY FARM PLAN A COLLABORATIVE EFFORT

While all of the food actors have specific agendas, there are planning interrelations between the various food actors. For example, the public agencies and food corporations develop shared visions to achieve their mutual benefits. While the corporations are influential in making urban food related plans, they also adjust their plans to fit in the changing state-led plans and regulations. Civil society organisations interact with corporations and the public agencies. Civil society organisations critique large corporations that create and monopolise the food regime, and the civil society groups also develop a link with public agencies. They implement the state-led planning, rather than fight it, and learn to work and share resources with social enterprises. The governments regulate and facilitate street food venders and mobile markets by recognising that they determine the identity of Bangkok. Without them, there is no Bangkok that everyone gets used to. The role of BMA, in particular, helps facilitating co-functions of formal and informal distribution activities. The BMA, for example, bridges formal and informal food actors by negotiating to use outer space of modern supermarkets for traditional food venders. As a consequence, customers, who go to the mall, usually have choices to choose of going inside the mall for the service of formal distribution system or of staying outside for the service of the informal one.

In addition to this organisational interaction, the City Farm Programme has become a meeting point for all the actors and their different planning practices. Public agencies, experts, some corporations, civil society and informal sector were put together to plan the ideal food system to serve Bangkok and to insure its sustainability. This process found that the concept of sustainability was controversial with different interpretations, but that this collaborative process helped to define a meaningful way forward.

The City Farm Programme began in 2010 and was funded under the Food and Nutrition

Programme of the National Health Promotion Foundation, part of the Prime Minister's Office. It has been co-managed by a multitude of civil society organisations with cooperation from the public and private sectors. With such characteristics this programme can also be seen as an interaction plan. The emergence of the programme was a result of the concern about urban food insecurity (regarding poor quality and the increasing price of food) as well as the intention to impliment the King's idea of low-input farming in an urban context. The programme has been granted 7 millions Baht annually (about 235,000 US dollars). Some of this amount were used to support 50 collective/community gardens each year (35,000-50,000 Baht or about 1,170-1,670 US dollars). The rest is for organising training courses and alternative food markets, providing inputs, sharing farming knowledge, promoting wide-range food initiatives, doing public campaigns, and managing fixed and operating costs of the programme itself (Mahasarakham University 2013).

With regard to the expectations of many particpates, initiatives made under the umbrella of the City Farm Programme have resulted in unintentional collaboration. A good example began when the Laksi DAO, as a local government, developed its rooftop garden and opened it to public as a learning centre. This DAO also worked with various civil society organisations which played a key role in organising training courses on urban farming. Other DAOs, learning from this experience, developed their own rooftop garden and secured BMA support with organise training courses. However, the demand for training increased beyond the DAOs capacity. So, social enterprises stepped in by proposing alternative city gardening training courses and the City Farm Programme agreed to support them to start up.

As a result, there has been an expansion of rooftop garden installations throughout the city in locations such as private buidlings, temples, schools, and even hospitals. As the demands for rooftop gardens grew, university experts from Kasetsart University engaged with the programme and proposed the use lightweight soil and food growing plants. This programme could be applied to reduce structural stress on host buildings. They also conducted research on the relationships between the design for rooftop gardens and energy efficiency.

In parallel with the growing number of individual-based farmings, civil society organisations, led by the Sustainable Agriculture Foundation, have worked to promote community gardens in the city. Part of the City Farm program, civil societies also facilitated by local DAOs, encouraged community committees in their jurisdictions to participate in the programme. For example, the Slum Dwellers Network and the Informal Labour Network (as civil society organisations) helped to introduce the programme to the informal sector.

Similarly, the Working Group on Food for Change, another civil society organisation, lead the organisation of local seeds donations from the rural and peri-urban farmers to the urban communities and groups developing collective gardens. In the case that some community leaders required know-how knowledge, the programme managers asked DAOs and social enterprises to organise training courses for them for free. As a result, a lot of collective gardens have emerged in Bangkok and their networks were created to share and learn from each other (Boossabong 2012).

Food production also benefitted by the promotion of marketing opportunities. Apart from sharing and selling products to neighbours, the Green Market Network, as a network of social enterprises, played a key role in developing alternative markets, such as green markets, green fairs and the direct food delivery from producers to customers. Some green restaurants, particularly the ones selling vegetarian foods and promoted local food systems, also agreed to buy their products from these urban farmers.

From these examples, it can be seen that there is an articulation of public agencies, experts, social enterprises, civil society and the informal sector in planning food systems at different entry points and different scales. Their articulation helps to develop multiple food chains ranging from various ways to grow food to many food distribution initiatives that have spatial implication at the wider scale.

Photo 5: 'Pinchareaun' community garden supported by the City Farm Programme

Photo 6: Rooftop garden of Laksi local government

Photo 7: Sharing and learning event at 'Tungsonghong'

CONCLUDING REMARKS

Through different planning practices, different impacts are made and they either complement each other or bring about paradox. The intended impact was to improve the food system of Bangkok and to increase food security and sustainability. Other objectives were to augment public infrastructure development with the investment of agribusiness and to complement the modern food trade system with street food vendors and mobile markets, which can guarantee that the poor and marginalised will be able to access food.

The key lesson learned from Bangkok is that food systems are too complex to be covered by a the single all-inclusive plan which addresses the multiple scales and mixes of formal and informal activities, which have been developed by the multiple stakeholders. We discovered that the best approach was to integrate and facilitate an articulation of multi-scalar, sectorial, spatial and strategic planning practices from each of the various food actors. In this way, this layering of plans allows us understanding how food systems really work in the fragmented and pluralist societies. Such an approach also avoids the pitfalls of large scale collaboration and consensus building, which is both difficult to do and which can conceal the structural injustice and embedded conflicts. Our experience proposes the example of integrating food into urban planning networks in which spaces are opened up for everyone to participate in creating their prospective food systems.

We have also learned that the encouragement of urban farming is an integral part of our food planning. Many Bangkok dwellers, particularly the poor, have moved from rural area to live in the city and have farming skills. For many farming not only provides food, it also heals their feeling of homesick and opens the window of opportunities.

Moreover, civil society organisations cannot plan to create more sustainable food chains without the cooperation of social enterprises, with their corporate social responsibility plans. On the other hand, the paradox, from different planning practices, occurs from the different goals of large agribusiness and civil society organisations. While the former aims to control food systems, the later dreams to create just-food systems by which lay people have the power of determination.

To cope with conflicts of interests between the different food actors, the governments believe that growth and sustainability can be achieved together. While large food corporations operate for maximising their profit and alternative forces make for gradual reform, the governments support both sides by having two faces; one is to promote food actors who advocate for more sustainable, local and fair food systems, while another is to protect agribusinesses as they determine macro economic growth.

Thus, the food governance structure includes various food actors by which the governments, at the centre, allow different actors to contribute to the food system in their own ways. Two different approaches still battle pave the way toward more or less sustainable, local and fair food systems. Although large food corporations seem to be the evil, their existence and power stimulate the collaboration of alternative food actors, who realise that they need to work together to be stronger for bargaining with those food corporations.

The active role of some local governments, civil society organisations and social enterprises respond more to such social values by making the city dwellers' increasing concern with sustainable, local and fair food systems influence the strategic changes of agribusinesses. Apart from that, as food exports from Thailand were affected by testing which found about 330 millions dollars of chemical contamination in four years (Thailand Foundation for Customers 2012), the central government started to force large food corporations to improve their supply chains to be more organic. This is a good sign about moving forward in a better way and might enable agribusinesses and civil society organisations to meet at some point along the way.

Finally, it should be also noted that Bangkok's efforts to integrat food into urban planning was greatly facilitated by the support of the Thai King, who is our symbolic and spiritual leader. As he is respected as the father of the country, his speeches promote growing food in developed areas using low-input methods, his support for self-reliance, and his encouragement of urban farming in 'Jitlada garden' [9] (located in the inner

Bangkok) become positive forces that stimulate a lot of urban dwellers to follow his example and grow food in the city. Plural actors, whether they agree with his idea or not, do not disagree and usually refer to his speeches and practice to legitimise their plans and actions. For example, recently, the Agriculture and Co-operative Bank announced a program to give a credit to part-time urban farmers who intend to borrow money to follow the King's footpath. ◆

Unless otherwise credited, all photos in this article were taken by the author.

ENDNOTES

1 Retrieved on july 3rd from http://globetrottingstiletto.com/globetrotting-bangkok-thailand/

2 The estimated number comes from a consideration of the housing aspect. Most of these people (79%) live in the renting lands, rooms and houses, while the rest (21%) enters the lands of others without permission (trespass to land).

3 For those who are members of community supported agriculture (CSA) programmes.

4 This chapter differentiates regional and local governments by considering their scales – not by the Thai legal status.

5 The contracts mostly agree upon 3-5 years by which the owners can ask for returning their lands by notifying 4 months in advance (Ms.J.Tongput 2013, pers. Comm., 24 April).

6 Roughly 158 acres

7 For farming training business, the number of farming trainees in 2013 is roughly 1,000 and they led to the extending practices on urban farming about 3,000 by which this number tends to be increased continuously (Health Promotion Foundation 2013).

8 However, it is different from other strategic plans in that it discusses the analyses of risks and possibilities in the future without making specific recommendations.

9 'Jitlada garden' is the city farm that covers 100 rais (about 39.54 acres) inside the territory of the 'Dusit palace' located in the inner city of Bangkok. The farm is supervised by the King and aims to experiment initiative farming technologies and practices. There are rice field, dary farm, horticulture and aquaculture there.

10 Retrieved on july 3rd from https://www.justgola.com/a/damnoen-saduak-floating-market-1978046566

REFERENCES

Bangkok Soi Index 2016, Roads and small streets in Bangkok. Avaliable from: <http://th.soidb.com/ bangkok/soi/index.html>. [28 April 2016]

Bangkok Metropolitan Administration 2013, Bangkok Metropolitan Strategic Planning 2013-2016. Available from: <http://203.155.220.230/bmainfo/docs/plans/1 plan%20development%2012%20year%20time%202%20(%202556-2559).pdf.> [28 April 2016]

BioThai 2013, Thailand desired food and agricultural system 2033, Scenario Plan, Nontaburee.

Boossabong, P 2012, Growing City for Life: Approaches and Practices in Urban Agriculture, Sustainable Agriculture Foundation, Nontaburee.

Bunyapravitra, T 2015, The Role of Urban Planning in Food Conservation and Food Production Development in Thailand. Available from: <http://www.thaicityfarm. com/autopagev4/show_page.php>. [8 January 2015]

City Farm Program 2014, Progress Report of City Farm Program, Report to the Health Promotion Foundation, Bangkok.

Community Organisations Development Institute 2008, A Survey of Crowded Communities in Bangkok in 2008, Ministry of Social Development and Human Security, Bangkok.

Department of Public Works and Town & Country Planning 2016, Building Control Act. Available from: <http://www.dpt.go.th/krabi/main/images/stories/file_pdf/ control%20a%20building2522.pdf> [28 April 2016]

Department of City Planning 2013, Bangkok's Comprehensive Plan 2013, Bangkok Metropolitan Administration, Bangkok.

Department of Public Works and Town & Country Planning 2016, City Planning Act. Available from: <http://library2.parliament.go.th/giventake/content_nla2557/law 86-080958-76.pdf> [28 April 2016]

Environment Department 2012, Bangkok Environmental Quality Management Plan 2012-2016, Bangkok Metropolitan Administration, Bangkok.

Environment Department 2013, Bangkok Global Warming Reduction Action Plan 2013-2018, Bangkok Metropolitan Administration, Bangkok.

Environment Department 2009, Bangkok Green Space Action Plan 2009, Bangkok Metropolitan Administration, Bangkok.

Health Promotion Foundation 2013, Expanding city farms for more safety food. Available from: <http://www.thaihealth.org.th/content/16275.html>. [15 September 2015]

Klongtoei District Administration Office 2015, Klongtoei Operational Plan 2015. Available from: <http://www.bangkok.go.th/khlongtoei/page/sub/6247> [29 April 2016]

Laksi District Administration Office 2015, Laksi Operational Plan 2015. Available from: <http://www.bangkok.go.th/laksi/page/sub/4931> [29 April 2016]

Land Development Department 2016, Land Development Act. Available from: < http: //www.ldd.go.th/ACT/all.pdf> [29 April 2016]

Leaunjumroon, L et al. 2011, Agricultural reform for food security: an analysis and policy responses, BioThai, Bangkok.

Mahasarakham University 2013, An Evaluation of the City Farm Programme 2010-2012, National Health Promotion Foundation, Bangkok.

National Economic and Social Development Board 1961, National development plan 1961-1966, Prime Minister's Office, Bangkok.

Policy and Planning Division 2012, Agriculture in Bangkok, Research Report, Department of City Planning, Bangkok Metropolitan Administration, Bangkok.

Policy and Planning Division 2015, Bangkok 2020, Bangkok Metropolitan Administration, Bangkok.

Thailand Foundation for Customers 2012, The Survey of Chemical Contamination in Vegetables Sold in Supermarkets around Bangkok, A report, Bangkok.

Thai Seed Trading Association 2011, Hybrid seeds in Thailand. Available from: <http://www.thasta.com/>. [30 May 2012]

Thai Climate Justice 2012, Comparing commercial and green spaces in Bangkok. Available from: <http://www.thaiclimatejustice.org>. [30 May 2012]

Working Group on Food for Change 2012, Bangkok Food Mapping Survey, Report, Bangkok.

Damnoen Saduak Market, Bangkok[10]

EDIBLE PROVIDENCE INTEGRATING FOOD INTO URBAN PLANNING

KATHERINE BROWN · SHEILA BRUSH

» *From 2003-2015, Providence made significant strides integrating food into urban planning and policy. Throughout Providence, vacant lots and parks have been transformed into productive food gardens and farms; residents now have access to fresh food at farmers' markets, farm stands, restaurants and school lunchrooms; and tons of food waste are composted on a regular basis.* «

THE GROWTH OF PROVIDENCE

In 1636, the Narragensett Indians granted English colonists land-use rights to establish a town on the bank of the Providence River, at the head of the Naragansett Bay. (Today the city is mid-way between Boston and New York.) Providence's original colonists laid out narrow house lots along the eastern bank of the river and used land on the west side of the river as common ground for raising crops and grazing animals. Through the early 1800s, growth centered on the area along the river. Farms ringed the built-up part of town and supplied produce and meat to those in the town center.

Through the early 1800s, Providence grew from rural hamlet to prosperous seaport to early industrial and financial center and overland transportation hub. Later the city experienced a period of rapid industrial expansion. The availability of work in the new factories attracted waves of immigrants, first from England, Scotland and English and French-speaking Canada, and later from Ireland and Italy. The city's population doubled between 1865 and 1880 and doubled again between 1880 and 1910. As manufacturing boomed, factory expansion and housing construction rapidly consumed what had once been open land within the city limits. By 1900, Providence was the 20th largest American city.

The growth of the 19th and early 20th century did not continue. Providence's industrial base eroded steadily after World War II, the population shrank, and the city entered a period of urban decline. Like other American "rust belt" cities,

Figure 1: Once a trash-strewn vacant lot, the 1/2 acre Somerset Garden is now a highly productive source of food for neighborhood families. Photo credit: Lucas Foglia

Figure 2: Providence's immigrant populations bring agricultural savvy from their native countries. Photo credit: Lucas Foglia

Providence was faced with the dire need for both redevelopment and economic repositioning. Efforts in the 1980s and 90s, which combined historic restoration with major redesign and new development, were slow to attract new business. Only now is Providence beginning to see significant new economic growth.

Fortunately, the city is not without multiple assets, including historic and walkable neighborhoods, renowned universities, regional health care centers, an increasingly vibrant arts and cultural scene and a port that serves as a regional distribution point for fuel, salt and raw materials. The city has continued to attract new immigrant populations, who bring energy and entrepreneurial spirit. Of Providence's 178,000 residents, nearly half are Hispanic/Latino, Asian and African[1].

As the city declined, so did farm production. From 1945 through 1992, Rhode Island farms and land in farms decreased by about 80%.and the remaining farmland was under strong development pressure. Providence imported virtually all food from outside the state.

Food production and food waste composting within the city was limited to the occasional backyard gardener, twelve community gardens and a 3/4-acre market farm. Providence's once active food warehousing and market district had virtually disappeared. By 2002, there was only one farmer's market in Providence where Rhode Island farmers sold directly to customers. Beyond recognition that some of Rhode Island's restaurants were gaining regional attention, state and local officials did not view food production, processing and distribution as economic drivers. Nor were rising food insecurity and diet-related health concerns widely recognized.

FACTORS CONTRIBUTING TO THE INTEGRATION OF FOOD INTO PROVIDENCE'S URBAN PLANNING AND POLICY

Beginning around 2003, a number of factors combined to draw city government's attention to food system issues and to foster the inclusion of food in city planning and the adoption of city policies supportive of food initiatives.

CITIZEN AND NGO CAPACITY TO ENGAGE WITH CITY

During the 1990s, public interest in local food began to increase in communities across the United States and in other countries. In Rhode Island, the precipitous drop in farm numbers bottomed out, and the state began to see some farm growth. Furthermore, farmers began to capitalize on the increased public interest in local food by marketing directly to consumers, thereby increasing their profits. In Providence, a nascent groundswell of community support for the local food system was forming. Supporters included: food growers, many of whom were recent immigrants who brought their agricultural know-how from Asia, Africa, and the Caribbean; young adults who embraced the local food movement and urban gardening; and, environmentalists whose sustainability goals overlapped with urban agriculture.

This upsurge in interest was inspired and urged on by the work of Providence's earliest food-related NGO, the Southside Community Land Trust (SCLT). Founded in 1981, SCLT is the first, and remains the nation's only, community land trust that is uniquely dedicated to urban agriculture. Community Land Trusts in the United States exist in many forms with the common purpose of holding land in order to address a range of community needs. Most have focused on affordable homeownership.[2] SCLT's three decade-long dedication to urban agriculture has been a notable exception until recently when a number of others expanded their goals to include agriculture. By 2003, SCLT had established ten community gardens and one three quarter acre market farm inside Providence and it also managed a 50-acre farm just outside the city limits.

Figure 3: The next generation of growers. Photo credit: Southside Community Land Trust

Concerns about gaps in the local food system led to the establishment of several additional NGOs that complemented Southside Community Land Trust's agriculture programs, and by 2003 Providence's NGO community had developed the organizational capacity necessary to mobilize community constituencies and engage with city government.

In 2004, the Southside Community Land Trust took the lead in advocating for Providence's local food system when it launched the Providence Urban Agriculture Task Force (UATF). With a defined mission of creating community food systems where locally produced, affordable, and healthy food is available to all, SCLT's leadership brought to the table three elements: 1. on the ground evidence of the benefits of urban agriculture with their gardens and farms; 2. a network of growers who provided a ready constituency of support; and, 3. a recognition of the importance of municipal policy change if the food system was to make significant advances.

SCLT's goal for the UATF was to coalesce NGO and community interests thereby ensuring city residents access to affordable, fresh, locally grown and culturally-appropriate food. In keeping with SCLT's system-wide perspec-

tive and the priorities of their USDA Food Project grant program[3], UATF members organized around a food system model, seeking long-term citywide systemic changes. Interpreting "urban agriculture" broadly, they collaborated to identify policies and projects to: increase the amount of food raised in Providence and surrounding municipalities; facilitate healthy food access, especially for low-income consumers; integrate food with housing and community development; compost food waste; and, negotiate farm-to-school purchasing agreements between the Providence School Department and Rhode Island farmers.

UATF's 40-members included farmers, gardeners, NGOs, food and health professionals, environmentalists, and City and State staff and policy-makers. The members' diverse individual agendas included public health and nutrition, food security, housing and community development, environmental protection, youth betterment, anti-poverty and racism, immigrant and refugee resettlement, farm viability and economic development.

CONSISTENT POLITICAL LEADERSHIP VISION OF A GREEN FUTURE

Starting in 2003 three different mayors[4] began the City's commitment to food initiatives. During this period, cities and mayors in particular, were taking a lead on climate change and sustainability issues. Providence's mayors and several council members were among those who committed to work on these critical issues. Sustainability and climate change not only provided a larger policy umbrella under which food system issues could be treated, but food issues were often easier to discuss with the public than more complex subjects such as climate change and alternative energy.

An example of this commitment was the *2008 Greenprint Providence report* issued by Mayor Cicilline. This report summarizing the City's vision to "reduce global warming, pollution and to position Providence as a leader in the rapidly growing green economy." The report's section on Open Space stated that "community gardens and urban agriculture build community, foster cultural identify and connections, engage residents in the stewardship of land, and provide affordable produce."

Once the initial commitment to addressing food issues was made, subsequent administrations and councils continued the food initiative momentum. The city government moved from a focus on local food production at a neighborhood level to a systems-level perspective. Successive administrations not only continued to build on the goals, organizational changes and programmatic strategies initiated by their predecessors, but in many cases retained key personnel.

CITY SUPPORT FOR CITIZEN PARTICIPATION IN PLANNING

Soon after Mayor Cicilline's 2003 inauguration, the Providence's Department of Planning and Development (Planning Department) began to map out the process for creating a new Local Comprehensive Plan. Whereas previous plans had been developed using a "top down" approach, this time neighborhood associations and community residents called for a planning process that incorporated input from citizens across the city. In response, the Planning Department announced that its plan development process would include a citywide charrette in the fall of 2006, after which an interim Local Comprehensive Plan would be adopted. The process continued with a series of neighborhood charrettes in 2007-2009, and culminated in neighborhood plans and a final Local Comprehensive Plan.

The Planning Department's emphasis on public engagement provided an ideal opportunity for UATF members to garner municipal support for the policy changes they were advocating. They focused their efforts on incorporating language into the neighborhood plans and the Comprehensive Plan that would increase food production in Providence by enabling the development of new community gardens and market farms on City-owned property. One of the UATF's first steps was to invite Mayor Cicilline to visit SCLT's City Farm and speak with UATF members. The Mayor remembers his visit as a turning-point in his own understanding of the value of growing food in the city:

Figure 4: Cambodian monks bless an urban farm. Photo credit: Lucas Foglia

"At City Farm, seeing Dominican, Laotian, Haitian, and white interns working together, I understood immediately how powerful food gardens and farms in the city can be. These youth(s) were learning environmental stewardship, growing food for their families, and improving blighted lots. I was impressed to see how much food could be grown in a small space. I remember thinking here's a win-win model we can use all over the city".[5]

Other UATF efforts included publishing *Urban Agriculture in Providence: growing our community by growing good food* that made the case for including urban agriculture in the new Comprehensive Plan[6]; issuing a white paper for planning professionals entitled Planning for Appropriately Scaled Agriculture in Providence[7]; and submitting specific draft language to be considered for inclusion in the Comprehensive Plan that would increase food production in Providence.

UATF also spread word about the Planning Department's charrettes among food advocates and helped empower non-English speaking growers to present their interests at those public charrettes. This reinforced the Mayor and Planning Department's growing recognition that community gardens were a priority for many residents. As David Everett, one of the City's planners who staffed the public charrettes remembers, "Many at the City level didn't acknowledge urban farmers as much more than a fringe element, and even I came to realize the network was larger than I'd imagined."[8]

Garry Bliss, then Director of Community Development, summed up the effectiveness of the UATF's engagement with the city's planning process as follows:

"What the pro-urban ag folks did is a textbook example of effective engagement with municipal government. Their outreach helped policy makers and staff understand what urban ag could do. They offered successful on-the-ground examples so urban agriculture was not an abstraction. Their efforts complemented the government's process."[9]

NEW APPROACH TO CITY HALL STRUCTURE

There also was recognition within City Hall that complex issues such as environmental sustainability could most effectively be addressed through involvement and collaboration of multiple departments, the assistance of professional organizations and financial support from outside of government. It also became recognized that the city needed to expand its in-house organizations to formally address these complex issues.

In 2008, the City Council passed an ordinance that established the Environmental Sustainability Task Force and created the position of Sustainability Director. The ordinance responded to growing concern about sustainability and signaled the City's increased readiness to invite on-going NGO and academic participation in planning and policymaking. It directed the Task Force to work with the Office of Sustainability, the Mayor, the City Council and other city departments to coordinate and provide public accountability, transparency, and accessibility regarding the City's environmental agenda and propose innovative, achievable environmental initiatives.

From the first, local food system advocates have been represented on the Environmental Sustainability Task Force, ensuring that food issues are brought to the City's attention.

In 2012, Mayor Taveras established the Healthy Communities Office. Healthy Communities was charged with soliciting community input, establishing creative partnership across City departments and with the city's NGOs, and leveraging funds to create healthier outcomes for city residents. Its responsibilities include food system changes to improve nutrition and increase access to healthy foods. Like the Sustainability Office, Healthy Communities demonstrates the City's commitment to innovative structures within government to address system-wide responses to complex problems.

THE INTEGRATION OF FOOD INTO URBAN PLANNING

THE ADOPTED PLAN AND ORDINANCES

In 2007, following the active engagement of food system advocates in public planning charrettes, the City published *Providence Tomorrow: The Interim Comprehensive Plan.* Between 2009-2010, it also published a series of neighborhood plans to summarize the findings of the Planning Department's neighborhood charrettes and prioritize recommended actions.[10] Both the interim comprehensive plan and most of the neighborhood plans discussed the importance of providing community gardens and farming opportunities.

The City also referenced community gardens in another essential planning document – the Consolidated Plan. In order to receive certain Federal funds, the City is required to prepare a Consolidated Plan, in which it sets forth its priorities for housing and community development. Providence's 2005 and 2010 Consolidated Plans identified community gardens as a community development strategy, and thus allowed for distribution of Federal funding to promote community gardens.

Providence Tomorrow: The Final Comprehensive Plan, adopted in 2014, built on the foundational work contained in the Interim Comprehensive Plan and in the series of Neighborhood Plans. Developed in-house, the Final Plan provided even more robust treatment of food system objectives and strategies related to various components of the food system.

The Plan's Sustainability Element includes strategies to:

- Establish guidelines and amend regulations as necessary to promote appropriately-scaled, hand-tended agriculture, including community gardens as a temporary or long-term use of surplus or temporarily vacant City property and the Rhode Island Department of Transportation.
- Establish a goal that every Providence resident live within a ten-minute walk of a community garden.
- Promote CSA (community-supported agriculture) co-ops and the health benefits of local produce.

- Investigate innovative solutions to provide accessible and affordable water service for community gardening as needed.
- Support "vertical farming" whereby existing buildings and other structures can be used for growing.

The Sustainability Element also calls for "maintaining and supporting existing and proposed recycling and composting programs, supporting the establishment of a sustainable regional or municipal composting facility, and amending regulations as necessary, to support composting programs."[11]

The Business and Jobs Element recognizes urban agriculture as part of neighborhood economic development and includes a strategy of identifying and preserving "areas suitable for urban agriculture." Its strategies for neighborhood economic development include strengthening programs that support small business and neighborhood revitalization, such as Neighborhood Markets, micro-loans and storefront improvement grants. While these strategies do not identify neighborhood groceries and corner markets explicitly, such businesses, many of which meet neighborhood cultural food demands, are key elements of neighborhood business mix.

Recognizing "Providence's role as the economic center of the state," the Business and Jobs Element presents a strategy to "Support local agriculture through farm-to-school and farm-to-government programs that link local farmers to schools and encourage government purchasing of local produce.

The Land Use Element includes community gardens as a neighborhood revitalization strategy in residential neighborhoods and reiterates the importance of identifying city and state-owned open spaces best suited for agriculture, amending regulations as necessary "to facilitate urban agriculture" and "to promote a system of farmers' markets throughout the city."[12]

The City's new *Zoning Ordinance,* adopted in 2014-2015, permits plant agriculture by right in 16 of the City's 20 zoning districts and permits mobile food sales (with a temporary use permit) in 14 districts, and Farmers Markets (with a temporary use permit) in 17 districts. Use standards are provided in all cases. Apiaries, aquaculture/aquaponic facilities, chicken coops and coldframe structures are permitted as accessory structures in all districts unless specifically prohibited by the ordinance. The definitions section also notes that Light Industrial Uses include aquaculture/aquaponic facilities.

THE DEVELOPMENT OF OTHER IMPORTANT CITY PLANS

The 2014 *Sustainable Providence Food Plan*[13] is a policy statement that deserves mention, although it is not a legally binding planning document. Produced by the Sustainability Office and

Figure 5: Permitted in 17 of 20 districts, farmers markets provide access to fresh produce and give community growers a place to sell their products. Photo credit: Southside Community Land Trust

the Environmental Sustainability Task Force, the *Sustainable Providence Food Plan* is a strong expression of the Administration's commitment to a strengthened food system and the definition of metrics to measure progress.

One of six sections of the *Sustainable Providence* policy document, the *Food Plan* was developed via a series open meetings with community partners. Providence's Food Plan sets goals for production, processing, distribution and consumption and incorporates equity and environmental considerations. It states:

"Providence is part of a local and regional food system and has a critical role to play in ensuring that this system: A) Provides every Providence resident with access to safe, affordable, nutritious, and culturally appropriate food; B) Cultivates a healthy environment in Providence by striving for zero waste, adopting ecologically sound and sustainable practices, and ensuring healthy, fair, and just working conditions and wages; C) Contributes to the state and city's economy by supporting long-term economic development opportunities in the food sector."[14]

One final document should be mentioned. In November 2015, the Department of Economic Development released the City of Providence's *Economic Development Cluster Strategy*, which identified the food cluster as one of the areas on which Providence's economic development efforts should concentrate. The report notes:

"There is a concentration and growth in the entire regional food-related supply chain from farms to food processing to food sales and more. The state as a whole and the city in particular has opportunities to realize additional economic benefit from this cluster as national trends towards locally sourced products and global food security trends drive local opportunities."[15]

The report recommends feasibility research for a co-packing facility, refrigerated distribution space and food manufacturing, processing, and sales businesses, improved services, incentives, programs and zoning to support food-based businesses; workforce training; and outreach to private equity firms, highlighting food as a unique opportunity. Since the report's release, the Department of Economic Development has begun to develop specific proposals to implement the report's recommendations.

Referring to the *Sustainable Providence Food Plan* and the *Economic Development Cluster Strategy*, Planning Deputy Director, Robert Azar stated, "While these aren't planning documents like a comprehensive plan, I foresee us incorporating elements of both documents into the next iteration of the comp plan."[16]

Figure 6: The on-going success of community gardens depends on regular meetings among each garden's growers. Photo credit: Southside Community Land Trust

EXAMPLES OF ON-THE-GROUND CITY-NGO COLLABORATION

COMMUNITY GARDENS IN PUBLIC PARKS

Under Mayor Cicilline's administration the Board of Parks Commissioners approved language that permitted the Parks Department to work with neighbors and NGOs to establish community gardens in City parks.

The Parks Department's model is to provide a community garden in a public park only when the neighboring community requests the garden. The Parks Department covers capital costs for fencing, garden beds and water lines, and assumes on-going responsibility for water, repairs, and compost. Neighbors must commit to helping with the initial garden build-out and commit to taking responsibility for ongoing garden management. NGOs support this effort by mobilizing neighbors and providing community education, collaborating on grant applications for funding, and partnering with the Parks Department on community events. By 2016, the Parks Department had responded to neighborhood requests to install twelve community gardens and one fruit orchard.

LOTS OF HOPE

Lots of Hope is a collaboration between the Sustainability and Healthy Communities Offices, Planning Department, and food advocates. Where community gardens make it possible for people to grow food for their own families, with *Lots of Hope* the City and partnering NGOs offer people the opportunity to grow food to sell. The initiative seeks "to institutionalize urban agriculture and position the City as an urban agriculture advocate to help farmers navigate… bureaucratic challenges associated with acquiring land."[17] The program aligns with both Offices' goal of creating a community food system where locally produced, healthy, and affordable food is accessible to everyone.

Using the Planning Department's inventory of City-owned vacant lots, the *Lots of Hope* project team used lot size, orientation to the sun, tree canopy coverage and other factors to identify lots appropriate for urban agriculture. The project has created four urban farms to date, leasing land and greenhouse space to limited-resource market growers and community gardeners. It is committed to establishing an additional lot each year.

PROVIDENCE COMPOSTS!

Food waste composting is crucial to sustainable urban metabolism.[18] Providence currently sends an estimated 10,000 tons of food waste annually to the state's landfill. *ProvIdence COMPOSTS!* is one of many measures aimed to reach the City's goal of zero waste by 2033. The Offices of Sustainability and Healthy Communities piloted the program with NGOs and residents in two neighborhoods. The program has since expanded to eight community collec-

Figure 7: The Providence City Parks Department, the Southside Community Land Trust, the International Institute, an elderly high rise building and a shelter for battered women partnered to launch the Cadillac Drive garden. Photo credit: Southside Community Land Trust

tion sites. Two hundred neighbors receive pails and training, and deliver their food scraps to composting sites including Lots of Hope farms and the West Elmwood Housing Development Corporation's Sankofa Urban Agriculture Village. *Providence COMPOSTS!* will divert more than ten tons of residential food scraps from the landfill each year, complementing the thousand tons hauled from institutions by The Compost-Plant, a new local commercial composter.

FOOD AS A FORCE FOR COMMUNITY AND ECONOMIC DEVELOPMENT: THE WEST END AND THE SANKOFA INTIATIVE

The West End is Providence's largest and most densely populated neighborhood, with 20,560 people per square mile. The majority of West End residents are Hispanic (58.1%), and forty-one percent are foreign born, having immigrated from a variety of Hispanic, African, and Asian countries. The historic housing stock ranges from Victorian mansions to triple-decker working-class homes.

After decades of decline, recent community redevelopment efforts have returned much of the neighborhood's housing to relatively good condition. Small storefront businesses line the neighborhood's commercial streets, but the West End is by no means economically flourishing. The median household income is $32,899, with an unemployment rate of 9.7%; 41.4% of West End residents do not have vehicle access and 33% receive federal food assistance.

By the 1980s most of the neighborhood's manufacturing companies had closed, leaving many acres of abandoned and polluted land where factories once stood. The Planning Department's re-zoning of this land to mixed-use in the late 1990s enabled the West Elmwood Housing Development Corporation (WEHDC) and others to begin the steady process of revisioning this neglected part of the West End for new housing and other purposes.

Since the early 2000s, the WEHDC and others have recognized food as a driver for neighborhood betterment. The Southside Community Land Trust had already created five community gardens in the West End in the 1990s. After 2003, food production increased with the addition of nine new community gardens established by SCLT, WEHDC, and other NGOs. Two new market farms (one of them part of the City's Lots of Hope program) now sell produce to local restaurants. In 2013 Cluck!, a farm and garden supply business, opened in the West End to serve Providence's urban food growers.

The neighborhood now includes forty-one markets, a sidewalk tropical fruit stand business and Farm Fresh RI's Armory Parade Street Farmers Market. Nonetheless, food access remains a problem for residents – particularly access to fresh and culturally desirable produce. Furthermore, food insecurity continues to plague the West End. Many families report they are not able to afford a balanced diet. The West End's nine food pantries, three congregate meal sites, and homeless shelter routinely operate at full capacity.

In 2011 the WEHDC launched its Sankofa Initiative to "to foster the cultivation of land, lives and community". In 2014, the WEHDC established the Sankofa World Market as an outdoor venue for neighborhood residents to sell and buy locally produced food along with value-added food products and artisan wares. In 2015, WEHDC documented the neighborhood's food access and security challenges in a comprehensive Sankofa Food Assessment with the State Department of Health. In 2016, the Sankofa Initiative will augment its existing gardens with the cultivation of an additional 16,500 square feet of land for community gardens and market farms next to WEHDC's 50-unit, $15 million low-income Sankofa Apartments. The project will include a community kitchen, a greenhouse and other season extension infrastructure (to expand the growing season for urban farmers) as well as composting and food storage facilities. The Sankofa Initiative will "create new opportunities for West End residents to grow, market and sell local and culturally appropriate foods, value-added food products and other artisan wares and to create increased opportunities for meaningful connections among residents."[19]

Figure 8: Gardens strengthen neighborhoods by fostering cross cultural and cross generational connections. Photo credit: Lucas Foglia

CONCLUSIONS

From 2003-2015, Providence made significant strides integrating food into urban planning and policy. Throughout Providence, vacant lots and parks have been transformed into productive food gardens and farms; residents now have access to fresh food at farmers' markets, farm stands, restaurants and school lunchrooms; and tons of food waste are composted on a regular basis. These local food initiatives provide cost-effective, tangible ways for the City to respond to the expressed needs of an engaged and diverse constituency of residents and NGOs.

The City's planning process first provided the opportunity for NGOs and community advocates to draw attention to the positive revitalization, environmental and social impacts that community gardens and market farms could have on urban neighborhoods. The City's commitment to addressing food issues was documented through the inclusion of food issues and strategies in planning documents, most notably the current Local Comprehensive Plan: *Providence Tomorrow* and the City's Zoning Ordinance. The Comprehensive Plan and the Zoning Ordinance established the foundation that the City needed to launch its work.

The speed with which the City integrated food into urban planning and the direction that food policy has taken in Providence were due to several factors that include:

- NGO capacity to participate in the planning process and mobilize diverse constituencies
- Consistency of vision on the part of elected officials, the Planning Department and other staff;
- Changes in the City's planning process that enabled residents and NGOs to advocate for food system support;
- Innovations in the structure of City Hall offices that supported collaborative effort across government and between government and NGOs.

In order to fully understand the approach that Providence is using to broaden its approach of food issues, it is important to note that several city offices and departments, in addition to the Planning Department, play important roles. The Sustainability and Healthy Communities Offices, were created to enable the city to better address complex systemic issues and to engage the private sector in contributing expertise and resources to City initiatives. Their work related to food includes: the preparation of policy documents which expand public-private collaboration; the provision of policy guidance; and, the establishment of implementation strategies and progress indicators. The Department of Economic Development's focus on the food sector proposes opportunities to significantly expand food-based businesses within the City.

Thus, coordinated effort by the Planning Department and other offices enables the City to work comprehensively to strengthen Providence's food system components – from production to processing to distribution to access to food waste re-use – and to address food system issues at a systemic level.

Additional planning work will be essential to advance new strategies and recommendations. The commitment of elected officials, the planning work of the past twelve years and the effective collaborative processes between city staff and private sector interests have created a strong foundation for future urban planning initiatives. ◆

ENDNOTES

1 US Census. (2015) State and County Quick Facts, Providence. http://quickfacts.census.gov/qfd/states/44/4459000.html

2 Rosenberg, G and Yuen, J. (2012) Beyond Housing: Urban Agriculture and Commercial Development by Community Land Trusts. Lincoln Institute of Land Policy. http://community-wealth.org/sites/clone.community wealth.org/files/downloads/paper-rosenburg-yuen.pdf

3 Started in 1996, the United States Department of Agricutlure's Community Food Projects Competitive Grant Program (CFPCGP) funds community-based multi-sector collaborations to fight food insecurity by strengthening the self-sufficiency of low-income communities to meet their food needs. Community Food Projects take a whole food system perspective to develop long-term, system-wide solutions. https://nifa.usda.gov/program/community-food-projects-competitive-grant-program-cfpcgp

4 David Cicilline (now US Congressman Cicilline) 2003- 2010; Angel Taveras 2011- 2014; Jorge Elorza 2015-present.

5 Cicilline, David. (30th December 2015) in person.

6 Urban Agriculture Task Force. (2005) Urban Agriculture in Providence: growing our community by growing good food. http://www.dem.ri.gov/programs/bnatres/agricult/pdf/urbanag.pdfthat

7 Morton, B. (2006) Planning for Appropriately Scaled Agriculture in Providence, Urban Agriculture Task Force. http://community-wealth.org/sites/clone.community-wealth.org/files/downloads/paper-morton.pdf

8 Everett, David. (21st December 2015) in person.

9 Bliss, Garry. (14th January 2016) in person.

10 Providence Tomorrow The Interim Comprehensive Plan. (2007) http://www.gcpvd.org/images/reports/2007-12-providence-tomorrow-the-interim-comprehensive-plan.pdf.

11 Providence Tomorrow.

12 Providence Tomorrow.

13 Sustainable Providence, "Food Plan." (2014) 23-30. https://www.providenceri.com/efile/5705

14 Sustainable Providence, "Food Plan." 23

15 City of Providence RI Economic Development Cluster Strategy. November 18, 2015. Fourth Economy. http://council.providenceri.com/efile/224

16 Azar, Robert. (April 27, 2016) e-mail correspondence.

17 Lots of Hope. An Urban Agriculture Assessment with the City of Providence. (2014),6, https://www.providenceri.com/efile/5537.

18 Tornaghi C, Sage C, Dehaene M. (2005) Urban Metabolism and Urban Agriculture: How might growing food in cities 'mend' the metabolic rift?
to be produced as part of the work of COST Action TD1106 'Urban Agriculture Europe'. https://www.academia.edu/14720059/Urban_Metabolism_and_Urban_Agriculture_How_might_growing_food_in_cities_mend_the_metabolic_rift

19 Sankofa West End Community Food Security Assessment. (2015) West Elmwood Housing Community Development Corporation's "Sankofa Initiative" and the RI State Department of Health's Center for Health Equity and Wellness. P 7

FOOD ASSET MAPPING IN TORONTO AND GREATER GOLDEN HORSESHOE REGION[1]

LAUREN BAKER

» *The purpose of the mapping project was to provide a baseline for planners and policy mak- ers to: 1. understand, promote and strengthen the regional food system, 2. provide information to enable analysis to inform decision making; and, 3. plan for resilience in the face of climate variability and socio, economic, and political vulnerability.* «

Figure 1: The bounty of the Greenbelt harvest season. Photo credit: Joan Brady

The City of Toronto is the largest City in Canada with a population of 2.6 million people (2011). The City is known as one of the most multicultural cities in the world, with over 140 languages spoken. Immigrants account for 46% of Toronto's population, and one third of newcomers to Canada settle in the city[2]. Needless to say, diets are extremely diverse. This represents an opportunity for the food and agriculture sector in Ontario, one that many organizations are seizing.

The region surrounding the City of Toronto, known as the Greater Golden Horseshoe (GGH), is made up of 21 upper and single tier municipalities. This region is Canada's fastest growing, with a population of 8.7 million in 2011 which is projected to grow to 13.5 million by 2041. The region is plagued by traffic congestion, inadequate infrastructure, loss of agricultural land and natural spaces to urban development, and storm water management challenges. Efforts to densify the built environment and better plan urban communities could lead to healthier, sustainable and resilient communities.

In this same GGH region forty-two percent of Ontario's best quality farmland is located, representing half of the land area. The region produces a mix of crops including grains and oilseed, fruit and vegetables, floriculture, livestock and other specialty crops. Two provincially designated specialty crop areas define the region: the Niagara Peninsula known for tender fruit production and the Holland Marsh known for vegetable production. The GGH is known as the third largest food processing and manufacturing cluster in North America, and the cluster uses over 60% of the agricultural products grown in Ontario[3]. Agriculture and the broader food system contribute $11 billion and 38,000 jobs to the provincial economy, generating $1.7 billion in tax revenue.

In 2005 a Greenbelt was created to contain urban growth and protect the natural and cultural heritage of the region. The Greenbelt protects 7% of Ontario's farmland, approximately 856,424 acres and 5501 farms[4], mostly outside of urban communities clustered in the Golden Horseshoe and around the City of Toronto.

In Canada, the agricultural policy framework is established by the federal government. Land use policy is under the jurisdiction of the province (Ontario) and administered by municipal governments. This framework and the resulting policies and programs directly shape agricultural production. While land use policy is directed and defined by the province, the way those definitions are interpreted across municipalities can vary.

The regulation of food and agriculture involves over 19 ministries including Ontario Ministry of Agriculture, Food and Rural Affairs, Ministry of Municipal Affairs and Housing, Ministry of Economic Development, Employment and Infrastructure, Ministry of Health and Long-Term Care, and the Ministry of Environment and Climate Change. The provincial land use policy statement has recently been revised to accommodate new forms of agriculture, in particu-

Figure 2: Tomatoes grown in the Holland Marsh, a vegetable specialty crop region. Photo credit: Lauren Baker

lar to support on-farm, value-added activities. However, farmers state that the current provincial land use policy framework supports urban development over farmland preservation, inhibiting the viability of the agricultural sector[5].

Little is known about the historic changes and shifts in food assets over time in the City of Toronto and Greater Golden Horseshoe Region. The flow and diversity of the population impacts farming, food processing and manufacturing, the food retail environment, neighborhood markets and green grocers, but none of this is well documented. What is known is that agricultural production has shifted over time to access new markets and market opportunities. Overall the number of farms has diminished greatly over the past 50 years, as have the number of food processing outlets[6]. Food manufacturing and processing has been centralized and consolidated in the Greater Toronto Area and over half of the Ontario food processing facilities are located in the Golden Horseshoe.

Food insecurity is a persistent problem in the Golden Horseshoe, with over 12% of the population in Toronto reporting insecure access to adequate food due to financial constraints.[7] Over time, Toronto's food advocates have actively built a network of community food programs to address food insecurity, enhance food security and increase access to healthy food. These initiatives directly connect to the City of Toronto's diverse communities and priorities related to health, poverty reduction, and social equity.

WHAT ARE FOOD ASSETS?

Food asset planning is an emerging field. Food assets relate to the growing interest in food environments emerging from both the planning and public health literature, as well as the literature on strengthening regional value chain connections. For example, the American Planning Association's Policy Guide on Community and Regional Food Planning, published in 2007, recommends that planners "provide data and mapping support to community and regional food assessments, including the incidence of food insecurity and location of diverse food assets" and develop policies and plans to enhance these assets[8].

Food assets are a key component of integrated food planning and have not been fully considered in the planning practice or literature. Food assets include the local food infrastructure that ensure food secure communities and regions - farms, processing and distribution capacity, food enterprises, markets, retailers, community gardens, urban farms, community gardens, community kitchens, student nutrition programs, emergency food distribution, and community food organizations or centers. The concept of food assets can be expanded to include waste facilities, agricultural inputs, urban orchards, and non-physical assets such as funding, investment opportunities, services, political support, etc.

Figure 3: Evergreen Brick Works Farmer's Market in Toronto. Photo credit: Lauren Baker

Figure 4: A produce auction managed by Mennonites in Elmira, Ontario. Photo credit: Lauren Baker

FOOD ASSET MAPPING BY THE GOLDEN HORSESHOE FOOD AND FARMING ALLIANCE

The development of the Golden Horseshoe Food and Farming Action Plan 2021 created a framework for action to keep food and farming a strong economic driver in this highly urbanized area. The Plan identifies pathways for a more integrated and coordinated approach to food and farming viability in the area to ensure that the Golden Horseshoe retains, enhances and expands its role as a leading food and farming cluster (Golden Horseshoe Food and Farming Alliance, 2012). The next event was the establishment of the Golden Horseshoe Food and Farming Alliance. The Alliance was established in 2013, after the development of the Action Plan. The Alliance is comprised of the Niagara Agricultural Policy and Action Committee, the Toronto and Region Conservation Authority, the Friends of the Greenbelt, the Ontario Ministry of Agriculture, Food and Rural Affairs, Vineland Research and Innovation Centre, Holland Marsh Growers' Association, Durham College, Holland Marsh Growers, Niagara College, Country Heritage Park, Ontario Federation of Agriculture, Ecosource, Food and Beverage Ontario, the Regions of Durham, Halton, Niagara, Peel, York and the Cities of Hamilton and Toronto, as well as local representatives from the food and farming value chain. This group acts as a regional governance and coordination body, supporting initiatives that enhance agriculture and the economic, social, and cultural viability of the food and agriculture sector. The first phase to asset mapping was undertaken by the Alliance in 2013.

The purpose of the mapping project was to provide a baseline for planners and policy makers to: 1. understand, promote and strengthen the regional food system, 2. provide information to enable analysis to inform decision making; and, 3. plan for resilience in the face of climate variability and socio, economic, and political vulnerability. Mapping also provides a method to assess and track local food assets as a way to strengthen the "food cluster" and connect farmers with processors, manufacturers, and new

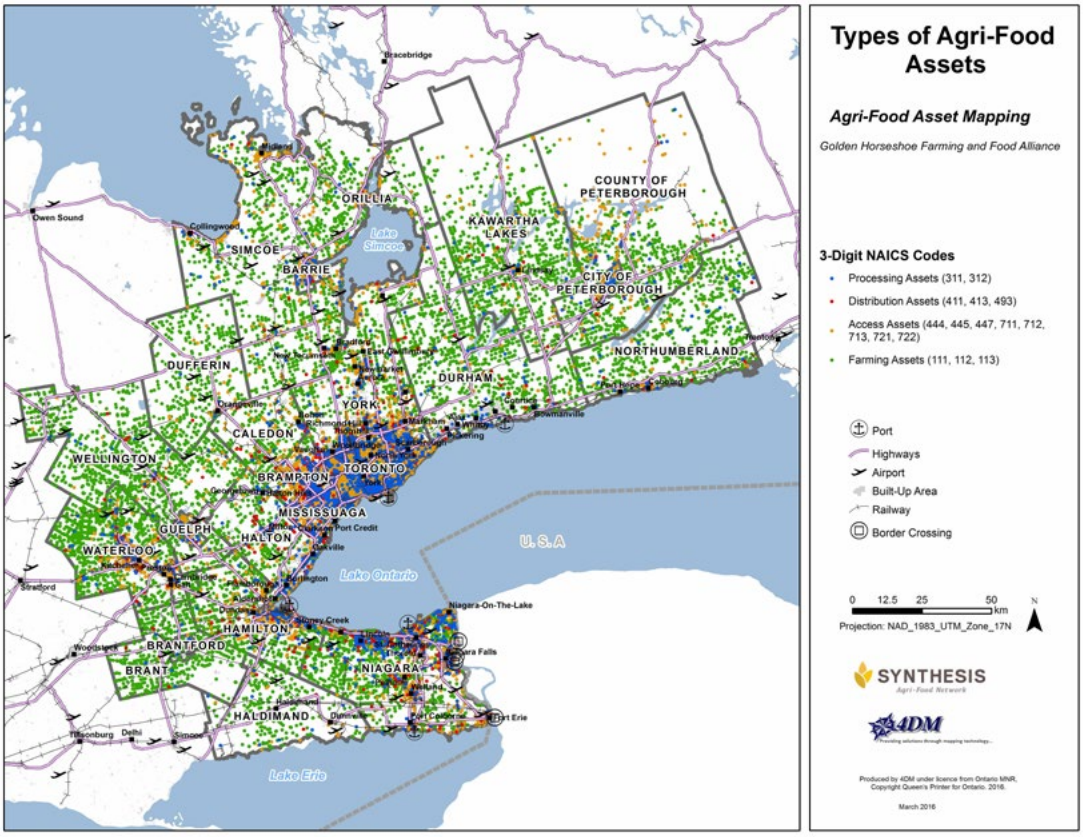


Figure 5: Types of agri-food assests

markets. Planners hope to use the information to understand how land use policy and economic development programs can best support the agri-food sector and the implementation of the Food and Farming Action Plan 2021.

The Alliance asset mapping project was guided by a steering committee of regional planners and economic development officers. In addition, a workshop about sharing the results of the asset mapping project attracted economic development officers, policy/landuse/GIS/environmental planners, public health staff, staff from the Board of Trade and staff from the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). Workshop participants identified the following ways they will use the asset mapping data:

- To understand value added opportunities and link up value chains
- As an investment tool
- To increase efficiencies in the food system
- To understand strengths/weaknesses and opportunities/challenges of the food and farming sector
- To move from anecdotal to quantifiable understanding of the sector
- To identify where government can best support industry and policy development
- For reporting
- To increase viability of agriculture in the greenbelt
- To work collaboratively across the region and across the food system vs municipality by municipality
- For regional food system assessment
- To define a new economic cluster for the region
- To compare municipality by municipality
- To collaborate, find synergies and enhance communication
- To apply the methodology to other sectors
- To enhance employment survey data
- For analysis and planning
- To protect agricultural land, protect livelihoods
- To compare data over time

Two phases of asset mapping have been undertaken by the Alliance. The first involved the seven regional and municipal governments engaged in the Alliance. In the second phase, the project was expanded to include the Greater Golden Horseshoe, 14 additional regional governments and Eastern Ontario. Future plans include expanding to the province as a whole. Funding for the Asset Mapping project was provided by the Alliance partners, Agricultural Adaptation Council and Ontario Ministry of Agriculture, Food and Rural Affairs.

Across the Greater Golden Horseshoe, over 50,000 asset points have been mapped using the following approach. Assets were identified through municipal data (44%), open source data (32%) and third party data (24%).[9] For example, municipalities provided data collected by economic development for business retention and expansion analysis. Many municipalities had previously collected data to map farm gate sales. OMAFRA provided access to farm business names, type of farming conducted, and locations. Each asset was assigned a North American Industry Classification System (NAICS) code, a data inventory was created, consensus was reached by the steering committee on common data attributes, a data model was developed to reflect the temporal, spatial, and business relationship of the agri-food asset records and to identify relationships between the data elements and attributes. The data was imported into a central database, and visualization and web presentation tools were developed. The tool has been designed for the use of the partnering municipalities and will not be available for public use.

Challenges included sharing data across municipalities, building confidence in the data, and maintaining data integrity. Moving forward the group will update data, maintain data integrity, review assets and confirm locations, update NAICS agri-food inventory, create guidelines on NAICS classification, add GPS locations, and enable new web functions. A longer term goal includes automation and synchronization of employment data and business retention and expansion surveys across the region for ease of updating.

FOOD ASSET MAPPING BY THE TORONTO FOOD POLICY COUNCIL

The second approach to asset mapping, undertaken by the Toronto Food Policy Council, complements the work of the Golden Horseshoe Food and Farming Alliance by adding in community food assets.

The Toronto Food Policy Council (TFPC) was established by the Toronto City Council, in 1991, to bring a food systems approach to the growing problem of rising hunger and food insecurity. The TFPC's mandate is to: advise and support the City of Toronto and Toronto Public Health in the development of inclusive and comprehensive food security policies and programs; advocate for innovative community food security programs; foster dialogue with Toronto Public Health, community groups, social agencies, educational institutions and businesses; and, act as the community reference group for the Toronto Food Strategy. TFPC members include three elected officials, three farmers from the surrounding rural communities, two youth delegates from the Toronto Youth Food Policy Council, and twenty two citizen stakeholders representing diverse food system perspectives and sectors. Over the past twenty five years, the TFPC has made significant contributions to the Toronto Food Strategy, Toronto Environmental Plan, Toronto Food Charter, the Official Plan, the Toronto Food and Hunger Action Plan, and facilitated City engagement with the Greater Toronto Area Agricultural Action Committee and Golden Horseshoe Food and Farming Alliance.

The TFPC food asset mapping initiative is called "Food by Ward: Food Assets and Opportunities Ward by Ward". Data began to be complied several years ago, and includes neighborhood food assets such as community gardens, urban agriculture initiatives, farmers' markets, healthier food retail, emergency food distribution, community kitchens and other community food organizations/programs. A central database was formed, data was mapped, ward resources were developed for Toronto's 44 wards, the resources were verified by community food advocates, and launched at City Hall. Funding has been provided by Toronto Public Health.

The asset mapping project is guided by a working group of community food advocates

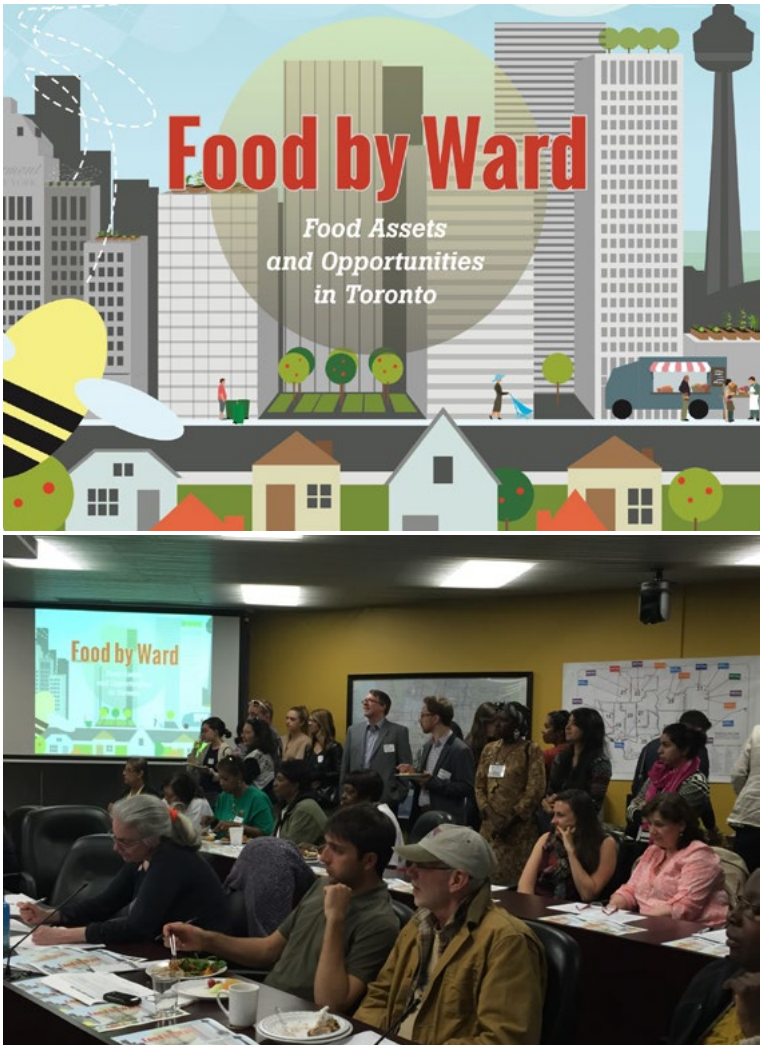


Figure 6: The launch of the Food by Ward asset mapping resources at City Hall in Toronto. Photo credit: Lauren Baker

and professionals. A workshop to share the results of the asset mapping project attracted City staff, public health professionals, academics, planners, community gardeners, people working in the emergency food distribution sector, urban farmers, farmers market coordinators, community volunteers, funders, and social service agency professionals. Workshop participants identified the following ways they will use the asset mapping data:

- To understand how to improve the neighborhood food environment;
- To advocate for better services;
- To build relationships with elected officials;
- To understand and rectify the uneven distribution of food assets across the city;
- To find land for urban agriculture;
- To understand the link between poverty, access to public transportation and food access;
- To find space for community food programs;
- To communicate how food is an important part of the city's social, cultural and economic infrastructure; and,
- To engage planners and other city staff.

Across the City of Toronto, 3500 asset points have been mapped using the following approach[10]. Assets were identified through municipal data (all of Toronto's data is open source), and third party data. For example, the City of Toronto provided data collected by the Parks, Forestry and Recreation Division on community

Figure 7: St. John's Bakery, a social enterprise in the City of Toronto. Photo credit: Lauren Baker

and allotment gardens. Toronto Public Health provided data on healthier food retail collected by food inspectors, and student nutrition programs. The Greenbelt Foundation supports a Greenbelt Farmer's Market network that provided data on farmer's markets.

Assets were categorized according to access to healthy food, emergency food assistance programs, community food programs and food festivals and events. Assets were mapped in these categories with definitions provided as well as a narrative about how these assets support a healthy, equitable and sustainable city. The maps were verified by community food advocates and the data was updated.

This approach to mapping reveals the inequitable distribution of assets across the city, connecting food access to broader issues of health and social inequality. Community food advocates and municipal staff involved are using the information to understand how the neighborhood food environment can contribute to a healthy, equitable and sustainable city. The data collected will now be integrated into the City of Toronto's data set and regularly updated. Challenges included building confidence in the data and maintaining data integrity. Moving forward the TFPC and City will work together to maintain data integrity, review and add assets, and develop web-based maps and functions.

DISCUSSION

Food asset mapping can provide an important baseline of information to understand how the agriculture and food sector is changing over time. It is both a quantitative and qualitative indication of what is important to those making decisions and about what to include (or not) as a food asset. The asset mapping, however, is only a first step – points on a map or entries into a database. The real work comes in putting the tools to use to strengthen food systems connections, networks of advocates and stakeholders, value chains, policy and governance. Over the years the tool will change and evolve and could be evaluated for its contribution to food system sustainability and equity. With both asset mapping initiatives, it

Figure 8: A rooftop community garden in Toronto. Photo credit: Lauren Baker

is too early to see how they will be used by advocates, professionals and policy makers.

Already, however, the maps are a catalyst for discussion and organizing. For example, the Golden Horseshoe Food and Farming Alliance municipalities are considering to extend their mandate beyond their political boundaries to make food system connections. In another example, one economic development officer suggested he would use the mapping tool to support local businesses to make value chain links to local suppliers. Another noted that understanding assets could leverage investment in a sector. Environmental policy planners were interested in seeing how agricultural landscapes could link to natural heritage areas to improve storm water management.

In Toronto, the asset mapping resource mobilized "food champions" to identify priorities that were embedded into the City's poverty reduction strategy. The food asset mapping catalyzed a discussion about neighborhood or ward food priorities that will be communicated to city councillors and decision makers. A longer term plan is to strengthen local food networks to realize their priorities. These networks link social service organization staff, city staff and community advocates, building community resilience and political agency.

NEXT STEPS

The food asset mapping initiatives will continue to evolve. A few opportunities for next steps are on the horizon. Toronto and region was selected, in 2015, to participate in the CityFoodTools initiative led by the RUAF Foundation, the Food and Agriculture Organization of the United Nations, and the Wilfred Laurier Centre for Sustainable Food Systems. Toronto is one of seven cities globally that will be undertaking a food system assessment.

The asset mapping work will be invaluable for this project. One identified possibility, to more deeply understand the regional food system, is to undertake food flow analyses for specific agricultural products. Here the strength of the asset mapping work is revealed as one can imagine

identifying, for example, apple farms, their current regional (and global) markets as well as exploring future market linkages.

The food system assessment emphasizes food security and equity, and an analysis of neighborhood food assets will be key to understanding issues related to access, quality, and community engagement. It is possible that the methods and process used in the food asset mapping initiatives, as well as the challenges, could be shared between global city regions. ◆

For more details on this initiative, visit http://www.ruaf.org/projects/developing-tools-mapping-and-assessing-sustainable-city-region-food-systems-cityfoodtools

Acknowledgements

Thank you to the Toronto Food Policy Council, Golden Horseshoe Food and Farming Alliance, Toronto Public Health Food Strategy, City of Toronto, 4DM, Synthesis Agri-food Network for their contributions to this chapter and the food asset mapping initiatives.

ENDNOTES

1 For further information and full reports on the two asset mapping initiatives described above, visit: www.foodandfarming.ca and www.tfpc.to

2 Statistics Canada, 2016

3 Golden Horseshoe Food and Farming Alliance 2014

4 Friends of the Greenbelt Foundation, 2014

5 Ontario Federation of Agriculture and Environmental Defense 2015

6 Carter-Whitney and Miller 2010

7 Tarasuk, V, Mitchell, A, Dachner, N. (2016). Household food insecurity in Canada, 2014. Toronto: Research to identify policy options to reduce food insecurity (PROOF). Retrieved from http://proof.utoronto.ca

8 2007, 15

9 Golden Horseshoe Food and Farming Alliance, 2015

10 Toronto Food Policy Council, 2016

References

American Planning Association. 2007. Policy Guide on Community and Regional Food Planning.

Carter-Whitney, M. and S. Miller. 2010. Nurturing Fruit and Vegetable Processing in Ontario. Toronto: Metcalf Foundation.

City of Toronto. 2012. History of food in the city exhibit at St. Lawrence Market. Toronto: City of Toronto.

City of Toronto. 2016. Toronto Facts: Diversity. Accessed online February 15, 2016 from http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=dbe867b42d853410VgnVCM10000071d60f89RCRD.

Fridman, J, L. Baker and B. Whyte. 2014. "A Terroir of Institutions in Toronto." In A. Sandburg et al (eds). Urban Explorations: Environmental Histories of the Toronto Region. Toronto: Wilson Institute for Canadian History.

Friends of the Greenbelt Foundation. 2014. Agriculture by the Numbers: Understanding the Greenbelt's Unique Advantages. Toronto: Friends of the Greenbelt Foundation.

Golden Horseshoe Food and Farming Alliance. 2012. Golden Horseshoe Food and Farming Action Plan 2021. Golden Horseshoe Food and Farming Alliance.

Golden Horseshoe Food and Farming Alliance. 2014. Agricultural Profiles. Golden Horseshoe Food and Farming Alliance.

Golden Horseshoe Food and Farming Alliance. 2015. Analysis Of Food And Farming Assets In The Golden Horseshoe. Golden Horseshoe Food and Farming Alliance.

Ontario Federation of Agriculture and Environmental Defence. 2015. Farmland at risk: Why land-use planning needs improvements for a healthy agricultural future in the Greater Golden Horseshoe. Toronto: Ontario Federation of Agriculture and Environmental Defence.

Statistics Canada 2016. Immigration and Ethnocultural Diversity in Canada. Accessed online February 15, 2016 from https://www12.statcan.gc.ca/nhs-enm/2011/as-sa/99-010-x/99-010-x2011001-eng.cfm.

Toronto Food Policy Council. 2016. Food by Ward: Food Assets and Opportunities Ward by Ward. Toronto: Toronto Food Policy Council

Figure 9: An apple orchard in the Golden Horseshoe tender fruit specialty crop region. Photo credit: Laura Berman, GreenFuse Photos

A CASE STUDY OF STREET FOOD VENDOR RELOCATIONS IN TWO INDONESIAN CITIES

LILY SONG · JOHN TAYLOR

» *Present street food vendor relocation policies appear to focus on reclaiming public space from low income street vendors and relocating the ven- dors into aesthetically pleasing new markets. We suggest that spatial interventions also need to improve the economic prospects of the ven- dors and address the socioeconomic, political, and spatial disparities underlying urban poverty and informality.* «

Figure 1: Following relocation, many vendors opted to return to the streets. Photo by Dennie Ramon

As informal street vending has proliferated in many Indonesian cities, some local governments have sought to relocate food vendors from the streets to public purpose-built markets. A number of such relocations have received widespread recognition for being undertaken in a conflict-free manner, through engagement and participation, and with limited confrontation. However, further examination reveals the success of such policies and programs are limited, as many relocated vendors returning to the streets within a few years.

This paper examined four different vendor relocation processes in two different Indonesian cities conducted between May 2015 and January 2016. It illuminates why informal food vendors return to the streets and how urban policies and planning might better incorporate informal food distribution activities with the formal market.

To study our relocation cases, we examine why certain food vendors might end up returning to the streets, after being relocated to purpose-built markets. We also explore mitigating factors and transformative policy and planning alternatives involving differently resourced and abled partners including local authorities. Though government is one among many decision makers and actors, it nonetheless has the power to influence rules that determine systemic interactions and emergent dynamics.

In the following, we investigate the ways in which relocation efforts, that deliver improvements public spaces including purpose-built markets, fall short of upgrading vendor livelihoods or even meeting their day-to-day needs. We also explore why simply extending property right efforts fail to address the sociospatial, economic, political disparities underlying urban poverty and informality. Finally, we study how relocation efforts can recognize and enhance the rights of street food vendors to the city or facilitate meaningful political participation as to promote more sustainable policy outcomes.

RESEARCH METHODOLOGY

We carried out a comparative study of four different vendor relocation cases, in the two "sister" Indonesian cities of Jogyakarta and Solo, in Central Java. While both are similar in population — half million within city limits and 4 million at the metropolitan level — Jogyakarta is a regional capital and art, education, and tourist hub, while Solo is known for its traditional handicraft and textile industries as well as a series of progressive policies under the former Mayor Jokowi. Specifically, the study focused on market relocation sites of Taman Kuliner and Gajah Mada University's Food Court in the city of Jogyakarta; and, Solo's Pasar[1] Notoharjo, and Pasar Punggunrejo market projects.

These two cities had received recognition by the national popular press for having undertaken broad-based, popular, and presumably successful campaigns to remove street vendors from public spaces. They are notable because the approach adopted in three of the four market cases contrasts with the more widespread practice of employing physical force and coercion to relocate informal markets. However, despite the use of collaborative methods and fiscal incentives, many of the vendors abandoned the public markets that they had been assigned to, and returned to the streets.

Our study was carried out by a team of five researchers from the local Indonesian NGO Yayasan Kota Kita. Researchers conducted in depth interviews with a total of 40 current and former vendors, including food vendors, between May 2015 and January 2016. Those interviewed included vendors who had been involved in the relocation processes and decided to remain in the new facilities, as well as an equal proportion of those who had returned to the streets (typically their original locations, but also including new street market locations). Interview questions were aimed at understanding the backgrounds and experiences of food vendors; their perspectives on street vendor relocation policies; their reasons for and experiences of remaining in or abandoning the market facilities; and, their thoughts and recommendations on how the City might better support food vendor relocation policies in the future.

DESCRIPTION OF CASES

CITY OF SOLO. Since 2005, Solo's long term development plan has explicitly sought to improve the welfare of the people and to improve the city building on the idea of Solo as Cul-

Figure 2: After selling his stall, a street vendor returns to Jl. Dewantoro in Solo, to sell sate. He never found success in Pasar Panggunrejo. Photo by Dennie Ramon

tural City. The official mission to support the "People's Economy" (ekonomi masyarakat) as the first development priority translated into several policy programs, including micro-economic development, support for cooperatives, street trader (PKL) management, revitalization of traditional markets, and promotion/capacity building for market traders (business management). The City lacks an explicit vision or policy program for street food vending and food markets. However, general street trader management and support programs also pertain to street food operations. These general programs include government registration, relocation and integration from public space to purpose- built markets and the upgrading of mobile vending stalls at select locations. Despite the City's overarching vision and policy programs with regards to street trading, actual policy processes and outcomes have varied.

PASAR NOTOHARJO, SOLO. Informal trading dramatically grew in the aftermath of the Asian Financial Crisis of 1997, as many unemployed workers in Solo congregated in Banjarsari Park (a public sPACE in the middle of the city) and became vendors. At its peak, the park was bursting with 1,000 vendors, leading to complaints by nearby residents about noise, trash, and general lawlessness. This informal market was becoming the city's most visible public agenda issue. Repeated attempts to force the vendors away, largely through the violent action of the police, were unsuccessful.

In 2005, a new mayor, Joko Widodo, tried a fresh approach. The mayor (now President of Indonesia) invited the street traders and other stakeholders to over 50 open dialogue meetings. The rapport and personal relationship that he built was instrumental in convincing them to support his relocation plan, which was implemented within a year's time. The negotiations included significant concessions from the government side, including the development of a new purpose-built market, the provision of stall ownership certificates, and access to business loans to support their businesses. The government also responded to vendors' concerns that the relocation site was too remote and disconnected from the city by surfacing roads, installing signage, designing new bus routes to improve access, and promoting the new market through the media.

Marked by a parade of vendors through the streets to the new location called Pasar Notoharjo, the ceremonial fanfare and celebration

helped to attract the attention of the public and raise the credibility of the move. Still, during the first year many traders complained that they had lost their customers and struggled to make ends meet as a result of the new location. Some sold their stalls and returned to the streets but eventually returned when the market started to attract more customers after the first year.

PASAR PUNGGUNREJO, SOLO. In the eastern part of Solo, a main road that runs alongside the Sebelas Maret University campus featured a high density informal market. This market was started in the laste 1990's by around 160 small-scale traders who had congregated there. As the City prepared for the construction of a strategic urban project, the Solo Techno Park, Mayor Jokowi sought to clear the vendors from the north side of the road. However, the density of existing land uses in the campus area limited relocation options to a site which sat behind a government building, out of view from the main road.

Paguyuban Pedagang Sekitar Kampus (PPSK), an association of traders established in 2000, strongly opposed this relocation plan, contesting the proposed new location for the market and sought concessions such as stall titles at their existing locations from the government. However, as the street vendors faced negative public opinion and pressure from the university, the PPSK conceded.

Between January 2008 and December 2009, 201 traders were relocated to Pasar Punggunrejo. Just a few years later, almost *all* of these relocated traders had abandoned the new market for the streets. In particular, those who sold food, phone credit, and spare parts— drawing from students as their primary client base and requiring convenient access points— were the first to go. Despite gaining stall certificates, vendors complained of being forced into the move with no governmental promotion of the market, technical assistance, or access to loans. Many felt that street vending would give them easier access to clients.

JOGYAKARTA. Jogyakarta is a medium-sized city in Central Java comparable to Solo, but known as a city of students (200,000 attend a total of 140 colleges and universities). It has aimed to become a quality education city, center of cultural tourism, a peoples' economy and one offering environmentally friendly services. However, its approach to street trader management has been somewhat ad hoc. These vendor policies were first couched as part of the post-earthquake infrastructural upgrades in 2007, then promoted as part of the cultural tourism in 2008, then associated with city efforts to improve human settlements and public facilities in 2010, and, finally part of the efforts to "tidy up" the city in 2011. In its current plan, the City cites uncontrolled street trading in major city streets as an acute problem requiring active street-to-market relocation efforts and zero tolerance on further growth of street trading. So far, the local government has exercised a high level of discretion in regulating and controlling street trades, including street food vending.

UGM, JOGYAKARTA. Many informal vendors congregate in public spaces and streets nearby and within universities like Gajah Majah University (UGM) to draw patronage from students and the wider public. In 2005, the university, with support from the city government, sought to improve circulation by banning vehicular traffic and street vending and relocating existing vendors to three on-campus, purpose-built facilities.

Initially the vendors demanded *in situ* upgrading instead of the move. But as a result of negotiations with public authorities, vendors agreed to relocate upon gaining assurance that the process would be inclusive and that the new site would be improved with needed amenities. Staggered over time, the relocation of the southern area was completed in 2009, the eastern area in 2012, and the western area in 2015. Each site offered a food court for exclusive use by food vendors. Each vendor received a stall with a kitchen area, plumbing, and sewage. The food courts also featured eating areas for students with Wi-Fi and public toilets. However, the food courts remained cut off from the main streets as part of the closed campus policy.

Supported by advertising and promotions, the food courts initially enjoyed high levels of popularity. Yet, over time, clientele declined.

Figure 3 (top): Street vendors have returned Jalan Tubun, Solo, preferring the street to remodeled market facilities. Photo by Dennie Ramon

Figure 4 (bottom): UGM Campus Foodcourt, Jogyakarta. Photo by Dennie Ramon

While almost all the food vendors remain on site, they do so for lack of other options.

TAMAN KULINER, JOGYAKARTA. A second relocation occurred immediately outside the gates of the Gajah Mada University, this time along the Selokan Mataram, a popular location for students, passing motorists, and pedestrians seeking food and school supplies. Blaming street vendors for traffic congestion and littering, the local government decided to relocate the vendors, but without the negotiation and participatory planning processes of the former UGM relocation.

After announcing the need to move street vendors, the actual relocation took another three years to occur during which time the vendors were kept in a state of limbo about their future location. In addition, the vendors were not involved in the site selection or the new design of the purpose built market. Finally, 120 vendors— 40 of whom were food vendors— were relocated to Taman Kuliner Condongcatur.

This new location was promoted as a destination for domestic tourists, despite being significantly removed from major roads and carrying little visibility. While the site came equipped with electricity, clean piped water, sinks, sewage, and public spaces for eating and for children to play, the design was lacking as many of the stalls were not facing outward but were hidden from sight and difficult to access.

Taman Kuliner was initially successful, partly thanks to promotional events organized by the management, such as arts festivals and traditional bird calling competitions. However, these events declined in frequency as time went on and finally stopped as more vendors closed their stalls. Nine years after the relocation, only four out of 120 vendors remained, the rest having returned to the streets.

FINDINGS

This section summarizes our findings as to why informal street food vendors from the four market sites returned to the streets after "successful" relocation and upgrading efforts. We also comment on how policy and planning interventions might prevent such unfavorable outcomes in the future.

THE NEW MARKETS OFFER AESTHETIC SOLUTIONS WITH LITTLE FUNCTIONALITY. Many street food vendor relocations delivered improvements in the visible quality of public spaces and purpose-built markets but fail to pay comparable attention to physical functionality and locational factors—key concerns of vendors. Respondents repeatedly indicated that markets better accommodated their needs around food preparation, storage, and waste disposal in addition to offering parking areas, public toilets, Wi-Fi access, and even places to pray, all of which helped attract customers. But such improvements were offset by shortcomings in site design and infrastructural elements such as low visibility from the street and lacking integration of the market with urban surroundings, which inhibited client access and patronage.

Among various respondents, food vendors were disproportionately concerned with issues of visibility and access as their businesses were highly reliant on selling food to people on the go. At previous locations, food vendors used tarpaulin or sheets to both separate eating customers from the street as well as advertise their business. Located away from main roads, central or busy areas, and most importantly, the sights of potential customers, the purpose-built markets overlooked the critical requisites of marketing and access for successful food vending. Purpose-built markets such as Taman Kuliner or Pasar Notoharjo were located on government-owned properties off main roads and on the outskirts of the city respectively. Solo's Pasar Punggungrejo was imperceptible from the road due to a large setback. Eko, a trader who left Punggungrejo for the streets, remarked:

» *The market is not accessible for students... I only had a limited number of regular customers, who knew me from my previous location. When they graduated, it was very difficult to find new customers due to the non-strategic location. So I had to move out.*

Interviewed food vendors also commented that site designs that failed to consider internal circulation and access. In Pasar Klitikan Notoharjo, relocated vendors complained that they were positioned in upper floors of two or three

Figure 5: An example in Pasar Panggunrejo, Solo, where food vendors were housed in long narrow rows alongside non-food stalls or in a three storeys building which makes them inaccessible because many clients do not want to walk up the steps. Photo by Dennie Ramon

story buildings where few customers ventured. Moreover, food vendors were arranged in long narrow rows alongside non-food stalls, and were made to use concrete benches for food preparation. Alternatively, food vendors prefer 'food court' arrangements where stalls face clients and offer food preparation areas, storage, and drainage for better hygiene and presentation.

Finally, food vendors highlighted locational considerations such as market proximity and accessibility to large customer bases, whether in residential or commercial areas. While mobile vendors can control their location and visibility by moving to strategic areas, vendors in purpose-built markets face more enduring circumstances. In Taman Kuliner, the lack of dialogue between vendors and the City precluded opportunities to troubleshoot the site's remoteness. In contrast is the Pasar Notoharjo relocation of 2007. During this project Mayor Jokowi heard the vendors' concerns about the site's remoteness from the rest of the city. As a result, his administration extended new bus routes, completed street surfacing, and undertook a promotional campaign to integrate the area with its surroundings and improve its reputation and popularity. This finding indicates that locational variables can be more or less maximized depending on the extent to which vendor relocation and site planning processes prioritize dialogue, negotiation, and a commitment to finding mutual benefits for street vendors and the local authorities.

THE RELOCATION POLICIES FAIL TO PREPARE VENDORS FOR CHANGING CLIENTELE AND BUSINESS ENVIRONMENTS. For street food vendors, relocation goes far beyond moving to a new location. The fixed market location means that venders need to accommodate the tastes and preferences of changing clientele and adjust to a more competitive business environment. The failure of relocation policies to prepare vendors for such ranging demands limits their effectiveness and durability.

Most relocated street vendors shed their previous customer base, as food patronage tends to be highly location specific. For instance, some

interviewed vendors previously served students from certain universities while others catered to taxi drivers on particular roads. At the relocation sites, customers often demanded a higher quality of food, preferred to have more choices, and were willing to spend more time eating compared to those eating at street stalls. As relocated vendors had to adapt to their new clientele, those specializing in one type of food and cooking style struggled much more than those able to diversify offerings and accommodate different taste preferences of new customers.

Among vendors who met success with market relocation, recurring themes included adoption of a competitive mindset, adaptability to new customer demands, and continuing relationships with existing clients. Whereas success in street vending can result from simply offering a product or service when and where they are needed, brick and mortar businesses alternatively succeed upon developing a brand or reputation and winning repeat patronage, whether due to the quality or reliability of the offering or strengthening relationships with customers. Given the difficult challenge for food vendors in public markets related to differentiating products from one another, many purveyors respond by offering distinct dishes, whether in terms of flavor or regional origin. As stated by Antok, the head of a Solo-based trader's associations:

» *There are some reasons people fail or succeed here: level of tenacity, type of commodity, amount of capital, extent of knowledge based on experience and education, and social links or networks. To win competition, first we should become distinct in the quality of our product, service delivery, and price because the competitors are not just those in this site but also the many new street vendors who have not been relocated.*

On the streets, food vendors can gain competitive advantage through mobility and outperform competitors by finding superior sites. But at fixed sites, competition is more direct. Some vendors have adapted by offering special deals to customers to generate new business and otherwise exploring creative and enterprising marketing strategies. According to Bu Mukti, one of the very few who stayed at the Taman Kuliner site, "To be a food trader in this empty market, I have to be creative in selling my food, including giving bonus to someone who can bring me a big order." As most of her peers have returned to the streets, the implication is that vendor preparedness for adjusting to more competitive business environments within fixed locations not only varies widely but also lacks sorely.

POLICY AND PLANNING PROCESSES NEGLECT THE ONGOING AND EMERGING NEEDS OF VENDORS. Our findings indicate that government commitment to vendor outreach and participatory planning is instrumental during the relocation process, but maintenance and support is also needed beyond the transition phase. At the moment, policy and planning processes neglect the ongoing and emerging needs of vendors following relocation.

In the relocation of street vendors from Solo's Banjarsari Park to Pasar Notorejo in 2007, Mayor Jokowi's deep engagement was critical to building trust, obtaining mutual concessions, and producing a satisfactory outcome. The mayor employed dinner invitations, site visits, and participatory planning processes involving the vendors, their associations, and intermediary non-governmental and community-based organizations.

On the other hand, street to market transfers have been less successful in cases of vendor exclusion from planning processes and inconsistent or stalled implementation. In Solo's Pasar Pungunggrego, the government relocated one group of traders while allowing others to remain in the streets. This resulted in increased tension among vendor groups and diminished faith in government capacity. In Jogyakarta the three-year delay in relocating vendors from outside Gajah Mada University, in addition to their exclusion from decision making processes, enhanced their dissatisfaction with the eventual selection of a site.

Once markets have been inaugurated, consistent maintenance instrumental to continued operation and success. This follow-up includes the regular provision of basic services (e.g. clean water, sewage, trash collection) and the initiation of promotional campaigns. In Punggunrejo, the

Figures 6, 7 and 8: Relocated vendors found that placement in Pasar Klitikhan Notoharjo, Solo, meant they could serve the needs of customers attracted to the market, as well as the vendors of other products. Photo by Dennie Ramon

accumulation of trash and inadequate maintenance led to falling hygiene levels, site deterioration, and eventual decisions of abandonment by many vendors. In the case of both Jogyakartan city markets, the discontinuation of promotional campaigns resulted in falling customer volumes. The importance of factors like adequate parking and hygiene levels should be observed.

Moreover, relocated vendors require ongoing training and support with learning financial literacy, management skills, and other capacities to succeed at business in a fixed location, formalized market environment. In relocating street vendors from Solo's Banjarsari Park to Pasar Notorejo in 2007, the Jokowi administration offered concessions of stall ownership certificates and access to business loans. In so doing, it unwittingly posed added economic risks and burdens to the poorest vendors, who lacked finance know-how and were often seduced to sell their certificates amidst unexpected hardship.

Rizal, a trader from Solo's Punggunrejo market, remarked, "Many traders have low education levels. Most of us are afraid to borrow money from the bank. We don't really have a clear understanding of how it works and feel insecure about the risk." Some commented on feeling trapped in their new positions because competitive concerns led them to obtain loans in order to enlarge their stock, which newly exposed them to financial risks. The vendor Purman, of Solo's Pasar Notoharjo, explained, "Immediately after I got the stall from the Government, I borrowed money from the bank [with stall as collateral] just to add commodities, but after a year I didn't have enough revenue so I abandoned the stall and went back to the street and the bank seized it."

Given limits to government capacity, non-governmental organizations, trade associations, and micro-credit financial institutions can step in to provide targeted training and technical assistance as well as mediate further negotiations with local authorities. Reflecting on the potential of self-organization and more sustained engagement by civil society organizations, Aa, a community-based organizer stated, "After relocation, the government should empower the vendor association to protect themselves legally, run soft saving and loan programs, get better leverage, and run mutual help associations to counter adversity." In the case of Solo's Pasar Notoharjo, such local organizations played an instrumental role in allowing the vendors to address common concerns as they arose and correspond with the Mayor in a coordinated manner. On the other hand, the City alternatively exploited differences among vendors in Pasar Punggunrejo to weaken their bargaining position.

POLICY AND PLANNING IMPLICATIONS

Our study also suggests lessons for improving urban policies and planning with respect to relocating street food vendors and promoting their long-term success at new sites.

THE NEED TO PROVIDE PRO-POOR AND INCLUSIVE SPATIAL INTERVENTIONS. Present street food vendor relocation policies appear to focus on reclaiming public space from low income street vendors and relocating the vendors into aesthetically pleasing new markets. We suggest that spatial interventions also need to improve the economic prospects of the vendors and address the socioeconomic, political, and spatial disparities underlying urban poverty and informality.

Certainly, relocated food vendors could benefit from designated spaces for food preparation, storage, and waste disposal within markets as well as the provision of parking areas, public toilets, Wi-Fi access, and places to pray. However, upgrading vendor livelihoods to ensure vendors remain in the markets long-term requires effective site designs, such as those which arrange food stalls in visible and accessible ways within market sites. Given the practical experience and grounded knowledge of food vendors, incorporating their perspectives and preferences on stall arrangements and locations within the markets can promote the viability of new facilities. Programs also need to be initiated which promote the visibility of markets from the street and integrate the market with urban surroundings. Aside from infrastructural elements which strengthen connectivity between market sites and major circulation routes or pedestrian access paths, locating markets in proximity to large custom-

Figure 9: Between 2007-2012 numerous street vendors were relocated from the streets of Solo, Indonesia, into purpose built public markets. One such example is Pasar Gede, pictured here, which received a number of street vendors during the term of Mayor Joko Widodo. Photo by Dennie Ramon

er bases, whether in residential or commercial areas, can promote their long-term viability.

What is ultimately needed is an explicit commitment to pro-poor and inclusive spatial interventions. In Solo, vendor relocation efforts were part of a larger local campaign of economic empowerment (of the urban poor) and building a people's economy, which partly entailed promotional campaigns promoting the reputations of public markets. Hence, pro-poor and inclusive spatial policy and planning would go far beyond convincing informal food vendors to abandon public spaces for designated market places. It would require attention to vendor rights to the city, including their proximity and connectivity to major residential and commercial clusters as well as major transport networks. Within the markets, pro-poor and inclusive processes of strategic spatial planning and management might engage food vendors in thinking through their unique offerings as well as complementarity with respect to products and services as to apportion space and assign stalls in ways that promote the overall success of the new market.

FROM MARKET-CENTRIC APPROACHES TO COMMUNITY-BASED WEALTH GENERATION. Relocation policies are more likely to have lasting effects if they incorporate technical assistance and trainings for food vendors. Vendors should be taught to adapt to customer demands and expand business through branding and marketing strategies. Food vendors might also benefit from coordinated bulk purchases of ingredients and supplies or complementary menu offerings within a food court or marketplace.

Awarding relocated vendors certificates of perpetual stall ownership, while intended to advance their economic prospects, often has the opposite effect. Street vendors exposed to a new market environment and competition can make them economically vulnerable. The pro-

vision of stall ownership certificates, which in turn enables access to bank loans, poses added economic risks and burdens in the absence of technical assistance and training. Vendors clearly require more support than new facilities, even with a formal certificate, given little experience working in formal conditions and in some cases, paying taxes and monthly rent. Being poor, they also have generally low levels of education and are often reluctant to take out loans.

FROM THE POLICY CYCLE TO COLLABORATIVE, ADAPTIVE GOVERNANCE. Local governments should enable vendors to resolve emerging issues and engage with government planners on an as-needed basis. For instance, vendor's associations or other non-governmental organizations could oversee maintenance, including the regular provision of basic services (e.g. clean water, sewage, trash collection), skills trainings, and promotional campaigns, to promote continued success of public markets following inauguration. Meanwhile, government could focus on consistently enforcing rules and regulations to ensure fair competition or improving public accessibility of markets, for instance, through subsidized bus fares or undertaking urban infrastructure improvements that improve circulation and walkability in the market vicinity.

On site, vendors are more likely to support stall reapportionments that are based on the varying profiles and the needs of the different vendors if mechanisms for shared decision-making and gains distribution are in place. Vendors may form a worker cooperative, where each member owns shares, contributes business revenues as a share of total profits, and takes out dividends (perhaps based on a combination of individual and group performance as well as number of shares). Moreover, vendors could participate in shared decision making about product and service placement within markets, improvement of common spaces, and marketing campaigns. They should proactively engage the City to deliver urban infrastructure improvements and other public works and services that improve the site's connectivity to the rest of the city and resultant public patronage.

ENDNOTE

1 Pasar in Bahasa Indonesia means 'Market' in English

Figure 10 (left): Food vendor relocation processes often fail because policies fail to prepare vendors for the competitive business environments inside purpose-built markets.
Photo by: Dennie Ramon

REFERENCES

Bromley, R. (2000). Street vending and public policy: a global review. International Journal of Sociology and Social Policy, 20(1/2), 1-28.

Bunnell, T., Miller, M. A., Phelps, N. A., & Taylor, J. (2013). Urban development in a decentralized Indonesia: two success stories? Pacific Affairs, 86(4), 857-876.

Cardoso, R. D. C. V., Companion, M., & Marras, S. R. (2014). Street food: culture, economy, health and governance. Routledge.

Donovan, M. G. (2008). Informal Cities and the Contestation of Public Space: The Case of Bogotá's Street Vendors, 1988—2003. Urban Studies, 45(1), 29-51.

Duit, A., & Galaz, V. (2008). Governance and complexity—emerging issues for governance theory. Governance, 21(3), 311-335.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. Annu. Rev. Environ. Resour., 30, 441-473.

Forester, J. (1999). The Deliberate Practitioner–Encouraging Participatory Planning Processes. Cambridge, MA: MIT Press.

Healey, P. (1997). Collaborative planning: Shaping places in fragmented societies.

Vancouver, BC: University of British Columbia Press.

Innes, J. E. (1995). Planning theory's emerging paradigm: communicative action and interactive practice. Journal of planning education and research, 14(3), 183-189.

Phelps, N. A., Bunnell, T., Miller, M. A., & Taylor, J. (2014). Urban inter-referencing within and beyond a decentralized Indonesia. Cities, 39, 37-49.

Rittel, H. W. J., & Webber, M. M. (1974). Wicked problems. Man-made Futures, 26(1), 272 280.

Roy, A. (2003). City requiem, Calcutta: gender and the politics of poverty (Vol. 10).

Minneapolis, MN: University of Minnesota Press.

Roy, A. (2004). Transnational trespassing: The geopolitics of urban informality. Roy, A and

Al Sayyad, N. (eds). Urban Informality" Transnational Perspectives from the Middle East, Latin America and South Asia. Lanham, MD: Lexington Books.

Roy, A. (2005). Urban informality: toward an epistemology of planning. Journal of the

American Planning Association, 71(2), 147-158.

SPECIAL SECTION
PLANNING FOR A FUTURE SOUTH AFRICA

CO-EDITOR: MARTIN LEWIS

THE WATERFRONT WE HAVE VS THE WATERFRONT WE WANT IDENTIFYING CHANGING CONDITIONS AND NEEDS THAT WILL RE-SHAPE THE CURRENT DURBAN WATERFRONT

MRIDULEKHA ALLOPI · BERNARDUS VAN HEERDAN

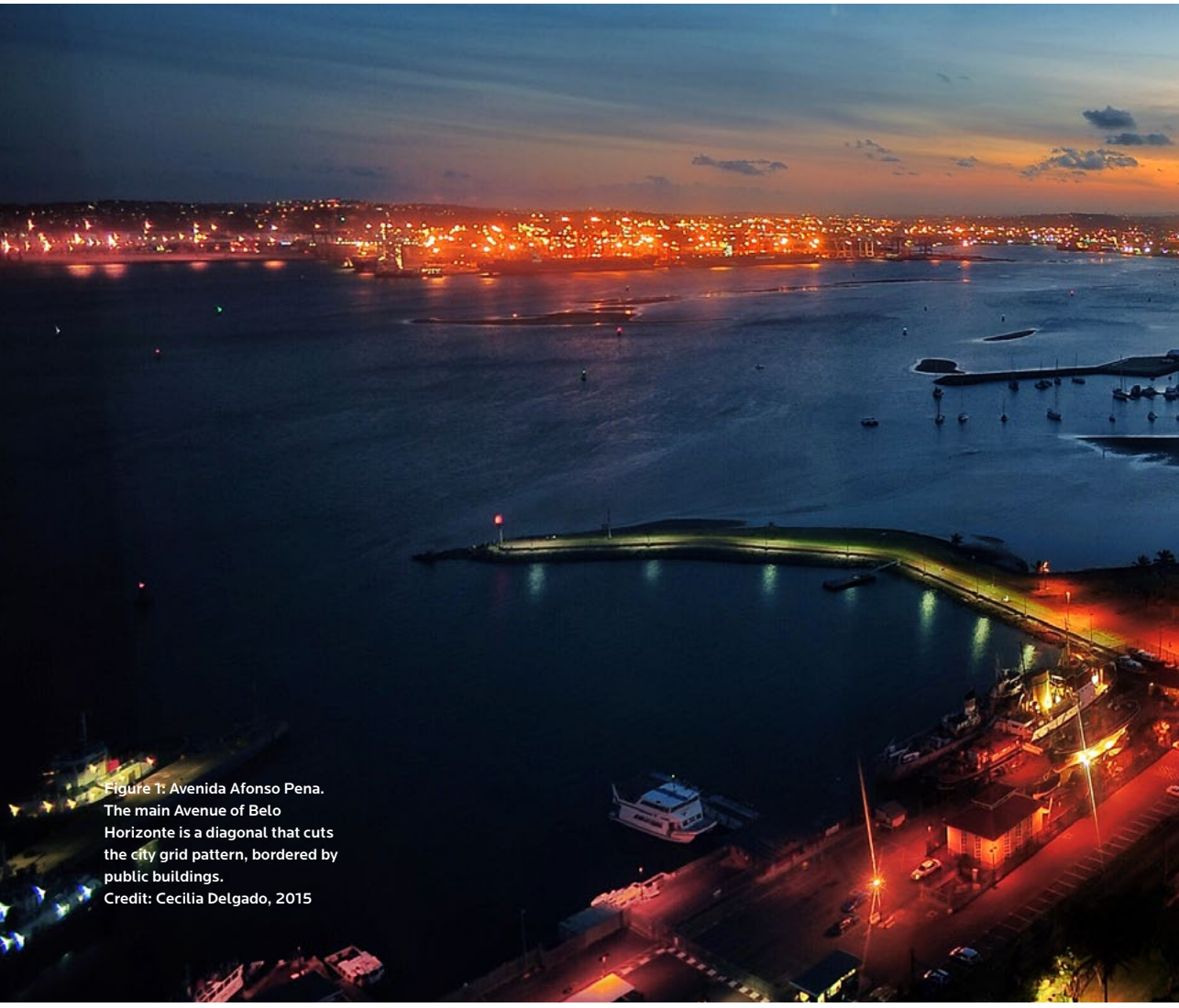


Figure 1: Avenida Afonso Pena. The main Avenue of Belo Horizonte is a diagonal that cuts the city grid pattern, bordered by public buildings.
Credit: Cecilia Delgado, 2015

»This article concerns itself with that portion of the Durban Harbor commonly known as the Victoria Embankment Waterfront; the Bay Waterfront; or the Durban Yacht Basin. It is an area whose role and function has been evolving for decades. Today the Waterfront includes limited public spaces; private spaces, a Yacht Basin and a ship/boat repair facility. We propose to review the waterfront's role in the context of "the city we have vs the city we need," and to look at the changing conditions and needs of the city that will re-shape the Durban Waterfront as a must see attraction. «

Figure 1: Durban Waterfront decades ago

CONTEXT AND BACKGROUND

Durban has one of the great natural harbors in the world. Today, the harbor is one of the busiest container ports in Africa and it also serves as a base for cruise ships. As a result, almost all of the shoreline is developed for port use. The exception to this extensive port development is an approximately mile-long section which fronts Durban's downtown, referred to as the Victoria Embankment Waterfront. The principle use along this area is a marina, which caters to sail boat. It is this portion of the harbor which is the focus of this article.

The potential of the Victoria Embankment Waterfront has long been recognized. During the 1980's the City of Durban undertook to integrate the Victoria Embankment Waterfront with plans for the Inner City. It also identified the need to upgrade the area in general and to consider limited public access into certain areas. A few years later, the City endorsed its intention to upgrade the Inner City; this time identifying the Victoria Embankment as part of a Corridor of Excellence. At the same time it received the endorsement of the National Ports Authority to consider a wider range of land uses for this area, such as commercial, recreational and tourism opportunities.

In 1998, another document prepared by the City, called "Towards an Inner City Development Framework Plan for Durban", identified the "Bay Waterfront" as a key project. In essence this plan proposed nodes of development which included entertainment, leisure, tourism, commercial and office use together with low impact port, naval operations and facilities. Arising out of this work, an Outline Development Plan for the Victoria Embankment Waterfront was prepared and approved by the City Council in 1996/1997, however "delays persist in the actual redevelopment of this strategic area."

Later in 200,2 the City Council approved an Urban Design Framework for the Yacht Basin, which was one of the nodes/precincts that was identified in the Outline Development Plan for the Victoria Embankment Waterfront. Today, all of the years of limited interventions have failed to produce success. However the opportunity for this catalytic project to force a change in this area still exists.

CURRENT PLANNING PHILOSOPHY

The Durban Planning Scheme was written some 60 years ago and identified all land within the Waterfront as "harbour." This plan promoted the mentality of limiting land uses to those associated with port operations and endorsed the need to keep the public out of this dedicated marine terminal area. Since then. and despite the various intentions of the City, the Planning Department has never been directed to review this Planning Scheme. Thus, allowed land uses remained static and the character of the waterfront remained largely unchanged.

Coupled with this lack of pro-active planning, the Waterfront remained a water facing piece of infrastructure, without any relationship to the urban land uses of Durban downtown. Further, the existence of a railway line and a high volume freeway along the edge of the site isolate it and complicate matters further.

In 2015/2016 the City announce another intention to regenerate the Inner City. This Inner City Regeneration Plan seeks to create an overall Master Plan; to identify seven key precincts for more detailed planning work; and lastly, to provide for a Management Plan to operate the day–to-day activities within the Area. The Victoria Embankment area of the Waterfront will fall under the Master Plan, but the Waterfront has not been identified as one of the seven precincts for more detailed planning work.

The Master Plan has identified that the real estate fronting the Waterfront has a new role to

Figure 2 (top): The Urban Design Framework for the Yacht Basin proposed the development of a limited commercial and specialized residential development and the upgrade of the public realm. Limited interventions have occurred to date

Figure 3: With this close proximity to the Durban Central Business District it is believed that the Waterfront Development could be a major catalyst for the regeneration of the Inner City

Figure 4: The Yacht Basin has been the venue for international regattas

play and that its revitalization will transform the area. The domino effect is that this Master Plan will, in turn, force the development of a Plan for the Waterfront. The resulting waterfront Planning Scheme, will be a component of the Inner City Regeneration Plan, and will be used as the tool to direct and manage the development of the Waterfront into the future.

The Planning Scheme will have to ensure that it remains responsive and robust and is able to promote and facilitate development within this area.

CHANGING CONDITIONS AND NEEDS THAT WILL RE-SHAPE THE DURBAN WATERFRONT

There appear to be two economic forces which might drive the waterfront development. Globally there has been an increase in people travelling on cruise vessels. In fact, two cruise lines already use facilities in the Durban harbor. To attract this type of growth, Durban must provide an exciting location with the ability to dock at a world class, safe and exciting place. Across the world cities are constantly re-invent their public waterfront spaces to offer a competitive edge and in this regard the Durban Waterfront is no different.

The second economic driver could be International yacht racing. Again, waterfronts across the world have grown and expanded their mandates to also attract and retain the global phenomenon of yacht racing. Durban should be able to attract this growth industry as it continues to grow.

Therefore, a vibrant mixed use development is the recipe for a successful Durban Waterfront. The plan should also respect the environment and its delicate and fragile ecosystems.

LOOKING INTO THE FUTURE

Perhaps then the process to shape the Waterfront of the future should begin with an examination of the Environmental Impact Assessment together with the Draft Estuarine Management Plan (2015). Without undermining past studies, the Draft Estuarine Management Plan is more likely to have the latest key indicators for the

Figure 5: The Urban Design Framework for the Yacht Basin proposed the development of a public promenade along the water's edge

re-development of this area. Without a doubt, there will be areas marked as "no go areas" (conservation areas) but the identification of areas for heightened development must also be identified. It is this balance that will make this Waterfront a sustainable waterfront into the future.

The resulting analysis of development opportunity and conservation areas should cause a new Framework Plan to be prepared to direct the urban fabric, the movement patterns, and the infrastructure for the area. Such a plan will also cause existing property values to increase in the area. These properties include the areas on the Waterfront itself, but also on the existing properties that sit on the edge of the existing facility.

The Management Plan will seek to improve recreation and boating by identifying key areas for such activities. The Management Plan should highlight the loss of commercial and public spaces due to the widening of the Port mouth and relocate them to other spaces within the Port, perhaps including the Victoria Embankment site. Such a plan should also talk about the need to enhance public access, reminding of the conflict between port operations and the movement of people, and lastly, put in place a plan of action for the next 5 years.

The Plan will look to direct the enhanced development of the existing Yacht Basin that is currently home to some 400 sailing vessels and its ability to increase this capacity. Clearly, support services to this Maritime Sector must be located within close proximity to the marina, but not necessarily within the Waterfront.

Existing bulk infrastructure such as waste water disposal into the Waterfront will also have to be considered. The impacts of such disposal will have to be understood and if significant to be relocated then such relocation initiated.

In preparing this Framework Plan it must be noted that the Waterfront currently has dual ownership, with some tracts of land owned by the City of Durban and others by the Port Authority. This dual ownership has, to a large extend, compromised the development of the Waterfront. While the City of Durban acts in the interest of

Figure 6: The Yacht Basin is primarily occupied by various water sport organizations and is an important recreation node within the Port of Durban

the general public; the Ports Authority, by virtue of its business, restricts and manages public access in these areas. Current institutional arrangements require review so that all parties, while still effecting their responsibilities, work towards the common good of the City , its Port and its people.

At this point the changing conditions and needs that will re-shape this Waterfront include:

- The enhanced role of the Waterfront as it relates to the global travel and the land uses that promote that adventure/experience. To this end a Development Framework Plan, together with a responsive and robust Planning Scheme incorporating urban design directives, will deliver a world class facility. Implicit in this will be the infrastructural and other specialist studies that will ensure that the Waterfront is sustainable;
- Secondly, the need to grow and enhance the role of the Waterfront in global yacht racing across the world. In developing the Framework Plan, consultation must be undertaken in capture this economic sector.
- Thirdly, to responsibly balance development with the environmental issues. Emerging climate change trends must be fed into the Development Plan.
- And lastly to review existing Institutional mechanism in the best interest of the City and its people and the Port Authority.

CONCLUSION

The Durban Waterfront is a landmark within the City and the need to grow its potential within the City is paramount. Looking back over our shoulders, we can see the Waterfront of the past; looking into our crystal ball, we can see a different Waterfront in the next decade. This new Victoria Embankment Waterfront will be dynamic and vibrant, colorful and people drive; a place that is abuzz and where there is symbiosis amongst all its users. The opportunity exists now to change the Waterfront we have and to evolve it into a Waterfront of the future - a Waterfront that we want and the one to which we can invite the world to enjoy this special place.

Acknowledgement:The photos in this article are by Prakash Bikha and Derek White.

WHAT'S CHANGING?

At the very outset all issues need to be understood and categorized; this includes everything from who stakeholders, the legislative requirements, the infrastructure capacities and funding streams; and the institutional arrangements.

Having understood the above; it is important to understand possible compromises and to understand what exactly they are; thereafter to draft a discussion document in order to start an engagement with all stakeholders. Once the conversation is complete, then to reach out to the world to prepare a Development Framework Plan. ◆

URBAN TRANSFORMATION IN SOUTH AFRICA

MFANISENI FANA SIHLONGONYANE · MARTIN LEWIS

Aerial shot of Johhanesbur, South Africa. Photo credit: www.c40.org[1]

The rise of the transformation agenda in urban thought and practice in South Africa since the 1990s has been quite profound. Despite all of the legislation, policy and planning mechanisms that have been introduced to foster transformation, it has been putatively acclaimed that it is not happening, or not happening as it should. Moreover, the political nature of the concept has not helped in its conception. This article seeks to explore the concept of transformation by firstly discussing its influences in urban development. This is followed by outlining the critical challenges for transformation. Lastly, the article puts forwards a conceptual framework of transformation that can provide a more practical way to foster sustainable urban change.

INTRODUCTION TO THE SOCIO-POLITICAL BACKGROUND

Apartheid Planning and its implementation have played a key role in the creation of a South African apartheid city structure (Mabin and Smit 1997). Apartheid was a system of racial separation which was introduced formerly in 1948 through a group of laws that curtailed the rights of the black majority. This structure was created through spatial planning with a segregating system of land use control. Therefore, South Africa was "... marked by deep social and economic inequalities, as well as by serious racial, political and social divisions" in the 1990s (RSA 1995b:2). Indeed, Smith (1992) noted that moves towards a solution meant that the negation of apartheid was the only beginning. It is not surprising that the dawn of democracy in 1994 was anchored around the pursuit of an agenda of transformation. Thus, the concept "transformation" was central to social change in South Africa (Williams 2000:168).

In planning terms, the normative objective in the new government was to adopt "equity-based, post-apartheid city building principles aspiring to stitch together apartheid's urban discontinuities and integrate the torn parts ..." (Bollens 1998:741). In their seminal book, *South Africa: A Manifesto for change*, Dewar and Uytenbogaart (1991) envisaged the post-apartheid city through densification and infill of the existing urban system and upgrading and removal of those parts of the urban system under stress. According to Dewar (1992: 248-253) the post-apartheid form of planning needed to: establish and maintain the relationship between non-urban and urban land; create a compact city by imploding growth; promote a more integrated urban form and more complex levels of order; redefine essential infrastructure; and, stimulate a more complex process of urban management. The agenda for transformation percolated much of the legislative and policy developments in the 1990s and 2000s, with a view to promote integrated urban development.

Various legislations, white papers and policies, both from national and provincial levels have been developed and implemented by local government in the past two decades. Also, South African urban policies have incorporated strategies that aim to achieve integrated and democratic local governments which support service delivery to the poor (Pillay 2008). In other words, each of the legislations, policy and strategies sought to realise a particular aspect of transformation using a variety of development metaphors. At a very high level, the Reconstruction and Development Programme (RDP) was associated with reconstruction; the Development Facilitation Act (DFA) was linked to coordination; the Growth, Employment and Reconstruction (GEAR) was associated with privatisation; the Local Government White Paper of 1998 was focused inclusion/participation; the Structures Act of 1998 was fostering institutional restructuring; the Municipal Systems Act of 2000 promoted integration.

In addition, various urban development plans were adopted at local[2], regional[3], and national[4] levels to respectively promote integrated and strategic urban development in the country. The enactment of the Spatial Planning and Land Use Management Act in 2013, and the subsequent development of provincial legislations for its implementation, marks a further attempt at providing a comprehensive legislative framework for advancing transformation through local planning.

This paper explores the concept of transformation by firstly discussing the impact of the legislative and policy changes on the built environment. This is followed by outlining the critical challenges for transformation. Lastly, the article puts forwards a conceptual framework of transformation that can provide a more practical way to foster sustainable urban change.

Figure 1: A BRT lane is a New Phenomenon on the Streets of Johannesburg

MODALITIES OF URBAN TRANSFORMATION IN SOUTH AFRICA

The impact of legislative change and policies has brought about certain outcomes of urban transformation. Williams (2000) discusses urban transformation as a multi-dimensional concept in the post-apartheid era with differentiated substance, form and dimensions. He identifies seven dimensions of urban transformation in the country. These include: epistemological, conceptual, Moral, empirical, institutional, managerial, and programmatic dimensions.

EPISTEMOLOGICAL DIMENSION

The epistemological dimension of transformation refers to "the origin and nature of specific sets of knowledge about social change, which in turn, reflects our thinking and cognition about the world. It is about the foundation and nature of knowledge with regards to social change, thus demonstrating our philosophy about the world" (Williams 2000:169). In today's context, it means that new theories of knowledge have emerged as valid claims in the post-apartheid era, especially with regard to methods, validity, and scope. Unlike the rigid, closed-off, racialized system of thought for the apartheid past, new ways of theory, methods, and practice have emerged (albeit contested and shifting) as valid ways of knowing and questioning.

One has seen the shift from the binary logic (of male/female; ruling class/working class; black/white; north/south; developed/underdeveloped; urban/rural; rich/poor; and so forth) (Williams 2000) towards an official embrace of diversity, contingency, assemblage and intersectionality in post-apartheid urban thought. New urban visions have emerged, such as the world class African city drawing from diverse cultural inspirations at global and local settings (cum-international and African environments). The drives by municipalities to reconfigure and reconstitute urban spaces through the new bodies of knowledge and knowledge formations that emphasise integration, de-racialization, compaction, etc., have become normative metaphors of change for post-apartheid society.

CONCEPTUAL DIMENSION

Conceptual transformation has been marked by the creation of new visions of society and of the urban setting. Whilst the city in the apartheid past was seen as exclusively a dwelling place for whites only and marked by variegated spaces of racial segregation, the new vision of the city incorporates an inclusive, unprejudiced, 'democratic' society that has a spatial setting where all the racial groups have access to social amenities (RSA 1998b).

In this content, Williams (2000) argues that transformation is seen as an interconnected sequence of materially-driven practices distinguishable from reformation. Thence, there has been emphasis on the development of "programmatic, plan-oriented, project-directed effort to change the unequal access to and occupation/ownership of socio-politically differentiated space in South Africa" against an "*ad hoc* and piecemeal fashion," of intervention that leaves the status quo largely intact (Williams 2000:169).

HISTORICAL, MORAL DIMENSION

In this dimension, Williams (2000) draw attention to the fact that transformation is driven by a constitutionally entrenched concern about redistribution justice. Thus, the adoption of new visions of urban change, such as integration, compaction and densification programmes, are geared towards the eradication of the spatial ills incurred from apartheid planning[5]. As such, "most planning policy frameworks programmes and projects emanating from government highlight the historical antecedents of unequal relations of power undergirding the urban regimes in South Africa" (Williams 2000:170) and the need to address them. This has definitely affirmed that the new rules of the game, as defined by legislation and policy, have changed and seek to change the practice/implementation in urban planning. For example, unlike the use of urban legislative, policy, plans, and frameworks associated with town planning of 1950s, the post 1990's emergence of the lexicon of a *framework* in South Africa marks a significant shift in thinking about development towards accommodative forms of urban planning (Sihlongonyane 2014).

EMPIRICAL DIMENSION

Under empirical dimension, Williams (2000) points out that transformation in the South African context encompasses a political content since it involves de-racialization and de-ethnicization (Cloete *et al*. 1991; Commonwealth Secretariat 1991; RSA 1998b). In his short discussion of the section, he argues that transformation at the urban level is a socialised space which is characteristically political in nature and so it is dialectical and continuously contested. As such, it is precisely the political character of transformation itself that is generative of transformation in urban South Africa. In other words, the opening up of space for political contestation is the engine behind transformation. This political space for contestation can be appreciated when considering that such spaces were closed down in apartheid past and currently in parts of the world especially in the many countries in the African continent.

It has been observed that the rate of protests has been escalating since 2004 (Alexander 2012). Since 2008 more than two million people have taken to the streets in protest every year (Plaut 2012). In many ways the local protests and struggles signifies the thriving of democracy in South Africa. Notwithstanding, the negating violence, many significant gains have been brought about by such contestations – as with the recognition of local structures, delivery of services, stoppage of removals or displacements, and provision of support to marginalised sections in society. Njabulo Ndebele (2012) argues that "Widespread 'service delivery protests' may soon take on an organisational character that will start off as discrete formations and then coalesce into a full-blown movement".

INSTITUTIONAL DIMENSION

According to Williams (2000), the institutional practices of urban South Africa has transformed in principle. The norms, ethos, ethics and logos (logic) that governed the apartheid city has been dismissed in favour of normative guidelines that favour "regulations and codes of conduct that seek to facilitate forms of behaviour/relations of power that, for example, facilitate the provision of equitable services, especially to historically neglected communities" (Ibid p.170). The ad-

Figure 2: The Nelson Mandela Bridge linking Braamfontein and Newtown is a prime signifier of Integration

justments to transformative planning in public institutions have been influencing the pace of change in South Africa. Thus, most of the municipalities have adopted policies and practices that emphasise the empowerment or targeting of blacks, rural areas, women, youth, and disabled.

Since 1994, various institutions of government, current and erstwhile, have been established to push the agenda of transformation. Inter alia: the Development Planning commission was behind the setting up of the DFA; The Demarcation Board is central to the amalgamation and integration of various communities; the South African Council for Planners (SACPLAN) has set up various mechanisms and projects for the transformation of planning education e.g. the competency and standards project; and, the South African Planning Institute (SAPI) has undertaken a lot of training programmes and conscientization about planning in the country in the transformation of the professional practice.

MANAGERIAL DIMENSION

In the managerial dimension, Williams (2000) views transformation in terms of how government has created legislative frameworks for management such as the *White Paper on Local Government* of 1998, the *Municipal Systems Bill* of 1999, and the *Green Paper on Planning and Development* of 1999. These statutory documents have put forward specific managerial requirement for guiding implementation, practice and conduct of planning. Among other frameworks, the Municipal Structures Act of 1998, the Municipal Systems Act of 2000, and the Public Finance Management Act of 1999 (PFMA) have foster new ethos and ethics for new public management. Whereas in the Old Public Management system (OPM), efficient bureaucracy for public management was "equated with top-down, hierarchical and rules-bound public administration, staffed by permanent, neutral professional officials, motivated by the public interest and directly accountable to the political leadership," in the New Public Management (NPM) thinking, the emphasis is "on novel incentive structures to combat the perceived inefficient and wasteful propensities inherent in OPM." (Chipkin and Lipietz 2012).

To enhance this shift, government in collaboration with different institutions of higher learning have been "training newly-elected officials from historically deprived communities in areas such as: democracy, co-operative governance, infrastructural services, housing and financial management, thus it has been practice oriented" (Williams 2000:171)[6]. Also international study tours, the study of best practice models, as well as the assistance of professional consultants have contributed in shaping urban management in South Africa.

Indeed, many developers, planners, architects and politicians, as well as a powerful industry of marketing and image makers, have promoted the world class city as an object of desire in South Africa (Perera 1999). In many ways, whilst this has brought fortunes to the upper tiers of the urban class, it has also marked a transformation from apartheid's geographical structure[7] whereby black people were removed and prevented from entering the cities towards cities that are governed by discursive practices of the market embracing privatisation, class and exclusivity. The sequence of equivalence between the apartheid and post-apartheid governance has been critically notable.

PROGRAMMATIC/PRACTICAL DIMENSION

Lastly, Williams (2000:171) talks about programmatic dimension of transformation which promotes a vision of a non-discriminatory democratic social order in relation to urban profile and its morphology. This has involved "redefining both the procedural and substantive aspects of development and planning, commensurate with the basic right of freedom of movement and equal access to places of residence, work and recreation in the post-apartheid South Africa" (Ibid). The development of budgets, the employment of people, the design of spaces, format of the national and local calendars (for events) have all coalesced around pushing a common transformative agenda of change and emphasising the affirmation of people who were marginalised in the past.

SOCIAL TRANSFORMATION

Bremner (2000) also reiterates William's (2000) points by pointing at three kinds of transformation namely: social, economic and image

Figure 3: Neighbourhood transformation in Johannesburg. Hillbrow is a downtown inner-city neighbourhood built up with high rises in the 60's and 70's. Due to several factors including a collapse of laws governing rent control, health and building safety, and troublesome relationships between landlords and tenants, the neighbourhood went to high crime, "hijacked" buildings, debris in the laneways and drug infested parks that were entered at your own risk. By getting all the players together, laneways were cleaned up, parks were reclaimed for safe play[8]

transformations. Bremner (2000) talks of social transformation in relations to racial transformation especially in the inner city of Johannesburg. During apartheid, white inhabitants lived in the inner city, while the black working class, who were oppressed by the apartheid system, lived and commuted from Soweto (the sprawling township located to the south west of the city). However, the racial exclusivity of Johannesburg, at least in the inner city, began to unravel when the influx of Coloured and Asian families, together with a steady inward movement of African residents took place in the mid-1970s. Many more blacks sought accommodation in places like Hillbrow in the 1980s because of the intensification of violence in Black townships (Winkler, 2009). This was accelerated by the removal of the influx control legislation in 1986 which led to the rapid greying and consolidation of black presence in the city (Morris 1998). After apartheid laws such as influx control were lifted in 1986, the inner city had an approximately 20,000 black inhabitants (Bremner 2000).

Notably, the proportion of whites to blacks in the CBD was 7:1 in 1960; by 1970, the ratio had changed to 2 white employees to every 1 black employee. In 1990, the situation was closer to 1 to 1 (1 white worker to 0.85 black worker) (Inner City Ivukile, May 1995). Crankshaw and White (1995) observe that racial compartmentalisation and exclusivity in Johannesburg's inner city had effectively collapsed by the end of the 1990s. Oelofse (2003: 92) noted that more than two thirds of the inner city population were black with whites making up only around 20% of the total in the early 2000s.

A second demographic shift started to happen during the 1990s as more and more Africans migrated into the inner city (Bremner 2000). Hillbrow witnessed a steady flow of immigrants and migrants (Kihato 2010; Landau 2010) from neighbouring countries following the democratisation in the country in the early 1990s. This has seen a creation of a cosmopolitan mix of races in the cities of the country.

ECONOMIC TRANSFORMATION

Bremner (2000) also notes that there has been economic transformation for Johannesburg. She observes that many of the major economic headquarters that were located in the inner city, started to decentralise to the surrounding locations between the period of 1982 and 1994. In the 1990s, about 20% of top-grade offices in the city centre were leaving Johannesburg. Notably, even the Anglo American Properties (Ampros) sold its prime properties in the CBD including, the once precious Carleton Centre for R100 million, considerably less than its actual value (Sunday Times 1996; Business Report 1997). Consequently, one of the major problems of the inner city was the continued exodus of business from the CBD to the new decentralised nodes (Crankshaw and White 1995) such as Rosebank, Rivonia and the Midrand, Sunninghill and Sandton areas. At the same time, the informal trading market became the most "spectacular expressions" of the desegregation of urban space associated with the end of apartheid (Bremner 2000).

In the 2000s, the inner city has also re-affirmed its revival. The inner city became a magnate, attracting urban investments, through urban regeneration programmes that established precincts, city improvement districts, urban development zones, social housing and transitional housing as well as the Blue IQ projects. Besides public funded investments such as in Newtown, north of the CBD of Johannesburg, private investments provide a major signifier for urban transformation. An example would be the *en vogue* Maboneng Precinct in the south east of the CBD in Johannesburg. The inner city is now a space of encounter for different business activity between corporate and informal, large and small, black and white (Tomlinson 1999a).

IMAGE TRANSFORMATION

Bremner (2000) also notes that Johannesburg, like many other cities in South Africa, has adapted new ways to help market the city. During apartheid, Johannesburg enjoyed an image of racial exclusivity. It projected itself as the New York of Africa. This plan follows on what Beauregard (1993:26) called the 'mainstream approach to urban economic revival'. From the early 1990s, there was a strong sense in the city's Democratic Party-led administration that something had to be done to address the negative perceptions. This led to the re-imaged itself as a 'Gateway to Africa' because of its geograph-

Figure 4 (top): BRT Park Station in the CBD of Johannesburg Showcasing a Transformed Space Offering Public Transport

Figure 5 (bottom): The City Logo is a Common Image in the Streets of Johannesburg

ical location in the early 1990s (City of Johannesburg 1992). This period was marking a shift in the city's thinking by branding Johannesburg based on its locational advantages (Sihlongonyane 2015b). Also, in the catchphrase used in the 1990s was "Johannesburg- Economic Hub to Southern Africa" which focused on geographical advantages and emphasized Johannesburg's role as a financial hub (Rogerson, 1996).

Upon the election of new metropolitan local councillors in 1995 under the ANC leadership, the Johannesburg Inner City Development Forum (a partnership between government, civil society, labour and the private sector) came up with a new re-imaging initiative to make the city the 'Golden Heartbeat of Africa' (Rogerson, 1996). The year 2000 saw the transformation of the city towards achieving an overarching vision to be a globally competitive 'World Class African City' (City of Johannesburg 2001: 147). This has marked a shift from a city isolated in the international world to a city that is a major player in the international arena in terms of competition for attraction of investments, hosting of international events and fortifying its economic position in the region and the continent.

PITFALLS OF TRANSFORMATION

Despite these notable forms of transformation, it has been widely observed that, "Rather than compaction or integration, empirical research on South African cities, focused mainly on Johannesburg, ... show that new spatial divides are emerging along lines similar to patterns internationally" (Todes 2003:617; also in Mabin 1995; Beavon 1997; Tomlinson 1999b). This has made Dewar (1998:369) to lament that "the period that now might have been an urban planner's dream" (the new policies and the new political order are concerned with the well-being of the majority of the population) has "been marked by disappointment and in many cases by disillusionment." Beall, Crankshaw, and Parnell (2000:116) assert, "recent erosion of the racial residential segregation has done little to affect the geography of inequality in Johannesburg." Also, Bremner (2000) observed that the official housing programmes have tended to reinforce the apartheid plan, with the erection of mono-ethnic settlements situated either adjacent to existing African townships or not integrated with the surrounding predominantly non-African suburbs. Watson (2011:206) illuminated this observation by pointing out that 'Despite numerous national policy statements calling for integrated, sustainable and inclusive urban development, and despite the introduction of the Development Facilitation Act (Act 62 of 1995) which set out a process for replacing apartheid planning, this has not occurred'.

Peet (2002) argues that the switch of the ANC from a leftist, basic-needs-oriented Reconstruction and Development Programme as the popular foundation for its economic policy to a rightist, neoliberal Growth, Employment and Redistribution policy stressing privatisation, deregulation, and trade liberalisation undermined the ability of the country to undergo urban transformation that could foster democratic equitable, society. Khosa (2001:8-10) explains that the incursion of neo-liberal policy was the result of the state not having a choice than to accept a number of compromises, such as policies favouring big business, foreign investors, deregulation, and privatisation, in an attempt to reduce the role of the state through policies.

Similarly, Harrison, Todes, and Watson (2008:6) attributes the failures to the dangers of political transformation in South Africa which is associated with the "... transition to a liberal democracy" and an insertion into the global economy (Harrison, et.al., 2008:6). Within this realm, Pieterse (2004; 2008) reminds us of the globalised dimensions of power relations that dominate present planning practice. The nature of such a political transformation had been observed to cause tension between planning influences and market forces, as the policies have often gone in different directions. For example, the National Spatial Development Perspective statements, about where development should be supported, have not had much influence, and so planners (planning) and developers (market) do not pull development in the same direction. (Harrison *et al*, 2008).

There is literature that attributes the failure of urban transformation to the systems of neoliberal forms of governance (Pieterse 2008; Winkler 2011; Be´nit-Gbaffou 2012). While a

Figure 6: Extensive redevelopment projects, driven by a tax incentive, have transformed the Johannesburg CBD. Photo credit: http://mg.co.za/[10]

wide range of market oriented instruments of spatial governance which promote integration of a kind have been adopted[9], they largely support activities befitting of *homo–economicus.* In some cases, their visions, targets, budgetary cycles and standards do not carry the same mandate for supporting urban transformation that benefits the collective. The mandates of collective benefit if supported at all are secondary, if not tertiary, to the pressing logic market rationality. Therefore, these planning instruments have been found wanting because they do not support the institution of racial, economic, or gender equality. Part of their failure arises from the fact that planning instruments cannot respond adequately to the growing complexity and the increasing concern of rapid and random development which is characteristic of South African cities.

Bénit-Gbaffou's (2011:454) view is that participation is normally accompanied by 'clientelism - provisionally defined as the granting (by politicians to voters) of public goods based on personal networks and influences rather than on a well-established and clear-set of principles and rights'. Participatory practices from this perspective fail to be effective because they are perceived as linear, one-off and technocratic initiatives (Healey, 1999). In that way, participation is not transformative. In the city of Johannesburg for example, Parnell and Robinson (2006: 348) observe that "popular participation in the form of a mobilised community sector worked to delegitimate the process of policy formulation and as a result of on-going political conflict with the council, the participatory process was severely limited." They noted that public consultation was perfunctory in the Johannesburg CDS (Ibid p:344) as it was largely understood as a component of local political dynamics and not as a stand-alone solution to negotiating visions for the city's future (Ibid p.347). Similarly, in the City of Cape Town, "Whilst popular participation was supposed to be the main planning approach deployed, the City of Cape Town simply expected communities to support pre-designed IDP programmes without explaining the substantive processes informing such programmes to the citizenry" observes Williams (2006: 210).

Sihlongonyane (2015a) has also observed that although public engagements are often couched in a deluge of African phrases such as *indaba, bosberaad, Lekgotla, tswele pele, khomanani, masakhane,* which are used as metaphorical tropes of expression for participation, decision making is largely occurring in a process that is overwhelmed by technical and imperatives of physical planning. There are no means of balancing the imperatives of physical planning and the obligations for participatory development in spatial planning. Often the precepts of physical planning and the accompanying imperatives for promotion of economic development trumps down the mandates that come from public participation especially by local communities. It has also been noted that participation is often once-off whilst the application of especially physical and economic instruments of urban transformation are indelibly sustained in the planning of urban spaces. In the City of Johannesburg, Todes (2012:405) notes that the Growth Management Strategy (GMS) defines areas in terms of their levels of priority for infrastructural investment while the Capital Investment Management System has a prioritisation model which scores projects based particularly on their consistency with the GMS. "The (GMS) policy is tied to the budget, and all requests for capital funding are assessed through the Capital Investment Management System, a GIS-based system linked to the GMS of the planning department" (Todes 2012). Therefore, despite the existential community participation, it is planners that technically make decisions using the GMS, GIS, and the Capital Investment Management System.

A CONCEPTUAL FRAMEWORK OF TRANSFORMATION

To resolve the current problems, this paper puts forward a new conceptual framework for Transformation. This framework seeks to make an appeal to the person, the individual planner. It argues for an intrinsic process that redefines transformation from a perspective of changing attitudes, behaviour and practices. It seeks to promote an expression of new values, principles and premises of thought. It emphasises the transformation of the mind, space, practice and eventually our society at large.

Mind include: attitude, beliefs, perceptions, ideas, imagination and consciousness	Space can be: an open thing, container, abstraction, metaphor, or social construct
Practice are: approaches, behaviours, habits, gestures/signs, absence/presence, action or no action	Society: can be defined by traditions, beliefs, or values, sector, scale, interests, etc.

The **Transformation of the mind:** involves a change of mindset: what we think, imagine, believe, or choose, and what we create. Thoughts determine the orientation of everything we do and evoke the feelings that frame our world and motivate our actions. A process of decolonising education should be engendered to transform thought, discourse and worldviews.

The **Transformation of practice** is concerned with capacity to bring into its human environment many different approaches, behaviours, and policies and work that are effectively cross-cultural. It is concerned with the production of a collective vision to reimagine everyday spaces, and to see anew the potential of parks, downtowns, waterfronts, plazas, neighbourhoods, streets, markets, campuses and public buildings as an assemblage expressive of cosmopolitan cultural archive.

The **Transformation of space** should ultimately result from the previous two forms of transformation. The concept of "space" itself should be seen as a multi-faceted object - a thing, a container, an abstraction, a metaphor, or a social construct rather than merely as a container. Subsequently, the transformation of space should involve changes of the symbolic and material aspects of space such that it embraces shared traditions, beliefs, customs, history, folklore, and institutions of all people irrespective of ethnicity, language, nationality, or religion. Transformation of space should emphasise total change from inside out such that the form, appearance and expression are a means for creating a new form, function and structure that serves the whole of humanity.

The **Transformation of society** should entail a substantial complete change such that its set of values and principles, demonstrate behaviours, attitudes, policies, and structures that enable it to work effectively cross-culturally. When a society recognizes, respects, and values all cultures and integrates those values into the urban system, it will be able to meet the needs of diverse groups, and so, social inequity and injustice will be made history.

ENDNOTES

1 Retrieved on 23 July 2016 from http://www.c40.org/awards/2015-awards/profiles/71

2 e.g. Integrated Development Plans (IDPs).

3 e.g. Provincial Development Strategies (PDS).

4 e.g. 2003 National Spatial Development Perspective (NSDP).

5 Much of this emphasis is pressed upon in a litany of government policies (ANC 1994; RSA 1995a, 1997, 1998a, 1999).

6 Such programs have been offered by the University of Western Cape, the University of the Witwatersrand, the University of Fort Hare, and the University of Stellenbosch.

7 Governed by the Group Area Act and influx control.

8 Images and caption taken from Rooftops Canada / Abri International Blog: https://rcblog1.wordpress.com/2015/08/12/study-visit-15-neighbourhood-transformation-in-johannesburg/

9 Including: City Improvement Districts (CIDs), Urban Development Zones (UDZs), Cultural Districts, and, the Urban Edge.

10 Retrieved July 23, 2016 from http://mg.co.za/article/2016-04-15-00-a-strategic-vision-for-johannesburg

REFERENCES

African National Congress (ANC) (1994). *The Reconstruction and Development Programme*. Umanyano Publishers, Johannesburg.

Alexander, Peter (2012). Protests and Police Statistics: Some Commentary. *Amandla Magazine*, April 2012

Beall J., Owen Crankshaw and Susan Parnell (2000). Local government, poverty reduction and inequality in Johannesburg. *Environment & Urbanization* Vol 12 No 1. pp.107-122.

Beauregard, R.A. (1993). Constituting economic development: a theoretical perspective. In *Theories of Local Economic Development*, ed. R D Bingham and R Mier. Sage, Newbury Park.

Beavon, K. (1997). A City and a Metropolitan Area in Transformation. In C. Rakodi (ed) *The Urban Challenge in Africa. Growth and Management of its Large Cities*. London: Bernan, p150-91.

Bénit-Gbaffou, C. (2011). 'Up close and personal'—How does local democracy help the poor access the state? Stories of accountability and clientelism in Johannesburg. *Journal of Asian and African Studies*, 46(5), pp. 453–465.

Bénit-Gbaffou, C. (2012) "Party politics, civil society and local democracy – Reflections from Johannesburg", *Geoforum*, 2012, 43(2), pp. 178-189.

Bollens, S.A. (1998). Role of Public Policy in Deeply Divided Cities: Belfast, Jerusalem, and Johannesburg. in Timothy Sisk and Igor Koryakov. *Democracy at the Local Level: The International IDEA Handbook on Participation, Representation, Conflict Management, and Governance*. Pp. 82-89. Stockholm: Institute for Democracy and Electoral Assistance.

Bremner, L. (2000). Reinventing the Johannesburg inner city. *Cities*. Vol. 17, No. 3, pp. 185–193.

Business Report, 11 July 1997

Chipkin, I and Barbara Lipietz. (2012). Transforming South Africa's racial bureaucracy: New Public Management and public sector reform in contemporary South Africa. *PARI Long Essay*, Number 1, February, p.2 and 3.

City of Johannesburg. (2001). *Johannesburg: An African City in Change*. Johannesburg: Zebra Press.

City of Johannesburg. (1992). *Johannesburg: The Financial and Commercial Capital of Southern Africa*. A special report on Johannesburg issued as a supplement to Corporate Location Report, Milton Keynes.

Cloete, F, *et al*. (eds) (1991). *Policy Options for a New South Africa*. Human Sciences Research Council, Pretoria.

Commonwealth Secretariat (1991). *Beyond Apartheid: Human Resources for a New South Africa*. David Philip, Cape Town.

Crankshaw, O. and C. White (1995). Racial Desegregation and inner city decay in Johannesburg. *International Journal and Regional Research* 19, 622-638.

Dewar, D. (1998). Settlement Change and Planning in South Africa Since 1994. In Judin, H. and I. Vladislavic (eds) *Architecture, Apartheid and After*, pp369-375. Rotterdam: Nai Publishers.

Dewar, D. (1992). Urbanization and the South Africa city: a manifesto for change, D. Smith (ed.), *The Apartheid City and Beyond*, Routledge/ Witwatersrand University Press, London.

Dewar, D. & Uytenbogaardt, R.S. (1991). *South African cities: A manifesto for change*. Cape Town: University of Cape Town.

Harrison, P., Todes, A., Watson, V. (2008). *Planning and Transformation. Lessons from the Post-Apartheid Experience*, Routledge, London.

Healey, P. (1999). Institutionalist analysis, communicative planning, and shaping places, *Journal of Planning Education and Research*, 19(2), pp. 111–121.

Inner City Ivukile (1995). *Johannesburg Inner Urban Renewal Strategy*. Greater Johannesburg Metropolitan Council. May.

Khosa, M. (2001). Empowerment and Transformation in South Africa. in Meshack M Khosa (ed) Empowerment through Economic Transformation pp1-20. Pretoria: HSRC Press.

Kihato, C. (2010). Reconfiguring citizenship in African cities: Inclusion and exclusion in inner city Johannesburg. In C. Kihato, M. Massouni, B. Ruble, P. Subiros, & A. Garlabd (Eds.), Urban diversity: Space, culture and inclusive pluralism in cities worldwide. Washington: Woodrow Wilson Press.

Landau, L. (2010). Passage, profit protection, and the challenge of participation: building and belonging in African cities. *Urban Forum*. 21(3), 315–329.

Mabin, A. (1995). On the Problems and prospects of Overcoming Segregation, Fragmentation and Surveillance in Southern Africa's Cities in the Post-modern era. In S. Watson and K. Gibson (eds) *Postmodern Cities and Spaces*. Oxford: Blackwell. Pp187-98.

Mabin, Alan and Smit, Dan (1997). 'Reconstructing South Africa's cities? The making of urban planning 1900-2000', Planning Perspectives, 12: 2, 193 — 223.

Morris, Alan (1998). 'Our fellow Africans make our lives hell': the lives of Congolese and Nigerians living in Johannesburg, Ethnic and Racial Studies, 21:6, 1116-1136.

Ndebele, Njabulo S. (2012). Liberation betrayed by bloodshed, *City Press*, 26 August 2012.

Oelofse, M. (2003). Social Justice, Social Integration and the Compact City: Lessons from the Inner City of Johannesburg. In P. Harrison, Huchzemayer, M. and M. Mayekiso. *Confronting Fragmentation: Housing and Urban Development in a Democratising Society*, 88-105. Cape Town: University of Cape Town Press.

Parnell, S. and J. Robinson 2006. Development and Urban Policy: Johannesburg's City Development Strategy. *Urban Studies, vol. 43 no. 2, pp. 337-355.*

Peet, R. (2002). Ideology, Discourse, and the Geography of Hegemony: From Socialist to Neoliberal Development in Post-apartheid South Africa. *Antipode* 34 (1), 54–84.

Perera, N. (1999). *Decolonizing Ceylon: Colonialism, Nationalism and the Politics of Space in Sri Lanka*. Oxford: Oxford University Press.

Pieterse, E. (2008). City futures: Confronting the crisis of urban development. London: Zed Books.

Pieterse, E. (2004). Untangling "integration" in urban development policy debates. *Urban Forum*, 15(1), 81 – 104.

Pillay, U. (2008). "Urban policy in post-apartheid South Africa: context, evolution and future directions." *Urban Forum*, 19 (2): 109–132.

Plaut, Martin (2012). Behind the Marikana massacre. *The New Statesmen*, 20 August 2012.

Republic of South Africa (RSA) (1999). *Green Paper on Development and Planning*. Government Notice No 626. Government Printers, Pretoria.

Republic of South Africa (RSA) (1998a). *White Paper on Local Government*. Government Printers, Pretoria;

Republic of South Africa (RSA) (1998b). *Local Government Structures Act, No 117 of 1998*. Government Printers, Pretoria.

Republic of South Africa (RSA) (1997). *Urban Development Framework*. Department of Housing. Government Printers, Pretoria;

Republic of South Africa (RSA) (1995a). *Remaking the Urban Sector: The Government of National Unity's Strategy for South Africa's Cities, Towns and Neighbourhoods*. Government Publishers, Pretoria;

Republic of South Africa (RSA) (1995b). *White Paper on the Transformation of Public Service* , Government Printers, Pretoria.

Rogerson, C.M. (1996). Image enhancement and local economic development in Johannesburg. *Urban Forum* 7 (2): 139-158.

Sihlongonyane, M.F. (2015a). Empty Signifiers of Transformation in Participatory Planning and the Marginalization of Black People in South Africa. *Planning, Practice & Research* Volume 30, Issue 1, pages 83-100.

Sihlongonyane, M.F. (2015b). The Rhetorical Devices for Marketing and Branding of Johannesburg as a City: a critical review. *Environment and Planning.* A 2015, volume 47, pages 2134 – 2152.

Sihlongonyane, M.F. (2014). A Critical Overview of the Instruments for Urban Transformation in South Africa. In Christoph Haferburg & Marie Huchzermeyer (eds.) *Urban Governance in Post-apartheid Cities Modes of Engagement in South Africa's Metropoles* pp.39-59. Stuttgart: Borntraeger Science Publishers.

Smith, D.M (1992). The apartheid city and beyond; urbanization and social change in South Africa. New York, Routledge.

Sunday Times 9 June, 1996.

Todes, A. (2012). New Directions in Spatial Planning? Linking Strategic Spatial Planning and Infrastructure Development, *Journal of Planning Education and Research*, 32(4), pp. 400–414.

Todes, A. (2003). Reintegrating the Apartheid City. In G. Bridge and S. Watson (eds) A Companion to The City. Oxford: Blackwell Publishing.

Tomlinson, R. (1999a). From Exclusion to Inclusion: Rethinking Johannesburg's Central City. Environment and Planning A 31(9):1655-1678.

Tomlinson, R (1999b). Ten Years in the Making: A History of the Evolution of Metropolitan Government in Johannesburg. *Urban Forum*. Vol. 10. No. 1. pp. 1-39.

Watson, V. (2011). Changing planning law in Africa: An introduction to the issue, *Urban Forum*, 22(3), pp. 203–208. 10.1007/s12132-011-9118-9

Williams, J.J. (2000). South Africa: Urban transformation. *Cities*. Vol 17, no.3, p. 167–183.

Williams, J. J. (2006) Community participation, Policy Studies, 27(3), pp. 197–217. 10.1080/01442870600885982

Winkler, T. (2009). For the equitable city yet to come. *Planning Theory and Practice*. 10 (1): 65-83.

Winkler, T. 2011. Retracking Johannesburg: Spaces for Participation and Policymaking. *Journal of Planning Education and Research*, 31(3): 258—271.

A TRANSECT APPROACH TO LAND USE MANAGEMENT IN SOUTH AFRICA

ALBERT FERREIRA · DARREN NEL · VERNA NEL

» *(...) it is evident that a transect, based on criteria such land use and registration, density/intensity and agricultural suitability can be formulated for South Africa to define the predominant preferred use in that area. Further, each transect can serve as a basis for developing both spatial planning and land use management on a regional and local scale. Within each zone of the transect, locality specific development options can be developed and regulated.* «

Aerial view Naval Hill

INTRODUCTION

Transects or sections through a landscape are not unique to regional planning. They have been used in environmental sciences to identify the changes in biological populations in changing habitats (Grant et al, 2004) and assessing the role of humans in a socio-ecological system (McDonnell and Pickett, 1990). The application of a transect as an analytical tool through a region can be traced back to early planning theorists such as Ebenezer Howard and Patrick Geddes (Hall, 2002; Talen, 2002). Howard's garden cities were intended to have a strong density gradient, with densities resembling those of inner London at its centre and an agricultural fringe that included institutional uses (Hall 2002). The concept of a 'valley section' promoted by Geddes—inspired by Reclus and Le Play—encompassed both natural habitats as well as human (urban) habitations (Hall, 2002). More recently a rural-to-urban transect has been adopted as the basis for development regulation by New Urbanists to generate an urban form that is sustainable and liveable (Duany and Talen, 2002; Garnett, 2013).

While the rural-to-urban transect and accompanying form-based codes originated in the USA, they have been touted as a remedy for the troubles of the modern city (Singh, 2010). Transect planning is viewed as an alternative to urban sprawl that, combined with form-based codes, can create compact pedestrian and cycle-friendly places. However, to date, the planning transect has not been used in South Africa, where land development has been controlled by land-use zoning rather than urban design codes.

With the recent enactment of the Spatial Planning and Land Use Management Act (SPLUMA) (South Africa, 2013), this could change. SPLUMA requires all local municipalities to adopt a land-use scheme that covers their entire municipal area. Most municipalities are large enough to constitute a region and include vast rural areas, some under commercial farming and others under the authority of Traditional Leaders. Often urban areas within these municipalities include informal settlements with varying degrees of access to basic services. While SPLUMA stipulates the essential objectives of a land-use scheme, neither it nor the regulations (South Africa, 2015) provide much detail on the nature of the regulations that must be adopted. This is an opportunity for innovation in land-use management in South Africa.

This paper explores the possible adaptation of a rural-to-urban transect for land-use and development management in the South African context. The following section provides a brief background to development regulation in South Africa and the current issues facing planners in South Africa followed by a short description of Mangaung Metropolitan Municipality which is used as a case study area (MMM). Thereafter the concepts around transect planning are discussed leading to the development of a theoretical transect along with the considerations behind its conceptualisation with particular focus on the criteria defining each sector. The proposed transect is then tested in a short transect across the MMM where many of the sectors exist. Some preliminary inferences on the applicability of the transect as a basis for land development regulation conclude the paper.

LAND-USE AND DEVELOPMENT REGULATION IN SOUTH AFRICA

BACKGROUND

Initially most urban areas in colonial South Africa adopted British land use planning and development theories, approaches and tools. The prevailing paradigm was modernism, with its emphasis on separation of land-uses and activities by means of zoning through town planning schemes (Charlton, 2008; Watson 2009) that was also extended to include the separation of people on the basis of race (Christopher 1997, Mabin and Smit, 1997). Town planning schemes usually only applied to those parts of the urban area inhabited by whites. Little land-use control was applied to the remainder of the country, whether commercial agriculture or the Bantustans where land allocation and management was delegated to traditional leaders (Khunou, 2013). Later, some of the Bantustans enacted legislation to regulate the use and development of land, while each of the original four provinces had their own town planning ordinances. Thus by the end of the twentieth century South Africa was characterised by a highly fragmented legal

landscape relating to land-use regulation (Van Wyk, 2012).

New national legislation that applied to all places was imperative to address this situation, and to this end the Spatial Planning and Land Use Management Act (SPLUMA) (South Africa, 2013) was enacted. It provides a framework for spatial planning and land-use management throughout the country and a uniform set of principles and processes for land development. The Act also requires municipalities to adopt a "single land-use scheme for its entire area" (South Africa, 2013: section 24(1)). This scheme comprises the regulations, maps and a register of all amendments to it. Its content must "include appropriate categories of land-use zoning" (Section 24(2)(a)). Schedule B to SPLUMA contains a list of land-use zones that apply where no land-use scheme is in place.

CHALLENGES OF DEVELOPMENT REGULATION IN SOUTH AFRICA

While the national framework provided by SPLUMA is welcomed, there are still challenges in developing land-use and development regulations for the diverse landscapes within many municipalities. A number of municipalities have prepared town planning or land-use schemes that include the former 'townships[1]' reserved for Africans and that may include rural areas under traditional authority and commercial agricultural areas. Thus there is a gradual move to municipality-wide land-use schemes. However, in some cases—such as the Free State contestations between government departments over the authority to authorise land-uses on agricultural land has prevented the finalisation of land-use schemes (Nel 2011). Even where there are schemes, there may not be consistent enforcement for various reasons, including lack of personnel and capacity or fear of intimidation (Watson, 2013; Parnell and Pieterse, 2010). Municipalities with large informal settlements or areas under traditional authority have found it difficult to prepare conventional zoning schemes in areas where there are no formally registered individual sites to which land-use rights can be attached (Du Plessis, 2011).

Conventional land-use zoning as implied in SPLUMA, has been criticised on several grounds. These include segregation of land-uses, leading to urban sprawl that necessitates unsustainable commuting and expensive infrastructure (Duany and Talen, 2002; Wheeler, 2009; Swilling, 2010), as well as the placelessness of modern cities (Ben-Joseph, 2005; Coyle, 2011). According to Duany and Talen (2002:246) "conventional zoning schemes and the way they encourage development to separate and disperse are counter-intuitive to the way in which we ought to be planning and regulating urban development" and is contrary to urban planning goals. Separation and the formation of homogeneous areas tend to create exclusivity and exclusion, particularly of the poor(Watson, 1993; Silver, 1997; Knaap et al., 2007; Talen, 2012) that is a grave concern, particularly in the South African context where inclusion and equity are national imperatives to counteract the legacy of apartheid.

Consequently, alternatives to conventional zoning with all its problems that are more suitable for the South African landscape should be sought. Although there are a variety of regulatory systems for land and development (Hirt, 2014) only one, that of transect planning, will be investigated in later sections of this paper.

MANGAUNG METROPOLITAN MUNICIPALITY

The Mangaung Metropolitan Municipality (MMM), the judicial capital of the country, is located roughly in the centre of the Free State Province and contains a number of settlements[2] within a vast rural area. Bloemfontein is the only city; Dewetsdorp, Van Stadensrus, Wepener are small towns while Botshabelo and Thaba Nchu are remnants of Apartheid planning (Figure 1). It comprises an area of 9708 km2 (Local Government handbook: online) and a population of 774,634 persons (StatsSA, 2011). It is the provincial capital and the main economic and service centre of the region, hosting two universities, numerous private and public schools, state and private hospitals as well as financial and retail services.

As indicated in Table 1 Blacks comprise nearly 83,6% of the population. Historically wealth was concentrated within the white minority; this legacy is reflected in household incomes where 65% of households earn under R5000 (roughly $320) per month. The official unemployment

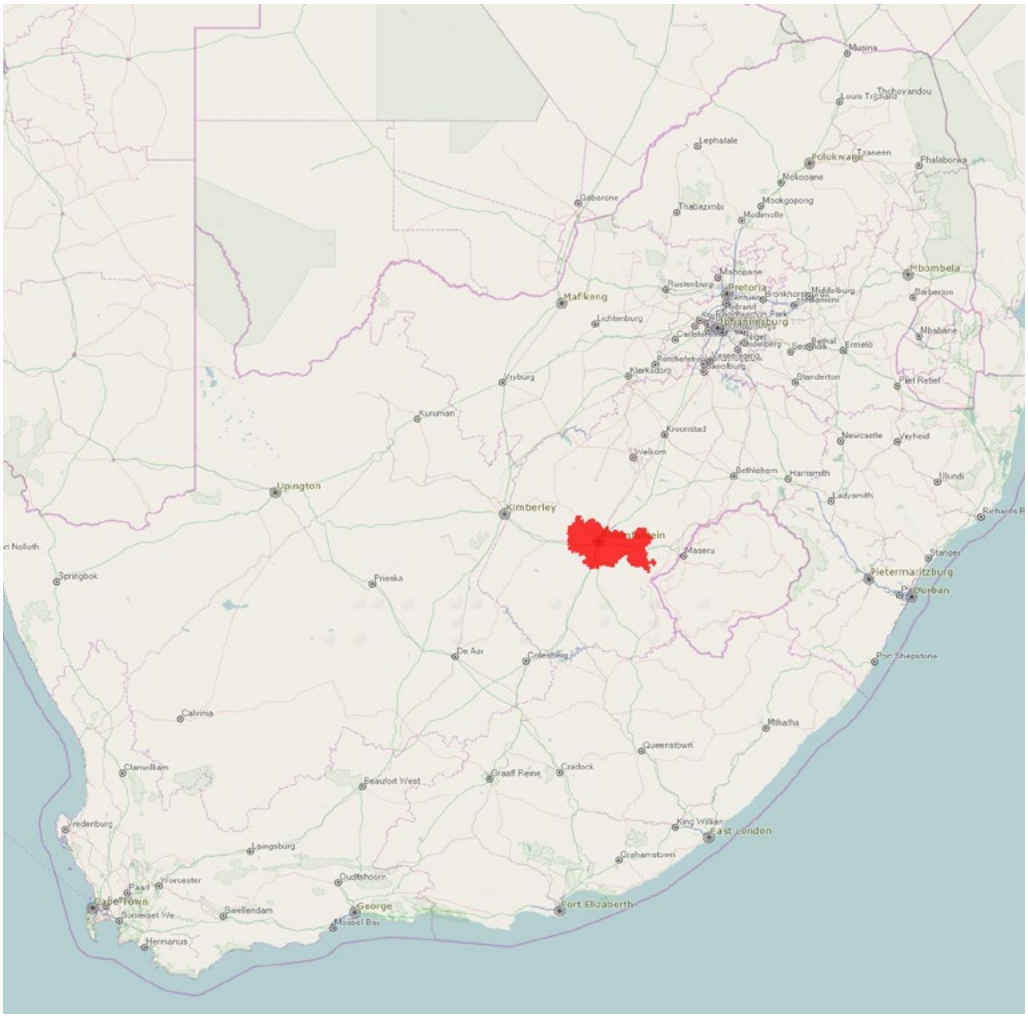


Figure 1: MMM location in South Africa (OSM, 2016)

COMPOSISTION OF POPULATION (1996-2011)

	1996	2001	2011	1996	2001	2011
	NUMBER			PERCENTAGE		
Black	491 717	561 663	648 022	77,9%	83,2%	83,6%
White	102 974	79 765	83 590	16,3%	11,8%	10,8%
Coloured	32 190	32 911	37 838	5,1%	4,9%	4,9%
Indian	1 122	1 117	3 259	0,2%	0,2%	0,4%
Other	3 113	NA	2 227	0,5%	NA	0%
TOTAL	631 116	675 457	774 935	100%	100%	100%

Table 1: composition of population (1996-2011)
Source: StatsSA 1996, 2001, 2012

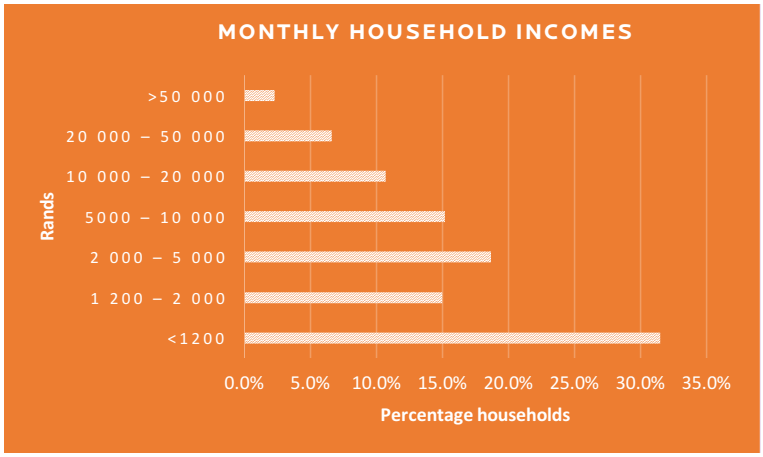
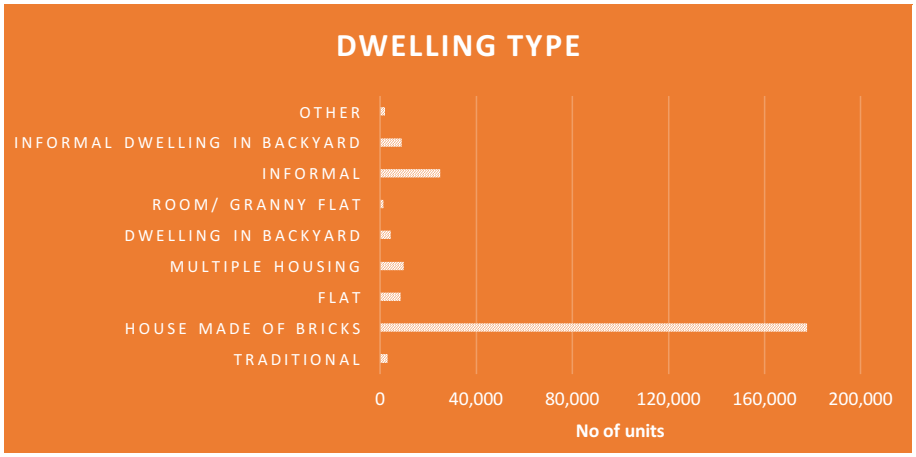


Figure 2: Household income in Rands per month (2011 values)
Source: StatsSA, 2012

Figure 3: Dwelling type
Source: StatsSA, 2012



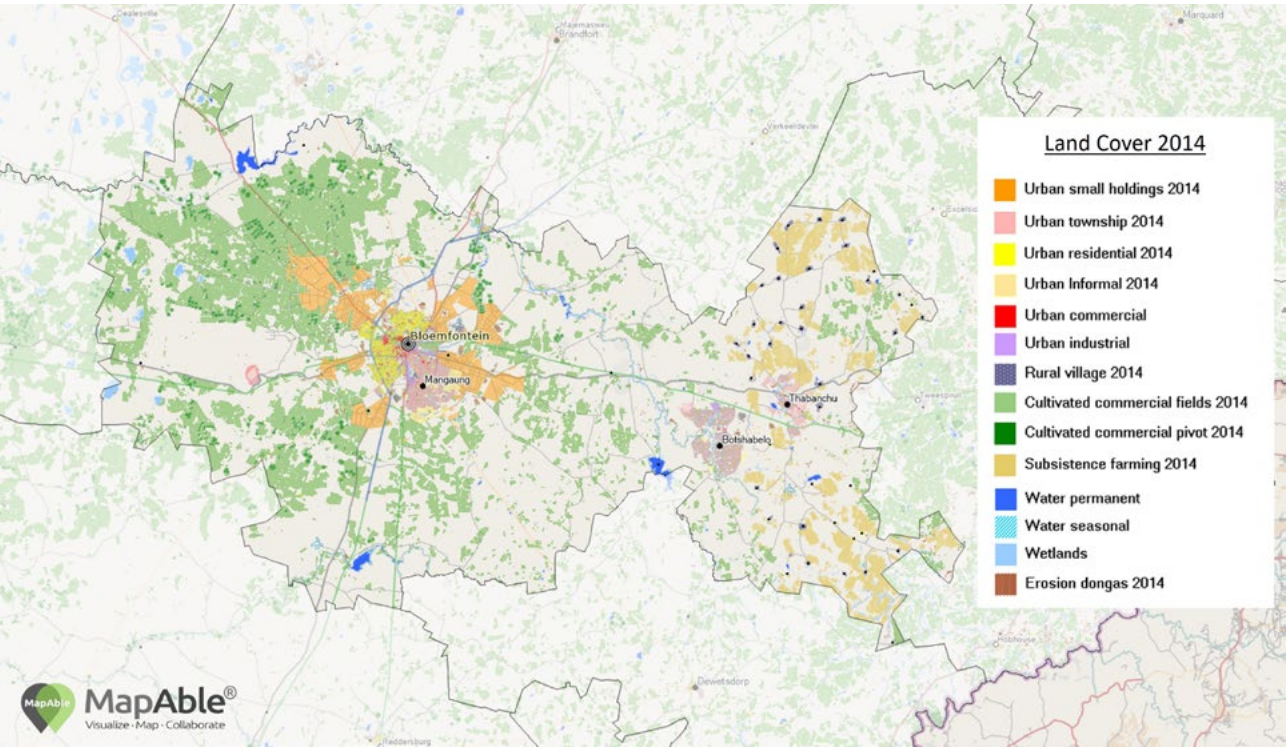


Figure 4: Land cover in MMM. (GeoTeraImage, 2014)

rate of 27% (excluding discouraged work-seekers) confirms high levels of povery in the municipality (Local Government Handbook: online). Bloemfontein is the desitination of many migrants, including those from Lesotho. Acute shortages of affordable housing have resulted in informal settlements, mainly on the periphery of the city.

The urban structure of Bloemfontein clearly reflects apartheid planning: the wealthier suburbs are to the north-west while the 'townships' and burgeoning informal settlements lie to the south and east separated by industrial areas from the remainder of the city. However, the majority of social facilities and employment opportunities are in the CBD and north-west part of the city. This pattern is typical of most South African towns and the small towns of MMM are no exception. Thaba Nchu is part of the former Bophuthatswana Bantustan and falls under traditional authority. Although subject to the same legislation as the rest of MMM, land uses and land-use management are largely controlled by the traditional council (Sekonyela, 2014). Botshabelo was established by the apartheid government for people who were neither Sotho nor Tswana. Neither Botshabelo nor Thaba Nchu have a significant economic base and hundreds of people commute daily to Bloemfontein to work.

Dewetsdorp, and Wepener are small towns established to serve an administrative function to the local farming community, while Van Stadensrus is a village in the foothills of the Maloti Mountains. Urban settlements constitute under 3% of the municipal area and the remaining area is rural, largely rangelands interspersed with field crops (Figure 4) (GeoTerraImage, 2014).

THE TRANSECT

A transect can be defined as a cut or a path (Garnett, 2013), a gradient (McDonnell and Pickett, 1990) and a "geographical cross section of a region used to reveal a sequence of environments" (Duany and Talen, 2002: 246). Transects are generally used as an analytical tool to assess variation within the region. However, the concept has been adapted as a planning and urban design framework to organise and regulate the built environment (Talen, 2002:295). Thus, instead of describing what is, it describes how development

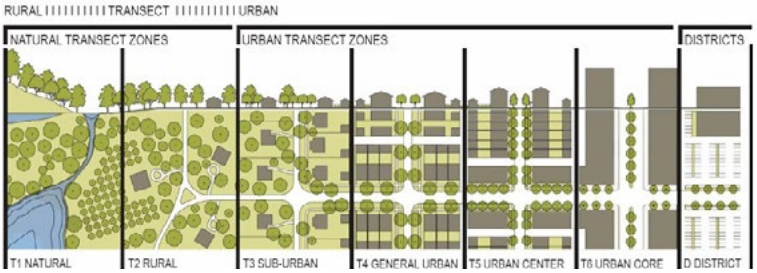


Figure 5: Transect zones (Centre for Applied Transect Studies., n.d.)

ought to occur (Brower, 2002). The best known version of a planning transect is the Smart Code developed by Duany Plater-Zyberk and Company with six zones (Figure 5); rural preserve, rural reserve, sub-urban, general urban, urban centre and urban core (Duany and Talen, 2002).

This planning transect is conceived as a rural-to-urban gradient with increasing densities and intensity of development forming a logical progression from rural to urban, that is divided into sectors each with its own set of densities, building forms and streetscapes (Brower, 2002; Talen, 2002). The changing ratio of natural to man-made elements reflects the changing density and complexity of the urban environment; natural materials are most evident in rural areas but man-made elements dominate high density urban areas. Although posited as a continuum, the transect contains discreet sectors, each with their own set of rules, or form-based code appropriate to the density of the sector (Talen, 2002:295). Such codes focus on the 'building disposition' (site size and building envelope), building elevation /façade, function (land-use) and development standards for parking, landscaping and signage (Duany and Talen, 2002:254; Brower, 2002:314).

Proponents of New Urbanist transect planning state that it is a simple, flexible and holistic system, that generates and supports diversity and greater sustainability (Talen, 2002; Duany and Talen, 2002, Talen, 2006). However, according to critics, while the theory is attractive, the practice is perhaps not as rosy (Garnett, 2013, Garvin and Jourdan, 2008; Brower, 2002; Correa, 2006; Kriken, 2006).

Garnett (2013) and Correa (2002) point out that the idealised transect does not exist in the USA, nor is it applicable to all cultures, e.g. Arabic cities or Mediterranean hilltop cities (Orr, 2006). On the contrary, the emphasis on a given set of urban sectors may deprive areas of their uniqueness derived from culture, history and topography, producing the very placelessness that the planning transect seeks to avoid (Kriken, 2006). Despite claims about flexibility and simplicity, critics point out that the detailed architectural form-based codes are complicated and rigid, difficult to interpret and increase the cost of development (Garnett, 2013, Garvin and Jourdan, 2008). By attempting to impose a planned 'organic' order, they ignore the natural complexity of the city (Garnett, 2013; Correa, 2006).

While the aesthetics of a place may be important, research by Brower indicates that it is the people, and the relationships between them that determine how attractive a place is "[p]hysical elements are valued less for their intrinsic qualities than for their social implications" (2002:314). Consequently, the focus on urban design may be less relevant in the search for more sustainable and liveable areas than proponents believe, as "the regional problem is not how a settlements looks, but where it locates. The planning tools are needed are ones that help protect valuable, irreplaceable land, promote air and water quality and conserve energy" (Kriken, 2006:78).

The question then arises: is it possible to apply the concept of a transect to determine where development should locate and to preserve natural resources while avoiding the problems of rigid form-based codes and zoning? The following section explores the use of a transect as a land development and use management tool in the South African context. In the first part a theoretical framework is developed while in the second part the concept is tested along a transect in the MMM.

APPLYING A TRANSECT FOR SOUTH AFRICAN LAND USE MANAGEMENT

In South Africa's municipalities that cover large areas with diverse activities, a single form of regulation may not meet the land use management needs of the municipality. Development controls formulated for urban areas may not be suitable or necessary for rural areas, and rules for suburbs may not be applicable in areas under traditional authority where land is generally held under communal tenure. Transect planning can generate appropriate land use and development controls for each unique sector, based on environmental, social, physical, economic and aesthetic criteria tailored to the needs of the area. A transect approach is compatible with SPLUMA, as it can still generate broad land-use zones that can be nuanced as required.

DEVELOPING CRITERIA

In developing the criteria for a transect-based land development management system, the following aspects are relevant:

- Environmental management. Sustainable development demands that attention is given to ecological integrity (Haughton, 1999), maintenance of biodiversity and the quality of essential ecosystem services such as the soil, air and water. This is particularly crucial in protected areas and agriculture, while the management of wastes and pollution are essential for urban areas (Swilling, 2006).
- Social. In most settlements, the ability to sustain livelihoods is critical. This requires access to opportunities —education, health, employment (Rihani, 2002) —and the capacity to use social and physical capital, e.g. a home, to generate an income (Watson, 1993; Pelling, 2003). Addressing social exclusion, poverty and inequality are also vital.
- Economic. Access to resources and opportunities are essential along with agglomeration economies.
- Physical. In addition to factors such as topography and climate, infrastructure – roads, water and sanitation services, energy and telecommunications—is essential. Aesthetics can contribute or detract from a place and may be important in historical districts for social and economic goals. Land use control is related to the potential impact of the use on the environment community and infrastructure.
- Level of control required. The nature and degree of control over environmental impact, aesthetics or land uses is not the same for all areas. In protected areas environmental management will take precedence over economic considerations, while in informal settlements, access to opportunities and livelihoods may be paramount. Thus the planning transect must reflect the primary needs of the sector. Three levels of control are suggested for environmental aspects, land use and urban form:
  - Maximum control: primary consideration around regulation of development
  - Partial control: management of impacts
  - Minimum control: only serious impacts controlled

DEVELOPMENT OF THE REGIONAL TRANSECT ZONES

Each transect zone, be it on a local or in this case a regional zone needs to have discrete or unique features. These features help differentiate different natural and human dominated spaces. It should, however, be noted that the criteria used to define each zone can be present in multiple zones, but the intensity or form can change (such as in the case of housing and population density etc.). The focus of this classification is on a functional description of place rather than an arbitrary administrative classification.

The regional transect presented below contains seven broad zones that is representative of a typical South African municipality or planning region (with a specific focus on the MMM). The zones move from natural and protected areas to more urban and densely populated centres. The zones can also be seen as a settlement typology broadly describing the settlement patterns and characteristics within a municipality.

The transect zones were constructed utilising existing classification systems (such as the CSIR Settlement Typology and Rural Typology) with real world analysis of MMM (CSIR, 2013). The methodology utilised to construct the regional transect is a multi-criteria analysis or suitability analysis. A set of criteria was constructed per

Zone/Sector	Characteristics	Examples
CONSERVATION	Protected areas requiring protection	Proclaimed reserves and landscapes, Conservancies Wetlands, forests, aquifer recharge areas Battlefields and heritage sites
AGRICULTURE	Intensive agriculture, extensive agriculture	Viticulture, Orchards, Horticulture etc., Poultry farms and feedlots, Rangelands; Field crops (e.g. maize & wheat)
RURAL SETTLEMENTS	Traditional rural	Areas under traditional authority including homesteads and subsistence agriculture
	Small towns and service centres;	Small service towns, mining towns; urban fringes
URBAN	Informal settlements	Settlements with un-surveyed sites
	General urban	Secondary cities and metropolitan areas
	Urban cores	High intensity urban areas with mixed uses, Central business districts
SPECIAL	Areas requiring unique controls	Historic districts/ streets Astronomy reserves

Table 2: A South African transect

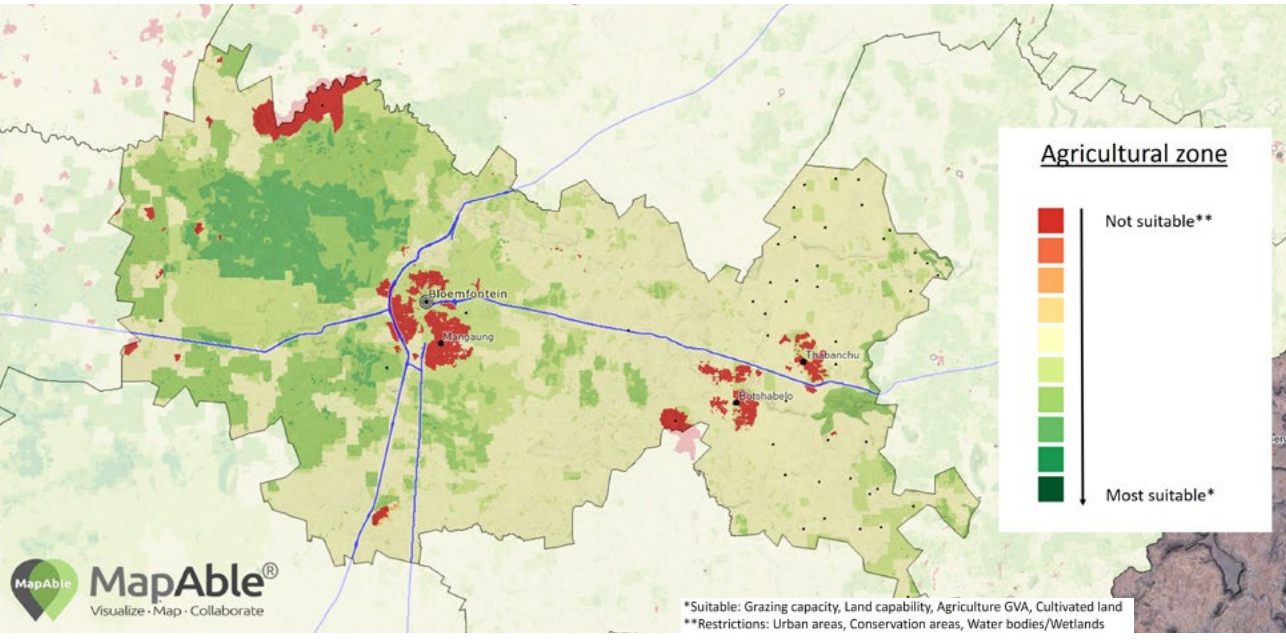


Figure 6: Agricultural Zone Suitability analysis

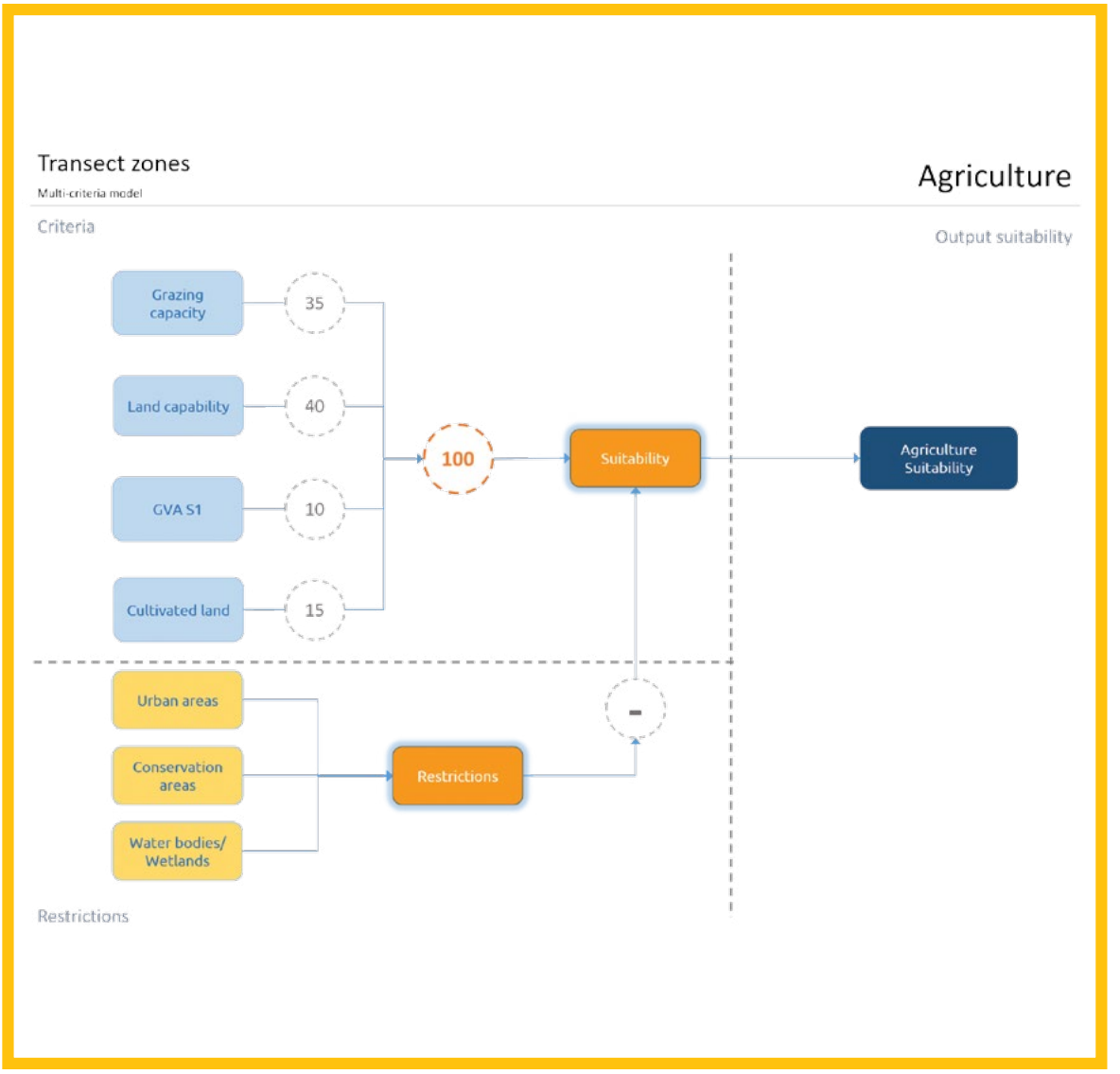


Figure 7: Example of application of multi criteria model

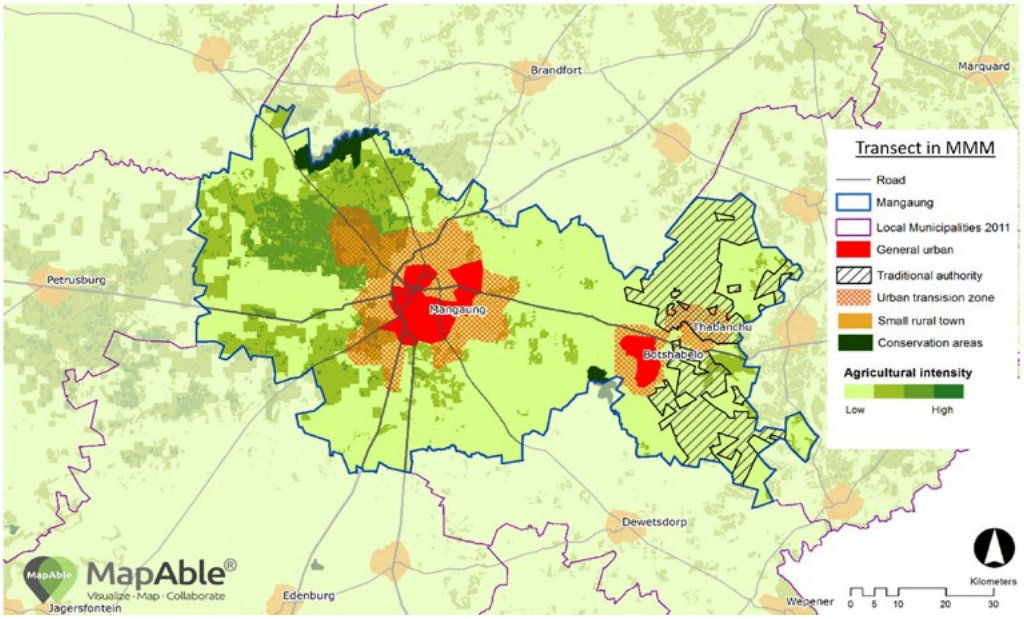


Figure 8: MMM Transect

transect zone which identifies areas that are suitable according to the criteria. The criteria can be positive (includes various areas that are suitable) or negative (excluding areas that are not suitable) (See figures 2 and 3 below). The criteria and subsequent analysis utilises appropriate spatial data sources in a GIS system to create a weighted overlay that describes the various zones (Bridney, 2014).

Figure 8 illustrates the transect applied in MMM along the N8 between Bloemfontein and Lesotho. All the transect zones are illustrated with an additional transitional zone around urbanising or peri-urban areas.

THE REGIONAL TRANSECT ZONES

The following sections describe the transect zones in more detail along with key considerations.

CONSERVATION

The conservation transect is characterised by protected and vulnerable areas that are important for ecosystem and tourism functions. The zone contains officially protected areas such as national parks, areas that are designated as vulnerable to ecosystem change and vulnerable river and wetland areas. The areas should exclude all high intensity urban development with noxious industries and mining strictly prohibited. The focus of development should be on eco-tourism and low impact human settlements that support the natural environment.

AGRICULTURE

The agriculture transect zone includes all areas that predominantly rely on the agricultural sector or areas that contain high potential agricultural land. The sector is relatively broad with different types of agriculture having different requirements or carrying capacity with associated support industries. The focus of development is supporting the overall industry through protection of both land and water resources, prohibiting mining and high density urban development or urban sprawl.

RURAL SETTLEMENTS

TRADITIONAL RURAL

Traditional rural settlements were formally part of the 'Bantustans' but now fall within munici-

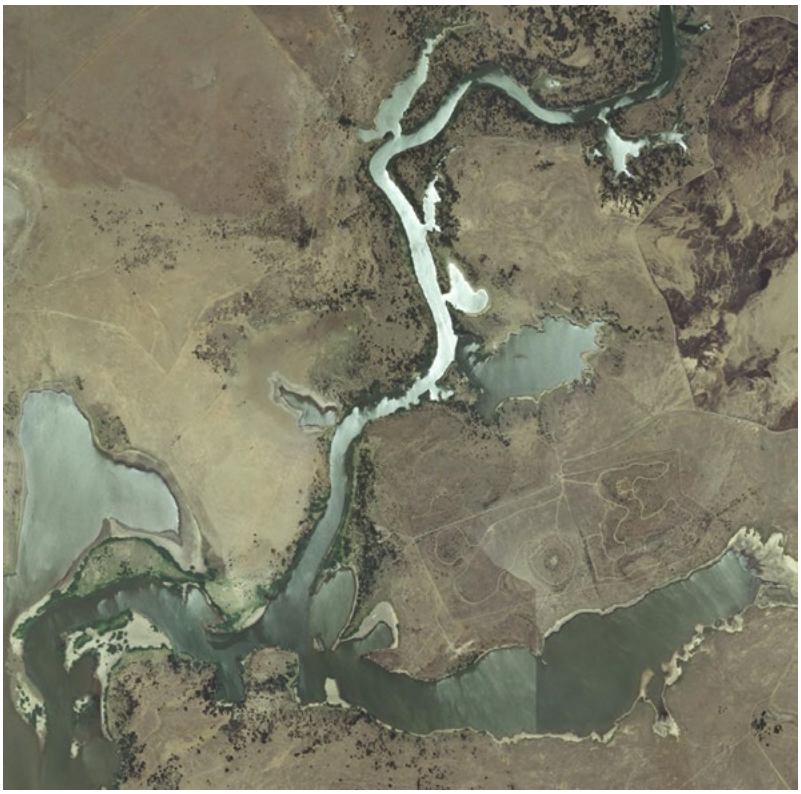


Figure 9: Soetdoring Nature Reserve in MMM (NGI, 2014)

Figure 10: Commercial Agriculture north of Bloemfontein in MMM (NGI, 2014)

Figure 11: Traditional settlement (Thaba Nchu) (NGI, 2014)

Figure 12 : Small town south east of Bloemfontein (Dewetsdorp) (NGI, 2014)

Figure 13: Informal settlement in the Grootvlei area (NGI, 2014)

Figure 14: Suburb in Bloemfontein (Fleurdal) (NGI, 2014)

Figure 15: Bloemfontein CBD (NGI, 2014)

palities and are governed by traditional authorities. These settlements often have little or no economic development resulting in chronic under-development (Harrison, 2014). A number of factors, including over-population and over-grazing have resulted in degraded land (Meadows and Hoffman, 2002) with low economic potential. Land is generally held under communal ownership, with households allocated land for homesteads, *kraals* and small fields and shared communal grazing rights.

RURAL SETTLEMENTS – SMALL TOWNS/CENTRES AND URBAN FRINGES

Small towns and centres typically function as service centres for the surrounding agricultural area. The main functions include general retail and trade activities and value-adding industries including distribution of agricultural products. Small towns often contain community and social facilities including regional government offices. The housing is generally in the form of detached houses while the settlements typically have regular grid street patterns. Most towns still have an apartheid structure with distinct residential areas. Key considerations are livelihoods and quality of life.

URBAN - INFORMAL SETTLEMENTS

Informal settlements consist of housing and other structures that are generally unplanned and may be illegally occupying the land. The individual sites are not surveyed or registered. Shanties and shacks constitute most of the housing. Informal settlements are often located on the periphery of cities with limited basic service infrastructure and facilities. Economic and social opportunities as well as improving the quality of life are crucial considerations.

URBAN - CITIES AND THEIR SUBURBS

Suburbs of differing densities constitute this zone. The major housing typologies range from single residential to medium density housing. These areas are usually well served with social

Transect zone/sector	Primary activities	Example of Secondary activities	Rules applicable to secondary activity
Conservation	Nature reserve	Rest camp	Small town
	Conservancy	Rangeland/ communal grazing	Agriculture
Agriculture	Agriculture, residences, farm stay guest house, home-based businesses	Resort	Small town
Rural Settlement: Traditional area	Homesteads, communal grazing and subsistence agriculture, small scale economic activities (eg spaza shops and workshops)	Urban node with retail exceeding 1000m2 floor area, community facilities and transport (bus stops/ taxi ranks)	Urban node or small town depending on scale
	Small town	Golf or eco-estate	General urban
General urban	Suburban area: residences, home-based businesses, community and religious facilities	Local node exceeding 20 000m2 non-residential floor space	Urban node
	Informal settlement	Local node comprising community facilities, retail and transport (bus stops/ taxi ranks)	Urban node
Urban core	High intensity mixed use	Park/ public open space	Conservation

Table 3: Land use management based on transect zones

and community services and contain various business and trade functions. Liveability and diversity are important social issues along with accessibility for low income employees.

URBAN - CORE

The urban core contains multiple uses in high density, often high-rise, buildings. These spaces are the most connected area in the city featuring with uses such as residential, business and government offices, retailing and service industries. Liveability and accessibility are key issues in these zones. Urban cores serve the larger urban area and are often the primary employment nodes with users and residents from all economic sectors.

SPECIAL AREAS

Special areas require specific or unique controls. These areas typically serve a unique function or service including economic, historical, cultural or social. Examples of special areas in the MMM could include the historical town centre, the new Airport node, the sports precinct around the Free State stadium, the universities and military bases.

CONCLUSIONS

From the analysis above, it is evident that a transect, based on criteria such land use and registration, density/intensity and agricultural suitability can be formulated for South Africa to serve as a basis for both spatial planning and land use management on a regional and local scale. For each zone of the transect, locality specific development options can be developed and regulated.

Among the benefits of this approach are flexibility and focus. The latter enables each zone to have appropriate planning and controls emphasising that most critical aspects to be regulated, controlling only what is essential to control (Oranje, 1995). Change can be accommodated by amending the transect zone as an area becomes urbanised or formalised (e.g. informal settlements).

Unlike conventional zoning schemes with a myriad of different land use zones, these few transect zones have the potential to generate diversity, resilience and sustainability[3]. The proposed transect or typology is fractal:[4] thus while an area may be part of one zone on a regional scale, the detailed planning and regulation of a small precinct may follow the guidelines of a different zone (Table 3). This will also enable a few rules to be applied flexibly in different transect zones to accommodate diverse environments and needs.

The proposed transect is legally possible within the confines of SPLUMA, and pertinently includes all areas previously excluded from planning and regulation. It is flexible and can promote diversity, inclusion and resilience. Furthermore, the simplicity of the system allows for its use in areas of limited skills and personnel.

However, more work is required to develop the regulatory details pertaining to each zone. Such refinement will require input from a number of stakeholders, including government agencies, to ensure that critical aspects of environmental sustainability, economic development and social justice can be supported. ◆

ENDNOTES

1 Apartheid era public housing estates on the urban periphery built for Black Africans (Mabin and Smit, 1997:206)

2 Note that the boundaries of the MMM have grown substantially over the past 16 years, with the inclusion of the Motheo district in 2011 (from 6284km2) and the Naledi municipality in 2016 (to 9700,1 km2). The statistics in this paper reflect the data from the 2011 Census for Mangaung and Naledi municipalities.

3 Complex adaptive systems are typically built using a few rules, however rich feedback loops generate the complexity, diversity and emergence.

4 The fractal nature of the transect means that the various transect zones are self-replicating on various scales (Mandelbrot, 1982). This means one can find the various zones on a regional scale but on a local scale within a regional zone, multiple local transect zones can be identified. A practical example of this can be an urban core (on a local scale) found within a traditional area (regional scale).

REFERENCES

Ben-Joseph, E., 2005. The Code of the City: Standards and the Hidden Language of Place-Making. MIT, Cambridge, Mass.

Bridney, A. 2014. Overview of Weighted Site Selection and Suitability Analysis. Available from https://www.gislounge.com/overview-weighted-site-selection-suitability-analysis/. Accessed 4 /4/2016.

Brower, S. 2002. The Sectors of the Transect, Journal of Urban Design, 7:3, 313-320, DOI: 10.1080/1357480022000039358

Centre for Applied Transect Studies., n.d. SmartCode (Version 9.2) available from http://transect.org/codes.html. Accessed 9/12/2014.

Charlton, S., 2008. The State of Land Use Management in South Africa. A Report as Part of the Inequality and Marginalisation Theme Prepared for Urban Landmark and Trade and Industrial Strategies (TIPS). Available from http://www.tips.org.za/files/u65/land_use_management_-_charlton.pdf Accessed 1/11/2014

Christopher, A. 1997. Racial land zoning in urban South Africa. Land use policy 14(4):311-323

Connor, S.M., 1981. Performance zoning: successor to Euclidian zoning? Land Use Law Zoning Dig. 33 (1), 7–10.

Correa, J. 2006. Counterpoint: Transect transgressions. Places 18(1):24-25

Coyle, S., 2011. Sustainable and Resilient Communities: A Comprehensive Action Plan for Towns, Cities and Regions. Wiley, Hoboken, New Jersey

Council for Scientific and Industrial Research (CSIR), 2013. Settlement Typology – SACN (GIS data layer). Available at: http://www.gap.csir.co.za/images/gis-data-layers/settlement-typology/view

Duany, A. 2002. Introduction to the special issue; The transect. Journal of Urban Design 7(3): 251-260

Duany, A. and Talen, E. 2002. Transect Planning, Journal of the American Planning Association, 68:3, 245-266, DOI: 10.1080/01944360208976271

Du Plessis, W. J. 2011. African indigenous land rights in a private ownership paradigm. PER / PELJ (14)7: 45-61, doi.org/10.4314/pelj.v14i7.3

Fischel, W.A., 2004. An economic history of zoning and a cure for its exclusionary effects. Urban Stud. 41, 317–340.

Garnett, N. S. 2013. Redeeming Transect Zoning. Brooklyn Law Review 78(3), 571-588.

Garvin, E and Jourdan, D. 2008. Through the looking glass: analyzing the potential legal challenges to form-based codes. Journal of Land Use & Environmental Law, 23(2): 395-421

GeoTerraImage (GTI), 2014. Land Cover of South Africa 2013-14 (GIS data layer). Available at http://bgis.sanbi.org/DEA_Landcover/project.asp

Grant, T. A., Madden, E. A. Murphy, R. K., Smith, K. A. and Nenneman, M. P. 2004. Monitoring native prairie vegetation: The belt transect method. Ecological Restoration 22(2):106-112.

Hall, P. 2002. Cities of Tomorrow. Blackwell, Oxford.

Harrison, P. 2014. Regional and spatial development Background paper for 20 year review. RSA: The Presidency, Pretoria.

Haughton, G. 1999. Environmental Justice and the Sustainable City. Journal of Planning Education and Research 1999 18: 233-243.

Hirt, S., 2014. Zoned in the USA: The Origins and Implications of American Land Use Regulation. Cornell University Press, Ithaca.

Khunou, S.F. (2013). The Origin and Nature of Traditional Leadership in South Africa: A Pre-Colonial Perspective. African Cultures and Literatures, 41: 293-320

Knaap, G., Meck, S., Moore, and T, Parker, R., 2007. Do we know regulatory barriers when we see them? An exploration using zoning and development indicators. Housing Policy Debate 18 (4), 711–749. doi:10.1080/10511482.2007.9521619

Kriken, J. L. 2006. The transect. Places 18(2):78-79

Local government handbook 2016. http://www.localgovernment.co.za/metropolitans/view/8/Mangaung-Metropolitan-Municipality 15/3/2016

Mabin, A and Smit, D. 1997. Reconstructing South Africa's cities? The making of urban planning 1900–2000. Planning Perspectives, 12: 193–223

Mandelbrot, B., 1982. The Fractal Geometry of Nature, p.44. W.H. Freeman and Company. New York.

McDonnell, M. J. and Pickett, S. T. A. 1990. Ecosystems structure and function along urban-rural gradients: an unexploited opportunity for ecology. Ecology 71(4):1232-1237

Nel, V., 2011. Provincial Land Use Legislative Reform Free State Province: Status Quo Report. Report prepared for SA Cities Network, Johannesburg. Available from acitiesnetwork.co.za/wp-content/uploads/2014/06/provinical_land_use_legislative_reform_-free_state-_-_september_2011.pdf

National Geo-spatial Information (NGI), 2014. Colour Digital Aerial Imagery (GIS data layer). Available at: http://www.ngi.gov.za/index.php/what-we-do/aerial-photography-and-imagery

Oranje, M., 1995. The need for an appropriate system of urban development control in South Africa: arguments and characteristics. Town Reg. Plan. 39, 22–33.

Orr, R. 2006. Pienza, Lessons at the edge. Places 18(1):56-59

OpenStreetMap (OSM), 2016. OpenStreetMap of South Africa. `Avaiable at: https://www.openstreetmap.org/#map=5/51.500/-0.100

Parnell, S. and Pieterse, E., 2010. The 'Right to the City': Institutional imperatives of a developmental state. Int. J. Urban Reg. Res. 34 (1), 146–62.

Pelling, M. 2003. The vulnerability of cities. Earthscan. London.

Rihani, S. 2002. Implications of adopting a complexity framework for development. Progress in Development Studies 2(2): 133–143

Sekonyela, S. 2014. Land Use Management Systems in rural areas: The case of Thaba Nchu villages. Unpublished dissertation submitted for Masters in Urban Planning, University of the Free State.

Silver, C., 1997. The racial origins of zoning in American cities. In: Manning, T., Ritzdorf, J., Ritzdorf, M. (Eds.), Urban Planning and the African American Community: In the Shadows. Sage Publications, Thousand Oaks, CA. http://racialequitytools.org/resourcefiles/silverracialoriginsofzoning.pdf. Accessed 8/12/ 2014

Singh, S. S. 2010. Form-based codes: An alternative methods for development regulation. Institute of Town Planners, India Journal 7(2):27-33

South Africa. 2013. Spatial Planning and Land Use Management Act, 16 of 2013 (SPLUMA). Government Printer, Pretoria.

South Africa. 2015. Spatial Planning and Land Use Management Act, Act 16 of 2013: Regulations made in terms of section 54 of the Act. Government Gazette Notice No. 38594, Government Printer: Pretoria

Stats SA (Statistics South Africa), 2012. Census data: 1996, 2001 and 2011, Pretoria: Stats SA.

Swilling. M. 2006. Sustainability and infrastructure planning in South Africa: a Cape Town case study. Environment & Urbanization, 18(1): 23–50. DOI: 10.1177/09562478D0o6w0n6lo3ad9e3d9

Talen, E. 2002. Help for Urban Planning: The Transect Strategy, Journal of Urban Design, 7:3, 293-312, DOI: 10.1080/1357480022000039349

Talen, E., 2006. Design that enables diversity: The complications of a planning ideal. J. Plan. Lit. 20 (3), 233–249. doi:10.1177/0885412205283104

Talen, E., 2013. Zoning for and against sprawl: The case for form-based codes. J. Urban Design 18 (2), 175–200.

Van Wyk, J., 2012. Planning Law. Juta, Cape Town.

Watson, V. 1993. The need for more appropriate forms of urban management: The case of land use controls and home businesses. Dev. South. Afr. 10 (2), 155–166.

Watson, V. 2009. Seeing from the south: refocusing urban planning on the globe's central urban issues. Urban Studies, 46, 2259 –2275.

Wheeler, S. 2009. Regions, Megaregions, and Sustainability. Regional Studies, 43(6): 863–876

DEVELOPING PROFESSIONALS FOR THE FUTURE

Figure 1: Future City starts with a question—how can we make the world a better place? To answer it, 6th, 7th, and 8th grade students imagine, research, design, and build cities of the future that showcase their solution to a citywide sustainability issue

DESIGNING FUTURE CITIES

EDITOR'S INTRODUCTION

If ideas about "Cities we have vs Cities we need" are to be realized, then we need to insure that the next generation of talented students pursue careers in the planning, architectural and engineering professions.

Future Cities is one of several activities of DiscoverE (formerly the National Engineers Week Foundation) to encourage students to pursue studies and careers in science, technology, engineering and mathematics. Started in 1993, this privately funded completion is open to all public, private and home schooled pupils in grades 6 to 8. It challenges student teams to seek mentoring from engineering and planning professionals and then to conceptualize, plan and build a scale model of a new city with a horizon year a century into the future. In addition, a design theme is assigned each year. The 2015 - 2016 theme of "Waste Not, Want Not" was intended to stimulate the design of cities with innovative waste management systems.

The competition occurs during the school year. Participation in the competition is sometimes incorporated into regular classroom activities, and in other cases is extra-curricular, which means that students and teachers/mentors invest extra hours, similar to the participation in team sports. During the four month-long competition period, teams are guided to follow these steps: 1. Identification and understanding of the problem; 2. Brainstorming ideas; 3. Conceptdesign of the city developed using Sim City software; 4. Test and evaluate the initial design and refine/redesign as needed (using the Sim City software environment); 5. Build a scale model of their future city using recycled materials; 6. Prepare and submit a 1,500 word description of their city; and finally, 7. Orally present the model to a team of judges. Additionally, student teams are required to use project management software to guide their work during this process.

Judging is organized by regions with the one top regional finalist team from each region forwarded to compete in the national competition in Washington, DC over President's Day weekend. All judging is done by professional engineers, architects and planners.

The following are two of the many excellent projects presented during the Philadelphia Regional competition. The first, prepared by the St Cecilia's School team, envisions an ocean-based city developed to recycle plastic waste from the Pacific. The second, prepared by the Great Valley Middle School team, describes a future colony on Titan, a moon of Saturn. Both display the enthusiasm, inventiveness and high quality which typified all of the presentations at the regional competition.

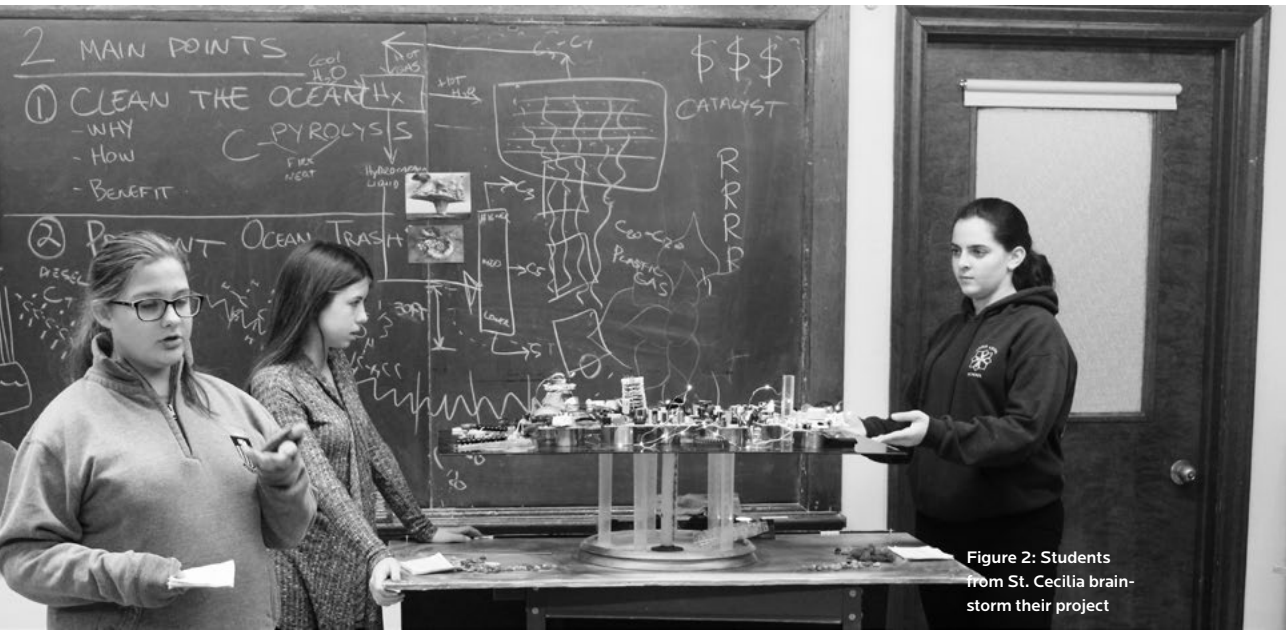


Figure 2: Students from St. Cecilia brainstorm their project

AN OASIS IN A SEA OF TRASH: PRESENTED BY THE SAINT CECILIA SCHOOL FUTURE CITY TEAM

The new city of Insula Inexhausta (ININ) is a man-made chain of floating islands, imagined, planned and created by a multidisciplinary engineering team to clean the world's oceans. After 70 years of continuous improvement, this city has emerged as a model of sustainability and environmental stewardship.

With a warm, semi-humid climate year round, the 42,000 residents of ININ enjoy living an active, outdoor island lifestyle. Located in the North Pacific Ocean, in an area known as the subtropical convergence zone, the city hosts a wide range of industries and is the world leader in developing innovative methods to convert waste into re-imagined products. What started as the largest oceanic clean-up effort in 2015 resulted in the most advanced manmade floating structures ever built. Due to its unique design, ININ has become a favorite tourist destination for adventure seekers and watersport enthusiasts.

IN THE BEGINNING

As North America's consumption of Pacific-caught seafood increased (as part of a heart healthy dietary initiative), it was discovered that alarming levels of phthalates and bisphenol-a contaminated the fish supply. A team led by marine biologists and materials engineers, was commissioned to identify the source of contamination. The plastic byproducts were traced back through the aquatic food chain to the North Pacific Gyre, better known as the North Pacific Garbage Patch (NPGP).

It is estimated that there are at least 100 million tons of floating solid waste trapped in the rotating ocean currents of the North Pacific. Ninety percent of the trash floating in the NPGP is plastic, primarily low-density polyethylene (plastic bags), polypropylene (bottle caps) and polyethylene terephthalate (water bottles). Estimated to be twice the size of Texas, 10 meters deep and containing at between seven to over 100 million tons of trash, the NPGP is the largest accumulation of marine trash on earth.

These plastics do not biodegrade but photodegrade. The plastic is broken down by the sun through a process called photodegradation. This results in tiny floating particles that marine scientists call nurdles, of which 80% having a size < 1 mm. Marine life mistakes the plastic pieces for food and ingests them, along with any chemicals the plastic absorbed. These organisms and small fish are consumed by larger fish and the contamination ends up in the human food chain. Traditional means of skimming floating trash proved to be inefficient and ultimately ineffective.

Figure 3: Students display the deflection booms on a portion of the Insula Inexhausta Model

ENGINEERING A SOLUTION

A project team consisting of marine, chemical, mechanical, electrical and civil engineers was assembled to develop a long-term, sustainable solution to eliminate the growing ocean trash problem. Due to the wide spread and ever changing nature of this issue, the traditional approach of bringing the problem to the solution was infeasible - so the team brought the solution to the problem. Their innovative plan was to utilize natural ocean currents to convey floating debris to a consolidation structure and guide the material to a centralized location for removal, processing and conversion.

The original plan consisted of a network of four spar platforms tethered to the sea floor. Roughly one city block in size, each of the recycled spar platforms, once used in deep-sea oil exploration, became the building blocks of the city. The spar platforms are connected to one another by a system of rigid structural causeways that provide lateral stability to the network. The causeways also provide the infrastructure for travel between platforms as well as a means to distribute utilities to each platform.

The four platforms created a system named GRACE, short for gather, remove, accumulate, convert and export. The Gather phase is accomplished by two deflection booms, extending 2 miles out and 10 meters deep, which are deployed at 45 degree angles to the platform network. Aimed into the prevailing ocean current to divert floating material toward the leading platform. All floating material is directed to the Removal platform and passes through an aeration zone where fine air bubbles are introduced below the debris layer, forcing less buoyant material to rise and concentrate at the surface.

Once gathered, the floating trash moves through the Accumulate steps of the process. A series of sumps gather the material where it is sent through a bank of Muffin Monster grinders and then transferred topside by trash pumps. Once topside on the Removal platform, the waste stream passes through a series of rotating strainers that separate the solids from the water. The water is collected and sent to our desalination process to produce potable water for the city.

The solids are collected and conveyed to an adjacent Conversion platform which houses the pyrolysis units including reactors, heaters, pumps, compressors, exchangers, fractionation columns and storage vessels. In addition to this process, the Conversion platform has a nitrogen plant that extracts nitrogen from the air where it is used to maintain an inert atmosphere in the pyrolysis reactor. With plastic being 90% of the material recovered, the design team chose a recycling technique based on a thermochemical

Figure 4: St. Cecilia students and faculty advisor showing the completed Insula Inexhausta Model

conversion process called pyrolysis. Heated in an oxygen-free environment, the recovered plastic is converted to a gas and sent through a reactor where it contacts a catalyst that breaks down the long hydrocarbon chains into shorter ones in a process called catalytic cracking. The gas stream is directed through a series of heat exchangers that use desalinated water to remove heat from the vapor and condense most into a liquid. The cooling water picks up waste heat from the exchangers and is sent to process boilers where it is converted into steam for use in turbine driven pumps, generators and compressors.

Separation of the liquid mixture occurs in distillation columns where the principle of varying boiling points of each hydrocarbon liquid is used to separate the hydrocarbon streams into four main products: 1) diesel fuel, 2) gasoline component, 3) fuel gas and 4) char.

The liquid hydrocarbons are stored on the Export Platform and sold and removed via tanker ships. The fuel gas is sent back to the beginning of the process for use as the main fuel for the thermal process. The fuel gas is also the heat source used in our process boilers. The unvolatilized solid byproduct called char left in the reactor has a BTU value and is sold as fuel to other industries. Although heavily energy dependent, this integrated pyrolysis process is a renewable energy technology that reduces greenhouse gas emissions by 70% when compared to traditional forms of crude oil extraction and refining.

DEVELOPMENT OF THE CITY

Four (4) floating platforms serve as the Industrial area of the initial city. In addition, there were several special purpose platforms. The Feedstock platform provides the main ocean cleanup function where trash is corralled, consolidated, grinded, dried and stored. The role of this platform is to provide an acceptable feedstock to the Conversion platform for the continuous pyrolysis process.

The Utilities platform provides all water, steam, condensate, wastewater and compressed air for the entire city. Here, high pressure pumps at the desalination plant forces salt water through a reverse osmosis membrane where all dissolved solids are removed. This water is used for drinking, cooling and boiler feedwater. The boilers utilize the fuel gas produced during pyrolysis to boil pre-heated cooling water to provide 680# steam to the city. Turbine generators utilize excess steam to produce power for the entire process making it self-sufficient. All primary rotating equipment in the city is turbine driven with electric motor backup.

The Maintenance platform contains all tools, material and equipment for repairs to the city.

This platform is also home to all city municipal services including sanitation, police, fire, etc.

Due to the predominantly industrial design of the initial development, a number of multi-purpose buildings were built up from the platform and also built down below the platforms into the ocean. The submarine structures not only provided a unique living experience but they added the benefit of increased buoyancy and lateral stability. To make the system self-powering, all platform spars with wave energy generators. Each spar houses a stationary generating coil and is surrounded by a magnetic sleeve and float assembly. Waves raise and lower the float/sleeve assembly over the spar coil, generating electricity.

As ocean clean-up and energy production increased, so too did the population of the city. In 2106, the population of the City was 42,000 people. Due to the scalability of our city, additional platforms were added to accommodate the needs of a growing workforce and their families. Schools, churches, recreation centers, open spaces, commercial/retail areas, hotels, restaurants and entertainment complexes were developed, which improved the quality of life. Crime and unemployment was below the national average and the energy export sector provided substantial tax revenue to fund all city-run services.

A high speed transportation system called the Dynatube was built on the ocean floor to link ININ to California and Hawaii with the commute to either destination taking less than 1 hour. Locally sourced vegetables are grown in vertical farming towers year round and the main protein source comes from aquaculture farms located under the platforms where fish and other aquatic organisms are cultivated and farmed to provide a sustainable source of seafood.

CLEANUP EFFORTS FALL SHORT

Environmental Engineers from the National Oceanic and Atmospheric Administration (NOAA) performed a study to determine the effectiveness of the Insula Inexhausta cleanup efforts after five years of operation. They reported that despite the success of the project, the size of the garbage patch had increased and cited poor global source control as the major contributor. Graduate biochemical engineers from the ININ Institute of Technology researching bioplastics made from seaweed and kelp developed a commercially viable method to mass produce biodegradable plastics. When fully implemented, a large percentage of plastics produced in the world will be plant-based and biodegradable. Education about the impact plastics have on our environment is a first step in cleaning up the world's oceans. However, by implementing engineering controls, worldwide ocean garbage patches will naturally reduce in size, regardless of land based source control.

EVIMERIA: PROSPERITY IN A NEW LAND : PRESENTED BY THE GREAT VALLEY MIDDLE SCHOOL FUTURE CITY TEAM

No person has ever set foot on Saturn, but with a large leap in space travel technology the Saturn's moon, Titan, was colonized. Nestled within the hidden valleys of Titan's topography, the new city of Evimeria rests in a vast plain with surrounding clouds above. Inhabitants enjoy life with the city's dome providing protection from the inhospitable environment, allowing citizens to enjoy the same activities they took part in on Earth, such as shopping and going to parks. Evimeria is about reusing resources to give back to the community, enabling the city to provide a stable government, homes, schools, and jobs for its citizens. Everyone is an equal on Evimeria, a utopia for any and all to enjoy.

DEVELOPMENT OF THE CITY

Evimeria was founded in the year 2116 when a brave pioneer by the name of Heather McGovern decided to try living on the previously uninhabited Titan. She began with her own shelter made of bio-fabric, a resilient material composed of entirely organic materials. Soon after, a geodesic Alpha dome was constructed, inspired by the works of Buckminster Fuller. The triangular structure of the dome is stronger and more resilient than any rectangular shape. Today that original dome is still in use in the center of Evimeria, which consists of multiple domes connected by transit tubes, to remind the population of what it took to create the life they are enjoying today.

The designers and builders wanted a civil

Figure 5: Model of Evimeria prepared by the Future Cities students Great Valley Middle School

design that would enforce safety but also give a futuristic design. The core element of the city consists of domes, with smaller domes circling the outside. As the city expanded more domes were built.

In this place with little gravity, no oxygen, and a harsh outer climate, the new version of the Alpha dome is used for protection. Stronger than a regular spherical dome, this hexagonal structure is virtually indestructible. The dome is covered by a membrane of shock absorbent substance which can withstand high amounts of bombardment. It will disperse any impact around the entire dome, providing maximum safety for the Evimerians inside. Coupled with the natural resilience of the dome, it can withstand nearly any impact. In case of an emergency, there are safety pods underneath the city to fly individuals to the nearest colonization.

The second design element of the city is its transportation system. Evimeria has introduced a transportation system utilizing pressurized air which can safely transport citizens to their destinations in other domes. This system gives off no harmful gasses. Passengers enter the transport capsules through the opening of part of a large tube, which lifts itself when passengers are boarding and closes when they are safely inside the capsule. Then, once everyone is safely secured with seat belts, the capsules begin to move to the next destination when air pressure is exerted in one direction or another. Air pressure is exerted both in the direction the capsule is moving, and in the opposite direction. This is so the capsule does not suddenly begin to quickly move one way and crash or become out of control. When the capsule must come to a stop, pressure is slowly reduced as the strong magnets on the capsule begin to connect with the magnets at the next capsule stop. From here, the operators must ensure that the capsule is not moving and completely secure in place. Then, the doors open and the citizens may safely exit.

TECHNOLOGY FOR SELF-SURVIVAL

Building a colonization in the vast unknown would lead to many different obstacles and trials.

Titan's gravity, which is 1/10 of Earth's, caused issues. If the colonists would want to ever return to Earth, they would be victim to bone disease even with the low gravity produced by the Dome's rotation. We have developed several methods to reduce this problem.

We have created a specialized exercise center for the citizens to build back their bone growth and maintain the same strength that they had on earth. We also insure that citizens maintain their physical fitness in various ways. Another example is that our trains are solely

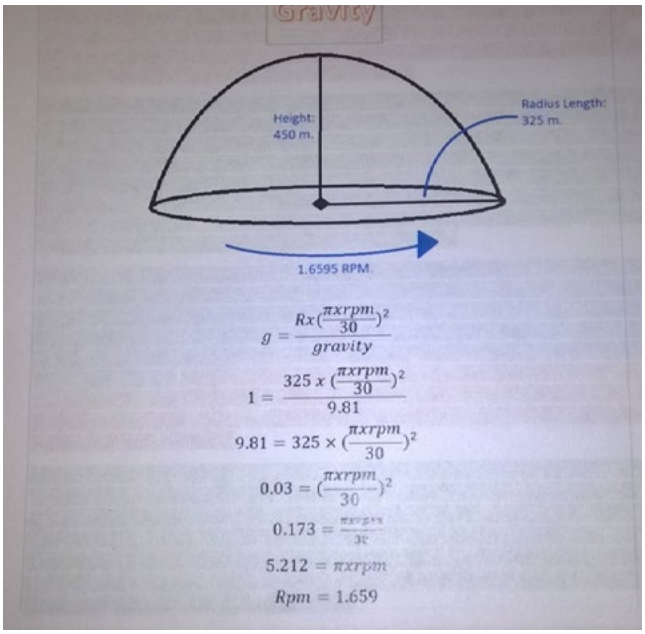


Figure 6: First concept sketch of Evimeria

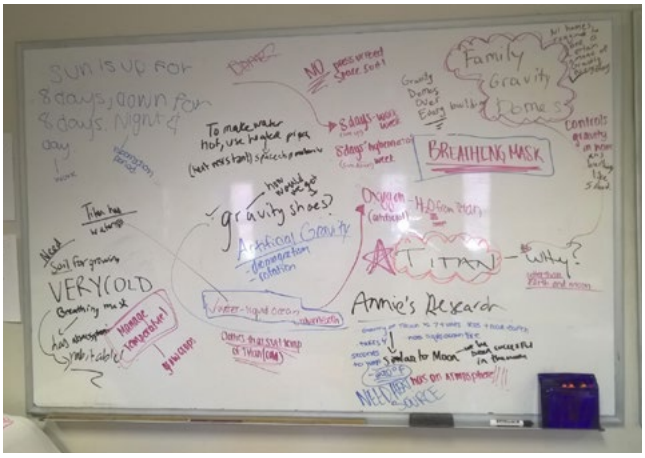


Figure 7: Concept notes from the development of Evimeria

Figure 8: Great Valley Middle School Future City team with their model of Evimeria

used to transport the citizens from dome to dome. While in a dome, the citizens must walk to their destination.

Despite the cold, 200+ mile per hour winds, and the lack of oxygen, there are many surprising benefits that can be found on Titan. For example, atmospheric methane gas is used as a natural insulation to protect our city from the sub-zero weather conditions. Another benefit is that the high speed winds on the Moon's surface which has been harnessed for energy.

Technology has been developed to heat the otherwise below freezing city, to provide energy and water. Heat is provided through heat pads; 5ft by 5ft by 6 in pads located underneath the paved streets and buildings. These pads focus heat through electricity. We also create our water by using a molten carbonate fuel cell that takes in O2, CO2, and H2 and fuses O2 and CO2 into CO3-2 (carbonate) by using hydrogen to create an electrical current. This passes through the current again to create H2O and CO2. The carbon dioxide is used again while the water and heat is released. The heat and water is released while the carbon dioxide is used again. The Evimerians also burn methane found in the large lakes, and use the energy as electricity, which powers the solid waste into the tubes and into the agricultural center, which is one of the few areas where energy is needed for the trash collecting process.

Food is obviously one of the most drastically needed services vital to the city. Solid waste is used to fertilize crops, which acts as a stimulant, helps them thriveand grow several times faster than normal. This agricultural system also acts as a major job source and helps the economy thrive. While robotic, tractor-like machinery is used for most work, residents who wish to exercise can do so by helping out in various insulated greenhouses and get compensated for their efforts. One of the major crops grown on Evimeria is soy beans. This healthy, nutrient-dense food can be substituted for meat, grain, vegetables, fruits, and still taste and have all the benefits of the original food. To accommodate the agriculture and the aquaculture, space is maximized by designing building so that top floors are devoted to jobs while crops grow on lower floors

Evimeria recycles both water and waste. As Buckminster Fuller had said, "Pollution is nothing but the resources we are not harvesting. We allow them to disperse because we've been ignorant of their value." Our remote location has further encouraged us to recycle all that we can.

The toilets in Evimeria have two functions, both of which conserve the energy of later separation of excrement and urine. To flush urine, one button is pressed, and another for excrement. The urine enters the Urine Filtration System (U.F.S.), a highly technological system in which the urine is poured into a filter and comes out as clean drinking water almost instantaneously. The solids travel in another system of tubes, and are sprayed with bacteria to remove all negative by-products and possibly unhealthy materials from the waste. Then, the waste is delivered to the agricultural area and used a fertilizer.

Furthermore, a tradition has started to do "No Casket Funerals," where a deceased person is sprayed with bacteria and laid to rest in the agricultural area without being placed in any kind of box structure. Evimerians report a strong sense of peace and satisfaction knowing that their loved ones contribute to our city even after their death

One of the largest problems the Evimerian pioneers faced was properly disposing of solid waste. Living on a planet with very little space to dispose of garbage results in a large problem for the citizens. It takes a large amount of funding to engineer a system to dispose of the waste. Also, the garbage that is produced could possibly be hazardous and a host to diseases, which could start an outbreak of sickness.

The Evimerians are extremely ecologically advanced, hence, they use a system named C.O.B.S, the creation of biodegradable substances. Prior to the waste becoming garbage, any disposable item that has a chance of becoming unnecessary waste is instead created out of biodegradable materials. The main material that is used is gelatin which is created by boiling the unneeded parts of the sockeye salmon that are cultivated (for food) on Evimeria. This material is then infused with proteins and flash-frozen to make the material extremely strong. The end result is an industrial strength material that can be used, reused and molded into anything.

On Titan, the city's economy and success is built around the trust and cooperation of others.

A key aspect to allowing the city to come together is communication. Citizens need to be able to communicate with each other to get things done. With holographic communication technology, the receiver and sender can both interact and see one another and their environments. This allows the citizens to be able to work more efficiently even when they are not there. There can be meetings and important discussions right from the comfort of their homes.

REFLECTIONS ON THE CITY DESIGN

Living on an entirely new moon comes with a multitude of good and bad things. One tradeoff that the citizens face is a small living area with public transportation. The citizens do not have much privacy, however, this preserves resources. The largest tradeoff that is unlikely to occur is a system failure, which may result in death. However, the citizens are aware of this and there are systems in place to prevent this from happening, which include safety pods and emergency domes. Living on a new planet comes with its highs and lows, however, the benefits outweigh the drawbacks by a large amount. Using innovative and futuristic solutions, Evimeria is the definition of the future. Prosperity in a new land comes to live in our future city. ◆

ABOUT THE AUTHORS

ABOUT THE AUTHORS

In alphabetical order as per the last name of the first author

MRIDULEKHA ALLOPI

I am a South African Indian Female. I have a Masters in Urban and Regional Planning. I have been in the employ of Municipal Local Government for the past 28 years. While I have and practice all facets of planning, my passion lies in Statutory Planning and the delivery and implementation of planning projects. I advise and participate at all three spheres of Government on shaping and re-shaping Planning Legislation in this Country, and have been responsible for writing the first Planning Bylaw for eThekwini Municipality. My flair and passion for planning is seen in the delivery of the Dube Trade Port and Kind Shaka Airport, the Umhlanga New Town Centre, the Umhlanga Village Node, various and numerous billion rand worth of catalytic projects within the City. Perhaps most important for me is the ability to change people's lives and give them opportunities to better their own. I am indeed thankful for all the opportunities given to me- as how many Planners get to work on an Airport, a Port, and a Waterfront in a single lifetime? Lekha.allopi@durban.gov.za

BERNARDUS VAN HEERDAN

My qualifications include a Degree of Town and Regional Planning: University of Pretoria
I am currently employed as a Strategic Development Manager at City Architecture at the eThekwini Municipality which is a multi-disciplinary build environment Unit which serves various clients in a dynamic city with many challenges.
My twenty one years work experience includes: Participating in development strategies and master plans of catalytic regeneration programmes; managing multi-disciplinary professional teams for the development of urban design master plans for multi-modal public transportation hubs; transit orientated; and waterfront development; public realm upgrade, including pedestrian facilities for a dynamic growing African metropolitan area; participating in negotiations to form partnerships with various stakeholders; local; and international organizations. I have been very fortunate to travel internationally from an early age and experienced many of the great cities which contributed greatly to my career development.

LAUREN BAKER

Lauren Baker, PhD, has over 20 years of experience working on food system issues. Her expertise ranges from research on maize agrobiodiversity in Mexico to negotiating and developing municipal food policy and programs. Lauren currently is working as a consultant with the Global Alliance for the Future of Food, supporting their strategic initiatives and programs. Previously, Lauren was a Food Policy Specialist with the Toronto Food Policy Council, leading a citizen advisory group embedded within the City of Toronto's Public Health Division. She has consulted on farm to fork initiatives and food policy development across Canada, and in Mexico, Cuba, France and the Netherlands. Lauren's past work includes founding director of Sustain Ontario, Board of Director roles with Everdale Environmental Learning Centre and Food Canada's first certified organic rooftop farm. Lauren teaches at the University of Toronto and is a research associate with Ryerson University's Centre for Studies in Food Security. She is the author of Corn meets Maize: Food Movements and Markets in Mexico (2013).

TIM BEATLEY

Timothy Beatley is the Teresa Heinz Professor of Sustainable Communities, and Chair of the Department of Urban and Environmental Planning, School of Architecture at the University of Virginia, where he has taught for the last twenty-eight years.

Beatley is the author or co-author of more than fifteen books, including Green Urbanism: Learning from European Cities (recently translated into Chinese and Korean), Native to Nowhere: Sustaining Home and Community in a Global Age, Biophilic Cities: Integrating Nature Into Urban Design and Planning, and most-recently Blue Urbanism: Connecting Oceans and Cities. Beatley's book Ethical Land Use was declared, by the American Planning Association, to be one of the "100 Essential Books in Planning." Beatley also writes a column for Planning Magazine called Ever Green, which has appeared every other month since 2008, and is a regularly contributor to the Nature of Cities collective blog .

Beatley founded and directs the Biophilic Cities Project at UVA (http://biophiliccities.org/), and recently helped to launch a global Biophilic Cities Network. He also co-founder and co-director, with Reuben Rainey, of UVA's Center for Design and Health, within the School of Architecture. He has been the recipient of the All-University Teaching Award at UVA, and also received the Outstanding Faculty Award, the state's highest award for faculty at its public universities (awarded by the State Council of Higher Education for Virginia).

Beatley holds a PhD in City and Regional Planning from the University of North Carolina at Chapel Hill, an MA in Political Science from UNC, a Masters of Urban Planning from the University of Oregon, and a Bachelors of City Planning from UVA.

MERCEDES BEAUDOIN

Interdisciplinary in thought and in experience, Mercedes' passion to develop sustainable human-environments around the world led her to obtain a Masters in Urban and Regional Planning from the University of Central Florida. As a graduate student, Mercedes dedicated research efforts to sustainable development at the local and international levels. In addition to courses in planning methods, urban design, and environmental policy, she studies abroad with the University of Seoul and the Seoul Metropolitan Government in South Korea, which provided an international collaborative planning experience. As a graduate student in Florida, Mercedes won Best in Category: Social Sciences at a state-wide graduate research symposium and at the university-wide graduate research forum for her research on Barriers and Solutions of Integrating Sustainable Development. She has presented sustainable development research at two National American Planning Association conferences.

In October 2016, Mercedes participated as a Young Planning Professional at the International Society of City and Regional Planners 51st Congress in the Netherlands. At the 51st Congress Mercedes helped facilitate workshop session with planners from all over the world to generate alternative planning approaches to spatial goals

Currently, Mercedes is a research analyst at the Metropolitan Research Center within the College of Architecture and Planning at the University of Utah. Mercedes collaborates with faculty members and PhD students on metropolitan-level peer-reviewed research projects and planning consulting work. Along with research experience, Mercedes has worked at the city and county levels of government working on variously-scaled environmental and spatial planning projects to advance land use planning policy.

PIYAPONG BOOSSABONG

Dr. Piyapong Boossabong is the lecturer in policy analysis, planning and governance at Mahasarakham University, Thailand. He is also the director of the Research Center for Collaborative Local Governance Studies. He has worked as the researcher of the Centre for Metropolitan and Urban Studies, Thailand, in the research cluster entitled 'Public Policy for Cities of Tomorrow'. He has also been the consultant of the 'Thai City Farm Program'. He is the author of the first book written in Thai on approaches and practices in urban agriculture. He has experienced in evaluating public programs and facilitating strategic planning of many public agencies in Thailand. He got a PhD from Development Planning Unit, University College London. In 2013 and 2014, Piyapong had ever been invited as a research fellow at the University of Kassel, Germany and a visiting lecturer at New York University, USA.

His recent published works include 'The Governance of Bangkok's City Food System' in The Governance of City Food Systems: Case Studies From Around the World (Milan), 'Food and Floods in the City: Lessons from Policy Networks on Urban Agriculture in Bangkok' in Environmental Justice, Urbanization and Resilience in the Global South (UCL, London), 'Collaborating Farming Networks in Bangkok: To Promote Community Gardens and Alternative Markets as Theaters of Social Action' in City by and for the People (National University of Singapore), 'Deliberative Policy Analysis' (co-author with Prof. Frank Fischer) in Oxford Handbook of Deliberative Democracy, 'Community-based Food Production' in Routledge Handbook of Urbanization in Southeast Asia, 'Smart-about-Cities: A Review' in the Journal of Critical Policy Studies, 'Social Capital-based Local Policy and Governance: An Alternative to Local Development in the 21st Century' in the Journal of Social Science, 'Regional Planning in Thailand in Transition' in the Journal of Politics and Governance and 'Coping with Flooding in Bangkok' in Urban Agriculture Magazine (Resources Centers on

Urban Agriculture and Food Security).
Piyapong also presented his paper entitled 'Reframing Urban Policy in Thailand: Looking Back and Moving Forward' in the International Conference on Good Governance and Transformative Leadership. His paper entitled 'The Studies and Practices of Policy Analysis in Thailand' was presented in the Regional Conference on Public Policy 2016, Hong Kong. 'Exploring Democratic Practices through Network Governance in Thai Local Communities' was presented in the World Congress for Korean Politics and Society 2015, South Korea. 'Participatory Governance of the Urban Food Agenda: Engaging Multi-stakeholders in Creating Urban Food Systems' was presented in the Symposium on Governance of the Smart Cities Food Agenda, Milan. 'Promoting Pro-Poor Food Systems and Regional Food Chains for Enhancing Resilient Livelihoods and Reducing Poverty' was presented in the East Asian Poverty Reduction 2014, Beijing. 'Governing the Regional Commons: Some Challenges for Governing Rice Production and Distribution in ASEAN community' was presented in the Political Studies Association Conference 2013, Cardiff. 'Collaborative governance on urban food agenda during flooding in Bangkok' was presented in the RGS-IBG Annual International Conference 2012, Edinburgh. He presented his papers as well in the International Conference on Interpretative Policy Analysis organized in Hull (2016), Wageningen (2014), and Vienna (2013).

KATHERINE BROWN

Katherine Brown, PhD served as the Executive Director of the Southside Community Land Trust in Providence from 2003 to 2012. Katherine brings her experience "in the trenches" as a key partner in transforming Providence into an exemplar for urban agriculture. Other related experience includes founding City Sprouts in 1995, an urban agriculture project in Omaha NE; active participation at the national level in the Urban Agriculture Committee of the Community Food Security Coalition; founding member of the RI Food Policy Council; author of several well-cited publications about urban agriculture; and member of the Editorial Board for the Springer Urban Agriculture Book Series. Katherine's PhD in Sociomedical Science (Columbia University) combines public health policy and medical anthropology.

SHEILA BRUSH

Sheila Brush, BA. Sheila served from 1998 through 2015 as Director of Programs for Grow Smart Rhode Island, a statewide NGO that advocates for state and municipal land use planning policies designed to achieve sustainable and equitable economic growth. She is a founding member of the RI Food Policy Council and the RI Agriculture Partnership. Providing operational support, strategic planning and facilitation for numerous multi-interest coalitions, Sheila has shepherded many successful state and municipal policy initiatives, including policies that support the economic growth and viability of RI's agricultural sector, while ensuring increased accessibility and environmental sustainability. In recognition of her work, she received the American Planning Association-Rhode Island Chapter's Leadership Award. Sheila graduated from Middlebury College with a BA in History.

YVES CABANNES

Yves Cabannes is an urban planner and Emeritus Professor of Development Planning, Chair of Development Planning [2006-2015] at Bartlett Development Planning Unit (DPU), University College London. He was previously lecturer in Urban Planning at Harvard University Graduate School of Design and the regional Coordinator of the UN Habitat/ UNDP Urban Management Program for Latin America and the Caribbean and worked for many years with local governments, NGOs and social movements in various countries. He was awarded the United Nations Best practices award in 1996, along with other partners' institutions for their long-standing work on pro-poor urban development in Fortaleza Metropolitan Region in Northeast Brazil

He has worked as a researcher and practitioner in urban agriculture & Food sovereignty, collective and communal forms of land tenure, local currencies, participatory planning, municipal public policies, low cost housing, participatory budgeting, community-based micro credit systems and appropriate technologies for local development. He is an advocate on development and rights issues and was the convener for the UN Advisory Group on Forced Evictions (2004 -2010) and the senior advisor to the Municipality of Porto Alegre, Brazil, for the international network on participatory budgeting.

He is committed to civil society initiatives in different regions and a member of the board of the International RUAF Foundation - Resource Centres for Urban Agriculture and Food Security-, The World Fund for City Development (Metropolis), and Megacities Project.

Recent books and articles in English as author and co-editor include: Integrating Food into Urban Planning [Forthcoming 2016, co-editor, co-author]; Asian Cities by and For the people [forthcoming 2016, co-editor, co-author, Amsterdam Free University press]; Financing urban and peri-urban agriculture; What do we know, What should we know, Chapter 14, in Cities and Agriculture [2015, Earthscan, Routeldge]; The democratic contribution of Participatory Budgeting [2015, co-author, London School of Economics]; Another city is possible! Alternatives to the city as a commodity: Participatory Budgeting, Dossier 1 [2015, co-edited and co-authored book]; 21st Century Garden Cities of To-morrow. A Manifesto [2014, co-authored book]; Contribution of Participatory Budgeting to provision and management of basic services: Municipal practices and evidence from the field [2014, Working paper IIED]; Peri-urban agriculture, social inclusion of migrant population and right to the city: practices in Lisbon and London [2013, City, Routledge]; Financing Urban Agriculture [2012, Environment & Urbanization, Sage]; Pro-poor legal and institutional aspects of Urban and Peri-Urban agriculture [2012, book FAO Legislative Study Series].

CECILIA MAROCCHINO

Cecilia Marocchino is an urban and territorial planner with over than ten years of experiences in urban research and urban development planning in Africa, Latin America and Middle East. Her expertise and main areas of professional interest are: i) urban and territorial planning; ii) strategic and development planning; iii) participatory planning methodologies iv) urban governance; v) urban infrastructures and municipal services; vii) food system planning and management, mainly food distribution systems, including formal and informal activities.

Currently she is working for FAO headquarter as urban food planning expert, involved in various food system projects and activities related to food security and nutrition in cities. She has actively participated in the Habitat III process and in the consultations leading at the integration of food security and nutrition into the New Urban Agenda.

Cecilia has worked for UN-HABITAT in Jordan and in various cities of the Arab Region, providing technical

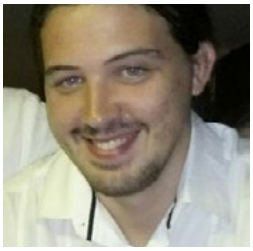
support to local governments on urban development planning. She was also in charge of supporting cities in improving urban information systems including the establishment of UN-HABITAT local urban observatories and in strengthening the urban observatory network in the Arab Region with specific attention on the Habitat Agenda indicators. She was also working for the Arab Urban Development Institute (AUDI) as Reporting and Monitoring Expert for the UN-HABITAT/AUDI project "Promoting Urban Monitoring and Observation for Sustainable Urbanization in Arab Towns", mainly focused on secondary cities.
Cecilia has also worked for the Ministry of Foreign Affairs of Italy/Italian Development Cooperation in Ethiopia in supporting the local governments of the small towns of the Oromia Region. She has developed and implemented a gender-sensitive, integrated, multi-stakeholders approach to food retail distribution system including access to credit, formalization of informal activities, creation of cooperatives and small micro-enterprises, urban development planning, market infrastructures rehabilitation and capacity building to the local governments. In the Oromia Region Cecilia also worked on promoting urban agriculture and temporary farmer's markets mainly addressing poor and vulnerable women.
In Ecuador Cecilia's work has been focused on the participatory budgeting system, urban agriculture, "productive households" and fair trade network organization and management. She was also involved in designing and implementing the European Commission Project on participatory budgeting system and good governance in various cities of Latin America and Europe.

CECÍLIA DELGADO

Cecília Delgado is a Portuguese Post-Ph.D. Urban Planner and Architect with long experience as university lecturer and researcher. She specialized in participatory methods and innovations in urban planning, urban agriculture policies, and gender urbanism. Currently she is part of the National Laboratory of Civil Engineering, where she works as main researcher on public policies. Her current fields of research focus on land use planning, urban and peri-urban agriculture and social inclusion. She works with Belo Horizonte and her last visit happened in April/May 2015, when she critically examined the city food supply and distribution systems.

Sponsor: A Post–PHD Grant - SFRH/BPD/94286/2013 from the Portuguese Government finances the author research project.

ALBERT FERREIRA



Albert Ferreira, M (TRP) , is currently employed by MapAble (Pty) Ltd as a Town and Regional Planner. His specialisations and interests include communicative planning, urban resilience, urban morphology, regional planning and spatial analysis.

Albert Ferreira completed his Bachelors' degree in Town and Regional Planning at the University of Pretoria in 2011. After completion of his Bachelors' he began work at the University of Pretoria's Department Town and Regional Planning as an assistant lecturer while undertaking research for his Master's degree in Town and Regional Planning. During his time at the University, Albert was involved in several research projects, the most noteworthy being the Resiliency Strategies for Aspirational African Cities of which he was a core member. Albert focused on the application of resilience theory in the urban context through the in depth study of the retail sector in the City of Tshwane. Albert has presented papers at several international and local conferences which includes topics such urban resilience, young planners in practice and appreciative inquiry.

Albert has been working for MapAble (Pty) Ltd from 2014. MapAble (Pty) Ltd provides. While Albert has a strong academic background he also has experience working in practice. He has been involved with several high level spatial development frameworks, infrastructure investment plans and asset management plans. He has also done work on urban renewal and management strategies and plans. His work includes projects across South Africa as well as in Kenya.

DARREN NEL

Darren has worked at University of Pretoria's Department Town and Regional Planning as an assistant lecture while undertaking research for his Master's degree in Town and Regional Planning, which he completed in 2016. Darren was involved in several research projects, the most noteworthy being the Resiliency Strategies for Aspirational African Cities. Darren is also a co-founder of the Think tank on Resilient Urban Systems in Transition (TRUST), whose fundamental aim is to understand resilience and mitigate the effects of climate change within urban and ecological systems. Darren has presented papers at several international conferences and has co-authored a book chapter. He has also given lectures and presented at workshops on spatial and urban morphological analysis.

While Darren has a strong academic background he also has experience working in practice. He has been involved with several high level spatial development frameworks, infrastructure investment plans and asset management plans. He has also done work on urban renewal strategies. His work includes projects across South Africa as well as in Kenya. Darren is currently employed by MapAble (Pty) Ltd as a Town and Regional Planner. His specialisations include urban complexity theory, urban resilience, urban morphology, regional planning and spatial analysis.

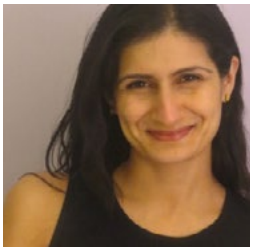
VERNA NEL

After obtaining her undergraduate planning qualification from the University of the Witswatersrand, Verna Nel worked at Johannesburg municipality, a private firm and a national government department before joining the Centurion Town Council. Here she was responsible for spatial planning, land use management, local economic development and formulating the municipal town planning scheme. While employed there she obtained her Masters and Doctoral degrees through UNISA.

She was appointed head of the Centurion Planning Department in 1998 and continued to head the planning function in the unicity of City of Tshwane from July 2001 until 2008. Not only did this entail leading and managing the restructuring of the planning function, developing new processes for the coordination and administration of planning work but also preparing spatial plans, a new Town Planning Scheme and Outdoor Advertising bylaws for the city.

She was appointed at a professor at Urban and Regional Planning Department of the University of the Free State in 2009. Her interests are local economic development, urban complexity theory, urban resilience and land use management in a South African context.

SIMONE BRODY



Simone Brody is the Executive Director of the What Works City initiative at Results for America. She previously served as the Senior Executive Director of the Office of Research, Accountability and Data at the New York City Department of Education (NYCDOE), leading evaluation and accountability for the city's 1,800 public schools. Prior to joining NYCDOE, Simone was a Principal at Ascend Ventures, a venture capital firm that invests in early stage education and technology companies. Simone began her career in the Investment Banking Division of Goldman, Sachs & Co., focusing on mergers, acquisitions and capital raisings for financial institutions. Simone earned a BA in political science, philosophy and economics (PPE) from the University of Pennsylvania, a Master of Education from the University of Pennsylvania and an MBA from The Wharton School.

SANDY ISENSTADT

Sandy Isenstadt teaches the history of modern architecture at the University of Delaware. He has published essays on postwar reformulations of modernism and American material culture. Spatial perception in the built environment is the subject of The Modern American House (2009), winner of the Spiro Kostof Award from the Society of Architectural Historians. He has co-edited Modernism and the Middle East. Politics of the Built Environment (2008), the first book-length treatment of modernism in the Middle East, and Cities of Light (2015), the first global overview of urban lighting. His current book project, “The Architecture of Artificial Light,” examines the novel luminous spaces introduced by electric lighting, with chapters on switches, automobile headlights, factory lighting, illuminated signage and blackouts. His work has been recognized with fellowships from the National Endowment for the Humanities, the Graham Foundation for Advanced Studies in the Fine Arts, the Center for Advanced Study in the Visual Arts, and the Institute for Advanced Study, in Princeton, N.J.

WANG JIANGUO

Dr. Wang Jianguo is the Academician of Chinese Academy of Engineering, the Professor and Former Dean of School of Architecture in Southeast University located in Nanjing, China. He is the Director of Research Institute of Urban Design in the university and the Director of National Supervision Board of Architectural Education. He graduated from the architectural department of Nanjing Institute of Technology in 1982 and received his Doctorate in Engineering from Southeast University in 1989. He is entitled the Cheung Kong Scholar by the Ministry of Education P.R. China in 2001. In the same year, he won the National Natural Science Fund for Distinguished Young Scholars. As a leading scholar in the field of urban design in China, he has published 7 monographs and more than 180 papers widely cited by SCI, EI, Web of Science, CSCD and CSSCI, covering a wide range of academic fields in urban design and architecture. He has been involved in a series of research and real projects concerning urban design, architectural design and heritage conservation, meanwhile receiving a number of prizes and honors from the practices. In the last three decades, Dr. Wang plays an important role in development of urban design studies in the context of rapid urbanization in China. The outcomes of his research have gone beyond the nation's experiences and conditions, and were highly recognized by international academic circle.

CHEN HAINING

Haining is working in Research Institute of Urban Design of Southeast University in Nanjing, China. She received her Bachelor of Architecture degree from Southeast University, a Master's degree in Urban Design from University of Miami and a Master's degree in Urban Ecological Planning from Norwegian University of Science and Technology (NTNU). Rooting in China, studying abroad in the United States and Norway, Haining has taken participation in a number of research projects with specific academic interests on urban issues and sustainable development of the developing and industrializing countries, such as the slum upgrading project in Kisenyi of Kampala, Uganda, in collaboration with UN-Habitat, Slum Dwellers International (SDI) and Makerere University, as well as the fieldwork in semi-urbanized villages of Delhi, India, in collaboration with Indian Institute for Human Settlements (IIHS). Haining is now mainly focusing on urban design practices in China, especially the large-scale urban design projects with relevant research, continuing to do explorations in dynamic process of urbanization in contemporary China with the team members from Research Institute of Urban Design, Southeast University.

JEFFREY R. KENWORTHY

Dr Jeff Kenworthy is Professor in Sustainable Cities in the Curtin University Sustainability Policy Institute (CUSP) at Curtin University in Perth, Western Australia and former Guest Professor at Goethe University. Currently he is a Guest Professor at the Frankfurt University of Applied Sciences, Germany. Professor Kenworthy teaches courses and supervises postgraduate research students in the area of urban sustainability. He has 35 years experience in urban transport and land use policy with over 250 publications in the field and has lectured in 33 countries and 82 cities throughout the world.

His most well-known books are Cities and Automobile Dependence: An International Sourcebook (Newman and Kenworthy, 1989), Sustainability and Cities: Overcoming Automobile Dependence (Newman and Kenworthy, 1999) and An International Sourcebook of Automobile Dependence in Cities, 1960-1990 (Kenworthy and Laube, 1999) and An Introduction to Sustainable Transportation: Policy, Planning and Implementation (Schiller, Bruun and Kenworthy, 2010). His new book from August 2015 is entitled The End of Automobile Dependence: How Cities are Moving Away from Car-Based Planning.

He is particularly noted for his international comparisons of cities around the theme of reducing automobile dependence. His most recent research involves updating of comparative urban transport data in some 50 cities around the world. His expertise in international comparative data lends itself well to benchmarking studies of individual cities or groups of cities, examining their land use and transport strengths, weaknesses and trends, and some underlying possible reasons for such trends. Some future prospects and priorities for a more sustainable transport system can also be explored using these data.

HOWARD M. NEUKRUG

In January 2016, Mr. Neukrug retired as Chief Executive of Philadelphia Water (PW), a USD 1 billion public utility responsible for drinking water, wastewater, stormwater and water resource management in Southeastern Pennsylvania, USA. Mr. Neukrug is a national leader for urban sustainability and the creator of Philadelphia's Green City, Clean Waters program. He is a Professional Engineer, Board Certified Environmental Engineer and a graduate in Civil and Urban Engineering from the University of Pennsylvania, where he currently teaches a course on Water, Science and Politics. In April 2016, Mr. Neukrug will join the US Water Alliance as a Senior Fellow, an organization dedicated to transforming the way our nation values and manages water.

LAURA BARRON

Laura Barron, Research Associate, Penn Institute for Urban Research

Laura Barron is the Research Associate for the Penn Institute for Urban Research. In addition, she is a part-time student at the University of Pennsylvania, where she is finishing a Dual Master's Degree in Environmental Studies and Public Health with a certificate in GIS. Her research focuses on environmental sustainability, urban health disparities, climate mitigation and adaptation techniques, and geospatial analysis. Prior to working for Penn IUR she worked for Greener Partners, in Malvern, PA and Mobile Kitchen Classroom, in New York City, NY addressing urban food equity and sustainability. She also completed a Post-Baccalaureate degree in Urban Studies at Columbia University in the City of New York where she worked with the Cypress Hills Local Development Corporation on a community garden and childhood health and nutrition project in Brooklyn. Her work there addressed how environmental programs, like urban agriculture, can increase safety, community involvement, and health in disadvantaged areas. She received her Bachelors of Art in Anthropology, Spanish, and International Studies at Trinity University in San Antonio, Texas.

ZHUOJIAN PENG

Zhuojian Peng (Nelson) is a senior designer at Calthorpe Associates; he has been practicing urban design for five years, focusing on infusing New Urbanism principles into Chinese cities. Previous projects include urban design in Chenggong, Chongqing, Zhuhai, Xiamen and Jinan. He published the translation of <Urbanism in the Age of Climate Change> by Peter Calthorpe in 2012. Nelson got his master degree in city planning from University of Pennsylvania and bachelor degree from Sun Yat-sen University in urban planning.

YANTAO CUI

Mr. Cui is a seasoned planning officials in the City of Jinan, he has worked in the Planning Bureau for over two decades, supervised many key projects in the city, including the city master plan, Regulatory Plan of the Central Jinan, Historical Preservation Plan of Old Town and the latest Jinan CBD projects. Mr. Cui is the Director of Urban Planning Department of Jinan.

JIANGYAN WANG

PhD, PE. Executive Director, China Sustainable Transportation Center. Dr. Wang received her bachelor and master degree in China in 1984 and 1987 majoring in Transportation Operation and Systems Planning; PhD in USA in 1991 in Civil Engineering, specializing in Transportation Planning. She has over 20 years of experiences working extensive projects in USA, China, India, and Abu Dhabi, in the capacity of researcher, planner and team leader. Her technical specialty includes sustainable city planning, TOD planning, carbon emission evaluation, transit network and operation planning for large events as Olympic Games, transit feasibility study, travel demand modeling and traffic simulation. She joint CSTC in 2011 and engaged in low carbon city pilot projects planning and execution for several Chinese cities and also working with related ministries in developing city and national standards and codes.

PETER CALTHORPE

Peter Calthorpe's long and honored career in urban design, planning, and architecture began in 1976, combining his experience in each discipline to develop new approaches to urban revitalization, suburban growth, and regional planning.

In 1983, Peter Calthorpe founded the award-winning firm of Calthorpe Associates devoted to sustainable urban design and planning globally. Throughout his honored career in urban design, planning, and architecture, he has been a pioneer of innovative approaches to urban revitalization, community planning, and regional design. For his contribution in redefining the models of urban and suburban growth, Calthorpe was awarded ULI's prestigious 'J.C. Nichols Prize for Visionaries in Urban Development' in 2006. He is one of the founders and the first board president of Congress of New Urbanism. In 1986 he, along with Sim Van der Ryn, published Sustainable Communities, a book that inspired several generations of new thinking in environmental design and helped launch 'sustainability' as a defining goal of many ecological efforts. In the early 90's he developed the concept of Transit Oriented Development (TOD) highlighted in The Next American Metropolis, an idea that is now the foundation of many regional policies and city plans around the world. In 2001 he published The Regional City: Planning for the End of Sprawl with Bill Fulton, explaining how regional-scale planning can integrate urban revitalization and suburban renewal into a coherent vision of metropolitan growth. His seminal plans for Portland, Salt Lake City, Los Angeles, and post-hurricane Southern Louisiana demonstrated a more interactive approach to environmental design at the Metropolitan scale. His latest book, Urbanism in the Age of Climate Change, documents his work relating patterns of development to energy and carbon emissions, along with other environmental, social and economic impacts. Recently he led a groundbreaking state-wide urban design effort, Vision California, to inform the implementation of the state's Climate Change legislation.

After studying at Yale's Graduate School of Architecture, he joined the Farallones Institute as Director of Design. Beginning private practice in 1978, with the firm of Van der Ryn, Calthorpe and Partners, his work ranged from large community plans to energy efficient residential and commercial buildings. Since forming Calthorpe Associates in 1983, his work expanded to include major projects in urban, new town, and suburban settings within the United States and abroad. Internationally his work in Europe, Asia and the Middle East has demonstrated that community design with a focus on environmental sustainability and human scale can be adapted throughout the globe. His current work throughout China is focused on developing standards and examples of Low Carbon Cities in Beijing, Chongqing, Kunming, Zhuhai, Jinan , Xiamen and other major cities. He summarized his design method and principles in China in the 2014 publication - TOD in China with Baojun Yang and Quan Zhang.

MFANISENI FANA SIHLONGONYANE

Prof Mfaniseni Fana Sihlongonyane is an associate professor and Postgraduate Coordinator in the School of Architecture & Planning, University of the Witwatersrand. His research interests spread over a wide range of theoretical, applied and policy arenas in the global as well as African realms of development. The research encompasses principally the interface between development and urban studies largely within the context of the poignant dynamics of the political economy in Africa. Over the years, he has worked and published in areas of land reform, planning, gender, spatial development, urban politics, local economic development, community development, and African city. The analysis of these topics is drawn from a wide range of disciplines which include: economics, history, sociology, anthropology, political and geography. More so, his insights in the exploration of these areas are draw from his experience as an African. He is currently the Alternate Chairperson of the SACPLAN Council.

MARTIN LEWIS

Martin Lewis is the Chief Executive Officer of the South African Council for Planners (SACPLAN). Prior to taking up this position he was the Head of the Department of Town and Regional Planning at the University of Johannesburg. He holds a Bachelor degree and Master degree in Town and Regional Planning from the University of Pretoria, South Africa.
Martin is a Registered Professional Planner with the South African Council for Planners (SACPLAN), a Chartered Town Planner with the Royal Town Planning Institute - UK (RTPI), and a Corporate Member of the South African Planning Institute (SAPI). He is also a member of a number of International bodies which include the International Society of City and Regional Planners (ISOCARP). He was employed at local government for approximately 15 years prior to moving to the Academia in 2005. His last employment within local government was with the Ekurhuleni Metropolitan Municipality.
Martin was part of a team that developed the "Quinary Career Development Model". The model uses Learning Simulation as the link between education and training on the one hand and Work Integrated Learning and Career Placement, Advancement and Transition on the other. This model can be implemented across various disciplines (e.g. education, engineering, town planning, sport and exercise science), level of programmes (e.g. from National Diploma to Masters Level), and modes of delivery (e.g. fully online, blended and face-to-face).
Martin Lewis' research interest stretches from Land Use Management, Spatial Planning, Strategic Planning, Urban Planning, Property Development, Sustainable Development and Transformation in Urban Planning to Work Integrated Learning (WIL) and Simulation in support of Education, Training and WIL.

LILY SONG

Lily Song is a Senior Research Associate at the Harvard University Graduate School of Design and a Lecturer of the City Planning and Urban Affairs Program at Boston University's Metropolitan College. Her teaching and research focus on issues of urban sustainability, livability, and justice; race and class politics in American cities and postcolonial urban contexts; and community-based economic development. From 2013-2015, she was a Provost Fellow with University College London's Department the Department of Science, Technology, Engineering, and Public Policy, where her research investigated how Indonesian local governments are incorporating urban informality to effect transformative planning in the area of sustainable transport and urban development. She holds a PhD in Urban and Regional Planning from MIT; Master's in Urban Planning from UCLA; and BA in Ethnic Studies from UC Berkeley.

JOHN TAYLOR

John Taylor is an urban planner and activist. He is the founder and director of the local Indonesian NGO Yayasan Kota Kita (Our City Foundation) whose mission is to help people make thoughtful and inclusive decisions about their cities by facilitating citizen participation and collective action. Kota Kita works on a range of urban issues including informality and planning, participatory planning and budgeting, publically available urban information, and climate change resilience. Over the last 15 years John has worked in Latin America, Africa and Asia, on a range of urban governance issues. He has also served as a consultant to UNDP, UN HABITAT, and The Asia Foundation. He received his Masters in Urban Planning from Harvard University, and his Bachelors of Architecture degree from UC Berkeley.

GREAT VALLEY MIDDLE SCHOOL

Great Valley Middle School is located in Malvern, PA. Eighth grade students have competed in the Future City Competition for more than 15 years as part of their mentally gifted seminar on Future Studies. This year, under the direction of Mrs. Kelly Eidell, a group of 20 students worked collaboratively to develop their vision of the future. The process included a computer model, an essay and abstract, a physical model, and a presentation by three of the students that represented the work of the class as a whole. Their city, Evameria, represents the futuristic vision of a group of 20 14 year old students.

SAINT CECILIA SCHOOL

The Future City Competition was introduced to Saint Cecilia School by new principal, Sister Jane Mary Carr when she took the helm of the school in 2008. The following year an engineer mentor, George Gaynor came on board and a small team of enthusiastic eight grade students who dreamed, planned, and built a city. It was Future City Competition's 17th year.

The beauty of the program was the promotion of the principles of Science, Technology, and Engineering, and Mathematics or STEM curriculum to foster young students who have an interest in engineering. It was the perfect time to introduce Future City to St. Cecilia School with the soon to be implemented Science for the Next Generation curriculum standards implemented a few years later.

Over the years the St. Cecilia team has grown in the knowledge gained and built upon by students from one year to the next, and in shear number of students involved. The program also grew to include both seventh and eighth grade students.

On a shoestring budget typical of a Catholic, urban school, each new school year the students and the engineer mentor plan and build a model city in the back of Mrs. Debra Brewster's seventh grade science classroom and sometimes in empty classrooms nearby when available. These students interested in engineering and technology have spent many hours outside the school day, in the evenings and weekends. Most of the model is made from recycled materials carefully kept from year-to-year along with donations from students with great ideas, sometimes even an item discarded.

It takes the students about four months to plan and build a Sim City model for the city, and work out the technology together each week in meetings, and finally a model to bring to competition. Every idea is heard and occasionally fierce debates ensue, however it is remarkable how the students come together in the last couple of weeks of the competition and finally embrace and understand the solutions for the theme as well as how a city works.

The best part of the program is watching the transformation from a great idea to tackle a problem, like solid waste management (the 2016 theme for Future City Competition) and see the conversion from drawing board and brainstorming to concrete solutions tackling the problem. The team understands that futuristic is exciting and taps the imagination, but also wants a better world for today and tomorrow, so the students keep an eye (with the help of the engineer mentor) on using technologies that have the potential to work in the future.

St. Cecilia Future City team is going into its seventh year and the hope of all those involved in this endeavor is to serve the needs of future students and foster careers in engineering.

ABOUT THE EDITORS

SHI NAN

As ISOCARP VP Publications, Dr Shi Nan is the first responsible EXCO member in the area of producing and distributing ISOCARP publications in different formats. He has been the editor for Review 07 to 10.

At home he is the Secretary General of the Urban Planning Society of China. His voluntary roles include Vice Director for 3 national commissions on planning education, professors at universities including Renmin University of China, Harbin Institute of Technology, etc.

A productive author in China, Dr Shi Nan's monthly column for the respected academic journal CITY PLANNING REVIEW, of which he is the chief editor, is the most popular planning literature in China.

Focused on policy analysis and city comprehensive planning, Dr. Shi Nan's 32-year professional background includes Senior Planner at China Academy of Urban Planning & Design, advisory services to Madrid, Moscow, Sao Paulo, Beijing, Shanghai, Guangzhou, Nanjing and other Chinese Cities.

FRAN KLASS

Fran Klass has been editing professionally for more than 40 years, including stints with medical publishers, a not-for-profit enterprise in the pharmaceutical arena, and a brief time spent in the world of "vanity," or self- publishing. A graduate of The Pennsylvania State University, now known as "Penn State," Fran was an English major with a minor in Secondary Education.

After a few ill-spent years teaching high school English, Fran moved into publishing, where she has held positions ranging from proofreader to managing editor. Fran has been the managing editor of a medical journal since its inception 30 years ago and continues to serve in this capacity to the present day. **Along with her husband, Jim Reilly, and their very assertive Wheaten Terrier, Maggie, Fran spends her non-editing moments scuba diving, playing tennis, and catering to the aforementioned Maggie.**

JIM REILLY

Jim Reilly began his planning career with the award-winning firm of Wallace, McHarg, Roberts and Todd, where he worked for nine years. His major assignments included portions of the Plan for the Inner Harbor, in Baltimore, MD; and elements of the Metro Systems in Washington, DC and Baltimore, MD. Eventually Jim was a Senior Project manager for the Plans for Abuja, the New Federal Capital of Nigeria. He then started his own (but not financially successful) company developing computer programs to assess economic impacts from planned improvements. Later, he worked for over 20 years as a senior planner and regional scientist for the State of New Jersey (USA) Office of State Planning and for the State of Maryland (USA) Department of Planning. While at these state agencies, Jim conducted statistical research about land use change and various impacts associated with change.

He is the author of numerous articles in various refereed journals as well as the author of GAMe, a computer model to predict future small area forecasts of land consumption, population, and jobs.

Jim is a disabled veteran, having served in the US Army (Reserves) Medical Corp for 25 years as well as two wars. He is the recipient of 35 medals for his service.

Jim is now retired, happily married to Fran (see Associate Editor), scuba dives, fly fishes, and travels.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