

5. The role of street design in supporting social and environmental functioning of the city



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Abstract

This chapter addresses the urgent need to transform urban streets, transitioning from a dominant car-centric model established in the second half of the 20th century towards multifunctional public spaces that prioritize social and environmental sustainability. It argues that streets must reclaim their original role as places of social interaction, vitality, and recreation, in response to contemporary challenges such as increased traffic and the scarcity of quality public spaces. The analysis is structured around two fundamental pillars. The first is the social aspect, where physical and psychological safety are paramount. Studies in Warsaw reveal that women perceive greater insecurity due to traffic and inadequate infrastructure, emphasizing the need to foster citizen participation to create a sense of belonging and “territorialism.” The second is the environmental aspect, which addresses phenomena such as the urban heat island effect and storm-water management. In this regard, it advocates for the implementation of nature-based solutions, such as green and blue infrastructure, to improve the microclimate and increase biodiversity. Through a case study of three streets in the Ochota district of Warsaw, the text proposes concrete design guidelines including widening sidewalks, visually unifying street furniture and facades, and integrating functional vegetation. Finally, the chapter

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concludes that success in creating resilient and pedestrian-friendly cities depends on an interdisciplinary and holistic approach, which must harmoniously integrate “hard” infrastructure with “soft” socio-cultural processes, thereby guaranteeing quality of life and long-term urban vitality.

Keywords: *returning streets to communities, public spaces, rapid increase in the number of cars.*

Introduction

Urban space plays an essential role in shaping social relationships in the contemporary world and significantly influences the quality of life for many people. Due to the rapid increase in the number of cars and the lack of high-quality public spaces, particular attention should be given to the potential of pedestrian-friendly urban streets. However, streets are still not commonly perceived as places where social relationships are formed. Approaches implemented in the second half of the twentieth century, which prioritized car traffic, remain predominant (Jacobs, 1961) resulting in the gradual disappearance of social activities carried out in the streets. The original role of streets, prior to the era of ‘car-centricity’ (Sattlegger & Rau, 2016), when they used to be a source of urban life, fulfilled leisure and recreational needs, and served a variety of functions is fading into oblivion. In public discourse, concerns about an increasing number of aspects related to the presence of pedestrians in the streets are becoming increasingly frequent. Therefore, returning streets to communities is one of the key multifaceted challenges faced by contemporary cities (Mbazuigwe & Kimic, 2021).

Street design guides

The development of the traffic calming concept began after the Second World War. Initially, cities were adapted to the needs of public and private transport. As industry and technology advanced, the era of the car-friendly city emerged. By the 1970’s, urban structures had been greatly adapted to

accommodate car traffic, often at the expense of pedestrian space. Since the 1980's, the negative impacts of car traffic on urban environments have become increasingly apparent, prompting city planners to reconsider how to design cities that are more responsive to the needs of residents (Schmucki, 2001).

Today, concepts such as walkable cities (Forsyth & Southworth, 2008), livable or living streets (Appleyard et al., 1981; Lusher & Seaman, 2008), complete streets (Kingsbury et al., 2011), and traffic-calming solutions such as *woonerf* (Appleyard & Cox, 2006) are widely implemented. The twenty-first century has also seen the development of numerous guidelines outlining principles for designing urban streets. Many of these, such as the *Global Street Design Guide* by the Global Designing Cities Initiative (2016), identify key challenges and propose spatial solutions tailored to the needs of pedestrians and cyclists.

Another example is *Calles para la vida: Trayectos seguros y saludables para los niños de América Latina y el Caribe*, developed by UNICEF, which addresses social, educational, and child safety issues. In addition, many cities and regions produce their own guidelines tailored to local conditions. There are also comprehensive guides that compile universal solutions applicable across different urban contexts, regardless of geographic location.

The social aspect

One of the most important factors influencing the quality of public space is safety, which constitutes a basic human need. In the context of streets, safety depends on factors such as car, bicycle, and pedestrian traffic, road infrastructure, and crime levels. Even aspects related to infrastructure quality influence users' psychological comfort and their willingness to spend time in a given space.

James Kunstler (1998) argues that urban spaces form the foundation of society, as they embody the history, identity, and aspirations of their inhabitants. Social space is shaped by both territory and culture; therefore, the location and connectivity of culturally significant places are of great importance. If residents develop a strong territorial bond with their place

of residence, the overall sense of security and social balance increases (Bell, 2004).

Place identity can be expressed through high levels of social participation, including residents' involvement in collective activities aimed at improving shared spaces. Another manifestation of such engagement is the growing number of urban movements that advocate for quality of life and respond quickly to concerning actions by authorities. The most attractive public spaces are those that evoke positive emotions and play a key role in shaping community life.

In this context, territorialism can be understood as a set of attitudes and motivations of individuals or groups in relation to their spatial environment (Szarejko, 2008). Sociologists identify territory as a key factor influencing human behavior in space and distinguish three primary attitudes toward it: negation, neutrality, and belonging (Fuhrmann, 2009).

Residents, as the primary users of space, should be actively involved in the design process. Participation fosters a sense of belonging, strengthens social capital, and helps create groups that take responsibility for their surroundings. However, it is important to recognize that different stakeholder groups may have differing goals. A lack of dialogue between developers, officials, architects, and residents often results in urban designs that are unclear and fail to meet community needs.

In the context of revitalization, the social dimension is just as important as the physical one. A holistic design approach, combined with active community participation, can lead to projects that better address local needs and adapt to the unique characteristics of each area. As landscapes are shaped by the culture of their inhabitants, it is essential to recognize residents not only as users or consumers, but also as co-creators of the public good (Wisznio-wski, 2019).

The environmental aspect

Cities and their streets are characterized by a unique microclimate that affects the living conditions of their inhabitants. Studies in urban climatology analyze climate changes caused by human activity and explore ways to min-

imize the negative effects of this phenomenon (Szczepanowska, 2015). The concept of “urban metabolism” has also been introduced into the analysis of anthropogenic factors influencing the natural environment, related to demographic changes, technologies, and economic competition (Borsa, 2015).

The urban heat island effect is created by an increase in air temperature resulting from hydrological changes and a growing share of heat-absorbing surfaces, such as pavements and buildings, compared to biologically active areas. Poorly insulated houses, building walls that heat up quickly, and impermeable surfaces intensively absorb solar radiation and emit the stored energy in the form of heat. The decreasing number of biologically active areas reduces evaporation, which cools the urban environment, while also contributing to the concentration of air pollutants (Żmudzka, 2019).

It is important to highlight the impact of climate change on biodiversity, as well as on the distribution and ranges of plants and animals. There is increasing ecological awareness among city dwellers and a growing appreciation of the presence of natural elements in urban environments (Kalinowska, 2015). Green areas are places where many needs of inhabitants are met; they provide spaces for recreation and offer numerous health benefits (Szulczewska, 2014).

Well-designed street greenery helps to slow down and limit surface runoff of rainwater, thereby preventing erosion and flooding. This is due to the reduction in the force and number of raindrops reaching the ground, as well as the transpiration of leaves. Roots create a microporous soil structure, allowing water to infiltrate the ground more efficiently. Urban greenery, including street plantings, strengthens the sense of community and helps combat social exclusion.

Green infrastructure has a positive impact on species preservation and protection, water resource management, and mitigating as well as adapting to climate change. It also contributes to increased safety, improved living conditions, economic growth through rising property values, and local social and cultural development (Szulczewska, 2014).

In cities, the existence of trees, shrubs, and herbaceous plants is particularly threatened by human activity. Therefore, solutions are needed to enable the proper development of vegetation in highly urbanized environments. The proper design of street greenery—such as the introduction of

species-diverse green belts—should form the basis of urban spatial planning due to its important multifunctional role.

One of the main challenges of street greenery is its conflict with underground and above-ground technical infrastructure. The scarcity of green and blue infrastructure in the urban microclimate limits a city's ability to counteract negative weather phenomena. An integrated ecosystem approach enhances urban resilience to climate change, and the more extensive the system of green and blue infrastructure, the more effective it is in maintaining stable environmental conditions (Gorgon and Gocko-Gomoła, 2016).

The degradation of the natural environment and the depletion of raw materials contribute to the intensification of natural disasters such as storms, hurricanes, and floods. Urban resilience has been incorporated into the urban resilience model, defined as the measurable ability of a city system and its inhabitants to maintain continuity of development during climate crises and shocks, while adapting positively toward sustainable development (City Resilience Profiling Tool, 2018).

The urban resilience model provides cities with opportunities for development, enabling them to ensure the safety of residents and their property (Tyburek, 2017). A systemic approach to urban development in the era of global climate change promotes sustainability and environmental friendliness. It contributes to restoring the functioning of the biosphere, purifying water, increasing the extent of natural habitats, and enhancing biodiversity.

Case study

The objects selected for the research are three streets located in the Ochota district of Warsaw, Poland: Julian Ursyn Niemcewicz Street, Filtrowa Street, and Grójecka Street. They were selected due to their diversity in terms of development, visible social and environmental problems, and their potential for changes in land use to improve social and environmental functioning.

At the same time, these streets differ in terms of width, traffic volume, and spatial development, while remaining in close proximity to one another. Their location within the same area of the district, as well as their functional and visual relationships, allows for the identification of both differences and

similarities when comparing them in the context of social and environmental aspects.

Methodology

Detailed analyses of three streets in Warsaw were carried out in relation to two aspects. In the case of the social dimension, a safety analysis was also performed, including the occurrence of the so-called “eyes on the street,” as described by Jane Jacobs (1961).

A crucial stage of the research was the conduct of social research aimed at understanding public opinion—specifically that of Warsaw residents—regarding their needs and attitudes toward city streets. For this purpose, a survey method was used, which also focused on the two aspects of sustainable development. The obtained results constituted an important source of information and served as a basis for defining the guidelines developed at a later stage of the work.

The environmental aspect was assessed based on the share of biologically active surfaces, tree canopy cover, the occurrence of the urban heat island phenomenon, and the presence of green and blue infrastructure elements. Based on information from the literature review, as well as the results of the assessment of each street, design guidelines were formulated and summarized in a table. These were then used to develop the proposed spatial solutions for the selected streets.

Discussion of the results of social research

The study shows that most Warsaw residents feel comfortable in street spaces. However, there is a noticeable difference between the sense of security of women and men. Women more often than men indicate that the level of safety on streets is unsatisfactory. They also more frequently notice the lack of priority given to pedestrians over vehicular traffic. More than twice as many women as men feel unsafe when riding a bicycle or scooter. Conversely, unlike men, most women believe that it is a good idea to close

selected streets to car traffic during the summer season. This may be driven by the need to increase safety in the use of street space, which is particularly conducive to such measures. It is also consistent with the still-prevailing stereotypical division of roles in society.

The visibility of the influence of “social gender” further encourages a participatory approach to spatial planning, including the design of city streets. Such an approach, based on broadly understood participation (Ga-decki, 2006), allows spaces to be adapted to the diverse needs and expectations of users who most frequently use them, while improving accessibility.

The survey results also show that respondents feel less safe in public spaces due to poor infrastructure quality, intensive car traffic, the excessive number of cars in public space, dangers from cyclists and scooter riders, and instances of pathological behavior. If not addressed in a timely manner, these problems are likely to worsen. Nevertheless, street infrastructure has played a crucial role in the structure of cities for centuries, as evidenced by ancient communication routes. It facilitates economic exchange and connects people and cultures. This aspect cannot be neglected when considering spatial development, especially in terms of improving social and environmental conditions.

Residents who view streets as neighborhood spaces mention numerous activities carried out within them, such as neighborhood meetings, community involvement, organizing events, caring for parking spaces, and other street-based activities. The majority also believe that streets contain places important to the local community, including local shops, markets, restaurants, green areas and potted plants, street furniture, residential parking spaces, playgrounds and outdoor gyms, sidewalks, promenades, pedestrian crossings, various services, city squares, and road and public transport stops. These places and elements are typically long-standing, frequently used, and well-remembered. They help build local identity and reduce the risk of “no-man’s places.”

Respondents show a clear preference in the assessment of green elements. Trees are considered the most attractive and durable plants, providing shade, purifying air, and maintaining humidity (Szczepanowska, 2015). Mowed lawns, which generate high maintenance costs, are increasingly perceived as less attractive. This shift reflects growing awareness of

climate change, the consequences of drought, and the positive impact of diverse forms of greenery on urban spaces. Flower meadows, in particular, are now seen as more attractive than traditional lawns and are gaining wider acceptance among the public.

Table 5.1. *Increasing drivers' awareness by introducing Tempo-30 zones*

<i>Result</i>	<i>Guidelines</i>
Poor quality elements of road infrastructure	Improvement of the quality of pavements, bicycle paths and pedestrian crossings, repair of damaged roadsides
Excess space dominated by parked cars	Arranging parking spaces, introducing the sign informing about restrictions - no stopping, parking may be towed away and /or introducing barriers in the form of vegetation and elements of small architecture
Danger from cyclists and people on scooters	Separating a space dedicated to cyclists and scooter users Organization of collision-free intersections — for cars, pedestrians, and cyclists
No priority for pedestrians	Increasing drivers' awareness by introducing Tempo-30 zones
No spatial order	Standardization of all elements of street development in terms of their form, materials, and colors
Too few parking spaces	Arranging the layout of parking spaces, unifying the parking system to clarify the applicable rules Expanding paid parking zones, increasing prices for parking spaces, restricting entry to some places for residents only
Excess pedestrian barriers	Arranging the elements of the development so that they do not disturb passers-by
Attractive and valuable trees, shrubs, and flower meadows	Giving up lawns generating high maintenance costs, replacing them with cover plants, shrubs, and flower meadows. Planting shrubs, perennial beds, and ornamental grasses under trees
The least attractive mowed lawns	
Insufficient protection against adverse weather conditions	Introducing more plants, especially trees Increasing the number of bus shelters

Table 5.2. *Standardization of all elements of street development in terms of their company, materials, and colors*

<i>Aspect</i>	<i>Issue</i>	<i>Design guidelines</i>
<i>The social aspect</i>	<i>View sequences</i>	Standardization of all elements of Street development in terms of their company, materials, and colors
		Renovation of the facades of neglected buildings
		Unification of the visual setting of service facilities on the ground floors (signboards, shop windows, café furniture, etc.)
		Removal of large advertising banners or replacement with elements less interfering with the visual reception of the space
		Exposing attractive buildings and memorial sites by avoiding the introduction of tall vegetation and maintaining open sightlines.

<i>The social aspect</i>	Security	Widening of sidewalks to increase the comfort of pedestrians
		Introducing a clear and functional division of the space dedicated to pedestrians and cyclists
		Securing places where collisions may occur by using functional spatial solutions and adding development elements that separate spaces intended for different traffic users.
<i>Environmental aspect</i>	View sequences	Adding lower greenery under the tree canopy
		Adding stripes / green zones between roadways in the form of plantings of grasses, perennials, and low shrubs to maintain visibility on the road
		Complementing the existing plantings of trees and shrubs
	Biologically active areas	Use of green tracks
		Increase of the biologically active surface
	Urban tree canopy cover	Planting trees along the street
	The intensity of the “urban heat island” phenomenon	Replacing surfaces with permeable materials and carefully selecting material types, textures, and colors to reduce heat absorption. Use of a green track
	Use of green and blue infrastructure	Use of consciously shaped elements of green and blue infrastructure adapted to the linear layout of the street

Conclusion

The negative effects of urbanization, including the increased threats to pedestrians in urban spaces such as streets, require the implementation of solutions aimed at addressing these challenges, which is undoubtedly a considerable task (Von Schönfeld & Bertolini, 2017). Today, only a sustainable approach can determine the success of creating pedestrian-friendly spaces that—perceived as safe, fair, and attractive—encourage people to use them.

When planning public spaces intended for diverse users, compromise-based solutions should be prioritized. Giving priority to pedestrians and cyclists is crucial in designing street spaces in urbanized areas and

maintaining their vitality, even with the understanding that not all users will be fully satisfied with the changes introduced.

Another important finding is that without an interdisciplinary approach to planning public space, including streets, it is impossible to positively influence its condition. It is essential to complement the “hard” components of design—such as gray, green, and blue infrastructure, and architecture—with “soft” elements, which include socio-cultural processes and the everyday life of inhabitants. Today, such an approach is necessary to ensure the proper functioning of public spaces. A holistic, comprehensive approach is key to their complete and effective design.

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