Research Paper

Healthy City versus Resilient Planning Paradigm

Case Study of New City Centre in Lodz, Poland

Małgorzata Bronisława HANZL, Lodz University of Technology; Poland
Lia Maria BEZERRA, Warsaw University of Technology; Poland

Abstract

In the current article, we are looking at some of the challenges of planning for healthy and resilient cities with a focus on the features of the physical structure. In order to examine the physical structures, we use qualitative assessment based on the comparative framework and the typo-morphological approach. We look for criteria of assessment based on the already existing indexes of health measurement. The above attempt is illustrated by the case study of the city of Lodz, Poland. We are looking at the best solutions which would enable healthy lifestyles and climate-resilient development. Our discussion refers to optimal models of mixed-use development and streetscapes of a central part of Lodz, namely focused around so-called New City Centre of Lodz, indicating possible alternative paths of its redevelopment. The methodological approach is supported by background research into the fields of resilience and healthy lifestyles.

Keywords

healthy city, lifestyle, urban form, streetscape, resilient planning

1. Introduction

This paper looks at some of the challenges of planning for healthy and resilient cities with a focus on the features of the physical structure. We examine desired densities and open spaces proportions, green areas, as well as the role and extent of transportation networks. In order to examine the physical structures, we use qualitative assessment based on the comparative framework and the typo-morphological approach. The above quest for the balance is illustrated by the case study of the city of Lodz, Poland. Initially, the model of development which has been prepared for the whole area within administrative borders of the town, with the special focus on the central areas is based on the typological classification. It includes the detailed analyses of a variety of the 19th-century neighbourhoods, with the special attention on their morphological development. The actual picture is further joined by the presence of open spaces related to transportation land uses, as numerous open parking lots. Taking into account the property structure, the elimination of some of these parking lots may be partially done through temporary use policies and recently introduced rehabilitation regulations. We analyse the potentials behind the presence of these large open spaces and define

future path options for their reuse in this paper. We are looking at the best solutions which would enable healthy lifestyles and climate resilient development. The Lodz municipality has addressed the problem of preparing the analyses and proposing strategies to redevelop some of the areas as green spaces, which we include in the paper. Based on the analysis of the case study, we attempt at the research of relationships between the fields of urban studies: resilience, planning for healthy urban environments and quality of life. Our discussion refers to optimal models of mixed-use development of a central part of Lodz, namely focused around so called New City Centre of Lodz, indicating possible alternative paths of its redevelopment. The methodological approach is supported by background research into the fields of resilience and healthy lifestyles. The relationships between the culture of usage of space and the urban forms have already been discussed extensively in similar research (for instance Thomson, Newman 2018, Fisher-Kowalsky et al. 2019). In conclusion, we summarise the discussion by providing the assessment and reasoning of the development methods.

2. Healthy cities versus climate change

2.1. Relationships between the domain of climate change planning and healthy city paradigm

Cities are major foci of production and consumption and its inhabitants rely on resources and services that are secured from areas outside of the city perimeter. Cities are not independent, but rather depend on their local, regional and global systems to function. Cities form complex systems, where climate change impacts not only the blue, green and grey infrastructure but also basic surrounding resources that guarantee the life in cites, from water and food supply to waste disposal, energy production and transportation, which draws severe consequences to the well-being and health of also those that live in the city.

Due to its individual characteristics, potential climate change impacts will be different, but can be generalised into mainly flooding, water scarcity, and heat island effect, which generates primary and secondary impacts, each having their own influence on the city system and the health of its inhabitants. Urban dwellers live in a higher concentration inside urban perimeters, which exposes them to contagious diseases that are prone by crowding, as epidemiological outbreaks by viruses, bacteria but likewise of rodent and vector-borne diseases. The current urban lifestyle also exposes dwellers to diseases related to noise, water and air pollution and other unfolding complications associated to vulnerability, causing violence and inequality.

Climate change impacts the health of urban dwellers in many ways and is often distributed unequally among more vulnerable segments of society (UN-Habitat 2014). Poorer urban inhabitants often suffer due to their informal or risk-prone dwelling condition and overall sensitivity, limitations on reactions to climate change impacts. Within poorer communities, women and girls are impacted more severely due to their traditional roles in the community. When analysing age and gender solely, the elderly and the young suffer with the direct and indirect impacts associated with climate change, as they’re less able to sustain injuries or illness, but also women suffer differently than men. A World Health Organisation (WHO 2014) study found more supporting evidence that despite climate change-related disasters impact the health of both men and women, on average, natural disasters

kill more women than men, which is proportional to the harshness of the disaster and effect women the most in countries where they have lower social, economic and political status.

Studies (Elmqvist et al. 2013, Hardin and Jensen 2007, Bowler et al 2010) have confirmed that green and blue infrastructure can reduce some of climate change's health impacts within cities through focused design. The placement of vegetation and water can help in alleviating extreme temperatures locally. The studies show that heat can be absorbed by water areas while greenery reflects solar radiation and aids in diminishing temperatures locally by shading and evapotranspiration. Urban greenery has the additional quality of being able to reduce air pollutants primarily nitrogen and Sulphur oxides (Hartig et al 2014). The combination of blue and green infrastructure can contribute with reducing flood-related health risks, by stabilising the soil and reducing the risk of landslides, while the design of water areas can also provide planned areas to hold off excessive rainfall or water surges complementing future-proof drainage systems. Vegetation and urban green areas as parks and gardens can contribute to alleviating noise pollution while providing areas for relaxation, de-stressing, physical activity and community encounters.

The potential impacts that climate change can have on urban dwellers' health could be partially reduced by city planning. In what it relates to the physical characteristics of an urban area, mitigation strategies that include careful green area design, vegetation protection, diminishing urban heat islands, improving the air pollution management, future-proofing water management can have a positive impact on the amelioration of urban dwellers health undergoing climate changes.

2.2. Urban Health Indicators

The measurement of urban dwellers' health is linked to various characteristics and circumstances, physical settings, living and working conditions, environment, quality of services, community organisation, among many more. The interest in population health is not recent but has increased with the growing worries that come with future proofing our settlements. Measuring and correlating such vast themes is far from a simple task, however, once established it aids the understanding of the current status of urban health and is capable of strengthening governance within the area (Doyle 1999), and aiding decision makers and planners to make better choices for the future. The mapping of urban health and its application can link planning inputs, health outcomes and economical benefits, becoming in itself a resource in the community (Green et al 2009).

One of the most prominent measurements that take into consideration health within a given urban geographical boundary is WHO's Urban Health Index (UHI). The UHI provides insights on various health indicators that enable the temporal and geographical comparison (WHO 2014b). The index separates its themes under five main umbrellas – health, environment, geography, economics and social demographics – where each are then subdivided firstly into relevant domains, and secondly indicators, which are catered to the data available in the analysed area. The UHI itself has the flexibility to adapt to the specificity of the local context, while keeping a solid measurement capable of being compared throughout different localities.

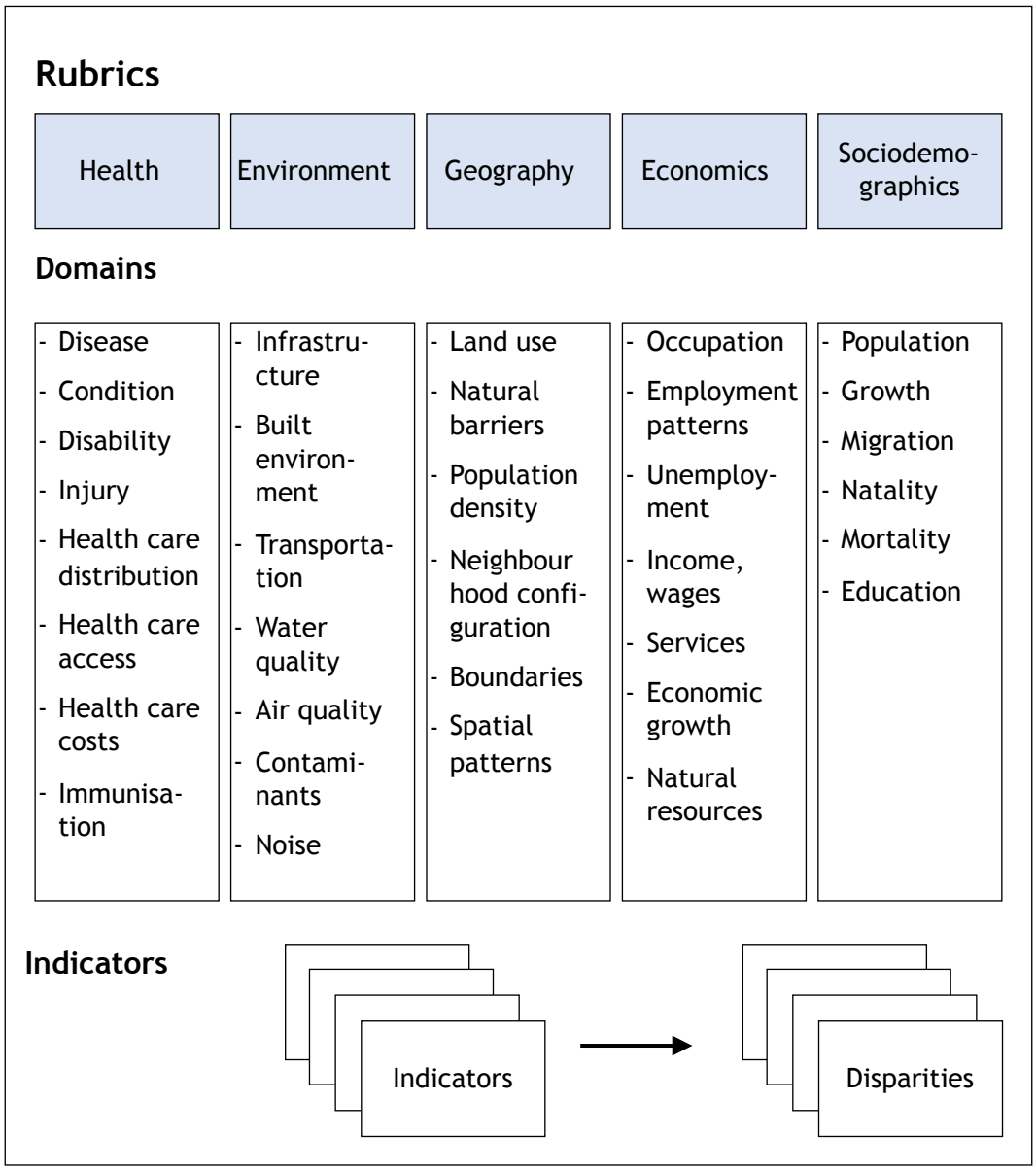

Figure 1 Framework for Classifying Measures of Urban Health, redrawn after: WHO (2014b, Figure 2)

The five main umbrellas over which UHI is based upon has been similarly used in its predecessor Health Cities Indicators (HCI) in 2012: health, health services, environmental indicators, social economic indicators. The HCI is designed in 2012 is a review of a set of indicators selected in 1998, which is a succession of improvements on the analytical framework (WHO 1998, Webster et al 1996 in Webster 2012). These can be grouped in 3 main groups: health, environment and social economics.

Table 1 presents two sets of health assessment factors based on two recognised elaborations (Webster and Sanderson 2012; WHO 2018). The list of indicators by Webster and Sanderson (2012) is of more normative character. The UHI (WHO 2018) offers a choice of collections of measures which might be applied based on the data availability.

Table 1. Two frameworks for assessment of urban health

Index	**Healthy City Indicators**	**Urban Health Indicator**
Abbreviation	HCI	UHI
Year	2012	2018
Author	Webster P. and Sanderson, D.	WHO
Application	Europe	Urban Areas
Themes/indicators		
Group 1 HEALTH	Health	Health
	mortality	disease
	main causes of death	condition
	low birth weight	disability
	Health Services	injury
	city health education programs	health care distribution
	immunization rates	health care access
	inhabitants per primary health practitioner	health care costs
	inhabitants per nurse	immunization
	percentage of population covered by health insurance	
	availability of services in foreign languages	
	health debates in city council	
Group 2 ENVIRONMENT	Environmental indicators	Environment
	air pollution	infrastructure
	water quality	built environment
	sewage collection	transportation
	household waste treatment	water quality
	green space	air quality
	derelict industrial sites	contaminants
	sports and leisure facilities	noise
	pedestrianization	Geography
	cycle routes	land use
	public transportation access	natural barriers
	public transportation range	population density
	living space	neighborhood configuration
		boundaries
		spatial patterns
Group 3 SOCIALECONOMICS	Socioeconomic indicators	Economics
	percentage of population in inadequate housing	occupation
	homelessness	employment patterns
	unemployment	unemployment
	poverty	income, wages
	availability of child care	services
	age of mothers at time of birth	economic growth
	abortion rate	natural resources
	employment of disabled people	Sociodemographics
		population
		growth
		migration
		natality
		mortality
		education

3. Methodology of assessment

3.1. Qualitative assessment

In the current paper, we would refer to a set of factors which might help evaluate the urban environment on a neighbourhood scale. We propose a simplified framework which might contribute to the assessment of the specific urban design solutions. The evaluation refers to physical urban structures and their relationships with specific lifestyles. The framework covers some normative components of sustainable urban design, including mobility and transportation, greenery and natural environment, promotion of social capital through public spaces and social participation, preservation and reuse of old structure, mixed-use development, compact development and appropriate densities. These postulates repeat in documents since Agenda 21 (UN 1992); they contribute a commonly recognised assessment framework for sustainable urban design. In our proposal, we looked for similar normative axioms in urban health framework and examined their interrelations. Then we combined the principles as a single assessment matrix and applied to the chosen study.

3.2.Typo-morphological approach

Further, we apply the typo-morphological approach to the analyses of open and unused spaces. These spaces are, for the most part, responsible for the perception of the urban settings. In this category, there are both spaces which serve the recreation and public life - public squares and parks, and these which are subordinated to the transportation needs - first of all, streets. The urban landscapes might be classified (Newman and Thompson 2018, Marshall 2005) into groups related to the primary development of various modes of transportation: pedestrian, based on public transportation, cycling or based on individual, car transportation. The modes of transportation contribute an explicit relationship with various types of lifestyles; the widespread presence of individual car-based transportation proves the dominance of unhealthy sedentary lifestyles, whereas the presence of comfortable pavements and cycle paths offers the opportunity for more active lifestyles.

3.3.Analyses of planned conditions

Further, we applied the typo-morphological approach to the analyses of planned, built structures. The reading of densities, the contribution of mixed-use development, the Green Area Ratio let us explore the future conditions of urban environment. Specifically useful proved the GAR, which is expressed through the parameter of *'biologically active area'* defined by the Polish building code (RMI 2002) as:

- *'area with soil surface arranged in a way which assures natural vegetation,*
- *50% of the surface of terraces and decks, if they are arranged as permanent lawns or flowerbeds with such surface - their size cannot be smaller than 10m2,*
- *surface waters'.*

This parameter strongly affects both local safety and stability of functioning of urban environments thanks to the management of the water retention and, at the same time, it is responsible for the urban heat island (UHI). In the current situation of climate change, the UHI, and desertification together with flash floods are next to strong winds, the three principal challenges for central Poland.

4. Case study - New City Centre of Lodz

4.1. Background information

The New City Centre of Lodz project extends next to the redeveloped railway station Łódź Fabryczna (Hanzl 2011). It contains several heritage post-industrial edifices and 19th-century tenement residential structures which used to accommodate social housing. The redevelopment plans cover circa 90 ha which spreads between streets Sienkiewicza, Narutowicza, Kopcińskiego, Tuwima. The railway station has been hidden underground to provide fast railway connection between Warsaw and Wrocław. The undertaking involves stakeholders at various levels who orchestrate their efforts to rehabilitate a large central area located in the direct proximity of the town's main street Piotrkowska. The project, which started in 2007, when the City Council approved the project and in 2008 when a culture institution EC1 was established (Wycichowska 2008), assumed more specific forms along with the approval of two local plans of urban development by the City Council in Lodz: III/40/14 and III/41/14. Parallel to the construction of the new Fabryczna railway station which replaced former terminus, the several new streets were built.

4.2. Qualitative assessment

The health aspects of the urban environment tend to be assessed against a framework which refers to the more holistic scale - such a research has been also performed for Lodz, without however selecting a specific neighbourhood ((Kaleta, Makowiec-Dabrowska, Jegier 2004). In case of a single location, more normative features apply. In order to be able to evaluate the current case study, we have chosen some of the elements which refer to the local environment and characterise with more normative aspects. Table 2 contains a full list of the assessment criteria, along with the case study assessment performed for a given list of features.

In order to propose a framework of assessment of urban health (UH), we have picked up the factors referring to the environment from the lists of Healthy City Indicators (Webster & Sanderson 2012) and Urban Health Indicators (WHO 2018). We then completed the framework adding the most commonly listed features of Sustainable Development (SD), as discussed above. It is clear that the project of the New City Centre of Lodz still needs many adjustments in order to satisfy the criteria, both for urban health and sustainable development. The provision of open green spaces, leisure facilities, recreation and organised public space is for now very low. Instead, there are many open spaces of large roads adjusted for the needs of car transportation. Whereas there are pavements and some cycling infrastructure is also present, they are mostly in the open air, and the users of them have to deal with strong winds and high insolation in summer. Streets' greenery is still to be planted, however not everywhere the space for it has been satisfied. The parks approved in the local plans of urban development have not been organised so far, and their spaces have been taken by automobile infrastructure. The positive aspects refer to the development of mass transportation - tramways and buses - connected with the station which after the construction of the underground connection between the two main railway stations in Lodz: Fabryczna and Kaliska, has got a chance to become a primary hub of public transport in the city.

Table 2 Qualitative assessment based on the proposed framework which refers to the categories of sustainable development (SD) and urban health (UH).

	Activities/ Goals	SD	UH	Case study Assessement
UH	Air pollution - low levels	X	X	-
	Green space availability	X	X	-
	Sport and leisure facilities	X	X	-
	Pedestrianisation	X	X	+/-
	Public transportation access	X	X	+
	Living, social space	X	X	-
	Low levels of noise	X	X	-
	Balanced population density	X	X	+/-
	Protection against UHI and draughts	X	X	-
SD	Compact development/ appropriate densities	X	-	+/-
	Preservation of old structures and their reuse	X	X	+
	Sustainable transportation/ mobility	X	X	-
	Promotion of social contacts through better social spaces	X	X	+/-
	Promotion of citizens' participation	X	X	+/-
	Protection of natural environment	X	X	-
	Mixed-use development	X	-	+/-

4.3.Typo-morphology of the streetscapes and planned development

The streets' system in the area went through a major transformation. Several new streets have been built, other altered significantly. Some streets designed in the plans still wait their turn. Summarising the process of transformations we might notice the typological shift from more equal distribution of 19th-century multi-use street layouts to more specialised segregation including streets adjusted to performed specific roles. In this group the major share (12% of the site) is taken by the automobile roads. This category would be the most prone to changes in future along with the shift to more pedestrian/public transport oriented city. They require planting of trees and adjustments to enable constructions along. Another emerging category are pedestrian streets, which offer a valuable residential environment, they are however scarce (2% of the site). Besides other types include: tram way integrating streets, traditional streets and interior streets. Figure 2 shows profiles of the largest group of automobile streets in the area.

Figure 2 Car oriented streets, total area: 111 147m2, 12% of the area of the area covered with the local plans of urban development under consideration.

The analysis of the planned development has focused on the Green Area Ratio parameter (Figure 3) and enabled counting of the runoff from the site. The analysis proves that there is still a lot to be done to satisfy the needs for proper organisation of water management in order to reduce the negative impacts of both flash floods and urban heat island; both of these phenomena have a major impact on urban health conditions.

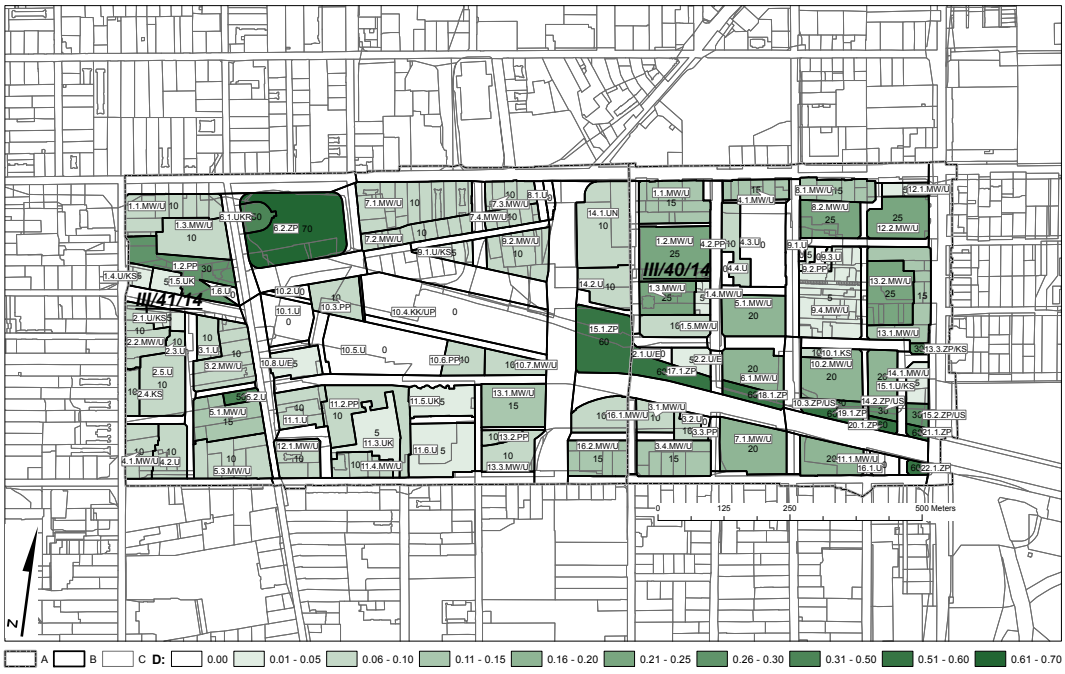

Figure 3 Green Area Ratio values for the local plans of urban development (III/40/14 and III/41/14).

5. Conclusions

In the current paper, we propose a method of evaluation of urban design interventions based on the normative frameworks of sustainable development and urban health assessment. The latter used the already predefined methods with a particular focus on the relationship between lifestyles and forms of the urban environment, notably streetscapes. We compared the three frameworks: of sustainable development, urban resilience and urban health looking for overlaps and mutual relationships. In the next step, we applied the method to the case study of a large-scale urban redevelopment project of New City Centre in Lodz. The project occurs to fail to fulfil many of the criteria of the proposed research frameworks.

The typo morphological analysis shows the transformation of the street network from the traditional, 19th century one into the hierarchical layout with pedestrian streets and car subordinated roads. The latter category dominates, which makes explicit the dominance of a car as a principal mode of transportation. This is associated with the predominance of sedentary lifestyles and creates threats for citizens' health. Still, some new streets which integrate tramways have been constructed, which improved the integration of public transportation system.

The preliminary analysis of the transformations of the area so far proves the need for more green infrastructure; the current levels of GAR remain very low. The focus on the development of GI is needed to improve the water management and to diminish the impacts of urban heat island (UHI). The assessment criteria enable benchmarking of the project strategies so far and look to adjust the strategy in future.

The study confirms the role of urban voids: open public spaces (including streets and parks) which influence the quality of urban life. Methods to assess their relationships with urban health have been developed. This current study proved that an attempt at the methodology for analyses and assessment may become a useful tool for urban design. The current experience gave us the initial thoughts on the conditions which have to be fulfilled to apply the method to a project. Further steps include the application of a similar methodology to other case studies, including larger scale ones.

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