

# Public Space Design as a Stimulator for Movement of Pedestrians. Case Study: Municipality of Vracar, City of Belgrade

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## 1 ABSTRACT

Contemporary trends in urban design and shaping of public spaces are set in domains defined by the principles of sustainable development. One of the propensities relates to ever-increasing presence and implementation of spatial and programmatic concepts and projects in areas that foresee usage and affirmation of environmentally acceptable modalities of traffic such as pedestrian movement, cycling, usage of electrically powered vehicles, etc. With respect to that, pedestrian movement, as a basic and natural form of human movement has become a subject of research of multidisciplinary teams of experts and organisations on the global level, especially in the last two decades<sup>1</sup>.

This paper will demonstrate correlative actions of the quality of pedestrian environment and infrastructure directed towards pedestrians' motivation for movement along street ways that connect city centres. The research was conducted on the polygon of the Municipality of Vracar, City of Belgrade, encompassing local centres and links between them. Data has been collected by using methods of direct field research and the method of surveying the local inhabitants. By systematising and comparing the collected data this paper determines relations of the subject of research. Special care was dedicated to pedestrian environment along the observed ways, which includes arrangement and activities in the ground floors of the buildings, which define the street ways, equipment in street ways and conflicts with other participants in the traffic. The research has demonstrated that the frequency of pedestrian movement is not only proportional to equipment and surrounding of street ways, but to diversity and continuity of contents in the ground floors of the buildings, while being oppositely proportional to the number and frequency of motor vehicles.

Main result of this paper and the aim of this research is defining suggestions for improving and equipping pedestrian ways and environments, which are to motivate people to opt for pedestrian movement in areas which are characterised as surmountable by pedestrians according to their dimensions and criteria. By creating such areas, the cities could be defined as a system of zones with predominantly pedestrian movements.

Key words: pedestrian movement, quality of pedestrian ways and surroundings, improvement of pedestrian side walks, polycentricity, Vracar, Belgrade.

## 2 THEORETICAL FRAMEWORK OF THE RESEARCH

With an aim of enhancing spatial connections and forming the new city centre, so as to avoid monocentricity and uneven development, this paper establishes an analytical tool in order to explore a variety of physical and functional characteristics of urban space. The analytical procedure was applied in the study of specific polygons in the territory of Municipality of Vracar, City of Belgrade. The results of the research provided for mapping of potentials and problems of the subject polygon that prevent or encourage the development of the observed local centres, paths that represent their connections, and diversity in usage of public space. The focus of this paper is to identify paths/directions that directly link important local centres, determine their specificities and actual intensity of pedestrian movement, mark problems which lead towards discontinuity in usage of entire route by pedestrians and define recommendations for avoiding the spotted problems. The research is based on the premise that the usage of local centres will be enhanced through intensification of pedestrian movement along paths that connect them.

The research is centred on theoretical framework within the domain of urban design with the spotlight on pedestrian movement and quality of pedestrian environment. Especially important in the given context are the works of three authors Kevin Lynch, Bill Hillier and Jan Gehl, because they take into consideration perception and orientation of users while moving through public space and reasons why people use specific public space and spend time within it. In his work *The Image of the City*, Kevin Lynch defines legibility of the city and urban environment by determining five basic structural elements (paths, edges, districts, nodes

<sup>1</sup> Actual COST project Action 358 Pedestrian Quality Needs, WALCLYNG, PROMPT and organisations such as WALK21

and landmarks). Hillier puts forward a general theory of how people relate to space in built environments in populated areas and considers various aspects of space and ways this space functions in his *The Social Logic of Space* and *Space is the Machine*. Gehl, in his *Life between Buildings, Public Spaces-Public Life and New Urban Spaces*, presents the results of intensive research on the topic of social usage of public space and experiences and thoughts of people related to a specific open public space. Besides the stated, Gehl portrays the method of evaluation of quality of cities, discusses the ways in which human sensory abilities direct the usage of public space and sets design recommendations techniques which can encourage active use of outdoor space. Also important for the aims of this paper is the article „Close Encounters between Buildings“, in which Gehl, taking into consideration characteristics of human perceptual apparatus, defines framework for direct experience of space and elements of the built environment, which are perceived during pedestrian movement, while moving 5 kilometres per hour. In this context, Gehl recognises the perceptual frame – urban scene – in which he notices the following key elements: scale and rhythm, transparency, appeal to multiple senses, texture, diversity of activities and vertical rhythm of façades.

## 2.1 Phases of Research

Theoretical framework mentioned above enabled for determination of specific analytical methods, which allowed for identification of concrete spaces within the observed territory which are a part of this research, and for which this paper, at the later phase of research will define recommendations with an aim to intensify pedestrian movement along the observed paths. Each of the formatted analytical methods is used at a certain phase of research so as to obtain as many relevant data for argumentation for further steps and recommendations.

The first part of the research was realised at the Faculty of Architecture, University of Belgrade, within the Master course UrbanLab, led by Assistant Professor Aleksandra Djukic and the undergraduate course Design of Public Space led by Professor Dragana Bazik. The second part of research was realised in cooperation with non-governmental organization “5km/h” from Belgrade.

There were two steps within the first phase of the research. The first one referred to research of the wider location, which encompassed the space defined by territorial framework of the Municipality of Vracar. The aim of this part of research was to identify spaces which are of importance for the investigated area and which hold capacity to become a local city centre, and connections among them used most often by the local inhabitants. This was achieved by using the method of direct surveying the users of space in the Municipality of Vracar. Besides the mentioned, the respondents were asked to define some of the basic characteristics of the investigated paths. The formulation of questionnaires was based on Lynch’s theoretical framework. The results that relate to paths as an element of urban image were of particular relevance. The second phase of was conducted in order to determine the users’ direct experience of identified paths, based on the criteria of quality of open public spaces (Bazik 2006). The analysis was carried out on the entire territory of the Municipality of Vracar. Within this phase, the research analysed only direct paths that connect the local centres.

The second part of the research was aimed to reveal the correlations between intensity of pedestrian movement along identified paths and characteristics of the pedestrian environment. The used analytical procedure was based on the method of space syntax and analysis of characteristics of pedestrian environment, according to Gehl’s criteria. Systematisation of results enabled for mapping of problems that lead towards discontinuity in pedestrian movement along identified paths and formulating recommendations for avoiding them.

## 3 CHARACTERISTICS OF KEY PATHS IN THE MUNICIPALITY OF VRACAR

The questionnaire formed based on Lynch’s theoretical framework was used in order to identify key paths in the investigated territory. The purpose of this part of research was to recognise the structural elements that formulate the image of the Municipality of Vracar and are in accordance with paths, edges, districts, nodes and landmarks.

### 3.1 Path Identification

Key spots, public spaces of local importance and paths that connect them were identified through direct surveying of local inhabitants, users of the open public spaces. The results demonstrated the necessity for

forming the network of pedestrian movement and thus connecting the separate public spaces of local importance (Cvetni Square, Kalenic Market and plateau in front of the Belgrade Drama Theatre) with an intention to intensify their usage.

By summarising the results of surveying the research has defined the following paths: the streets of Njegoseva, Milesevska, Maksima Gorkog and Cara Nikolaja II. The Njegoseva Street directly connects Cvetni Square and Kalenic Market. Paths along the streets of Milesevska, Maksima Gorkog and Cara Nikolaja II connect the Kalenic Market and plateau in front of the Belgrade Drama Theatre. Conducted poll enabled for definition of concrete polygons, paths that were a subject of further research of the quality of pedestrian environment. The results are displayed in the diagram (Figure 1).



Figure 1: Paths that connect local centres

Besides extracting paths that were a subject of further research, the respondents had the opportunity to determine their features related to modes of use of the identified streets. Based on these results, Njegoseva Street was characterised as one in which the respondents would prefer to spend time and one which is used most frequently. Maksima Gorkog and Cara Nikolaja II streets were characterised as busiest, in terms of non-pedestrian traffic, but also frequented by pedestrians. Milesevska Street was characterised as one in which the respondents would prefer to spend time.

### 3.2 Quality Evaluation of Identified Paths

Further research was founded on analysis of quality of open public spaces, based on the determined criteria: safety, accessibility, legibility, comfort, attractiveness and liveliness (Bazik 2006). The hierarchy was established among the set criteria; this meant that if basic criteria are not fulfilled, above all safety and accessibility, it would not be possible to accomplish other characteristics which contribute to liveability of certain space. Each of the set criteria was taken into account separately and it points towards direct experience of users related to the observed characteristic of the open public space. The respondents were asked to indicate spaces that can be characterised as positive or negative, with respect to the observed criterion and give short explanation.

Result summarization of surveying according to the set criteria determined the general attitude that the local inhabitants were more critical of basic criteria, which focused on safety, accessibility and legibility. Hence identified paths were mentioned as both positively and negatively characterised. With respect to other criteria, the results were more balanced; either positive or negative (Figure 2).

Based on the set criteria, from the aspect of safety Milesevska St. was characterised most positively, while Maksima Gorkog St. most negatively; from the aspect of accessibility Njegoseva St. was characterised most positively, while Cara Nikolaja II St. was characterised most negatively; from the aspect of legibility Njegoseva St. was characterised most positively (no negative comments), while Cara Nikolaja II St. was characterised most negatively; from the aspect of attractiveness Njegoseva St. was characterised most positively (no negative comments), while Maksima Gorkog St. was characterised most negatively (no positive comments); from the aspect of liveliness Njegoseva St. was characterised most positively (no negative comments), while Cara Nikolaja II St. was characterised most negatively (no positive comments). It

is assumed that the basis for such results is the recent reconstruction of Njegoseva St, which provided for wider sidewalks, less frequency of vehicle transport, activation of contents in buildings' ground floors. On the other side, Maksima Gorkog and Cara Nikolaja II Sts. are extremely frequented by vehicle transport, with narrow sidewalks, intense pollution, discontinued sections of street frontages, both vertically and horizontally.

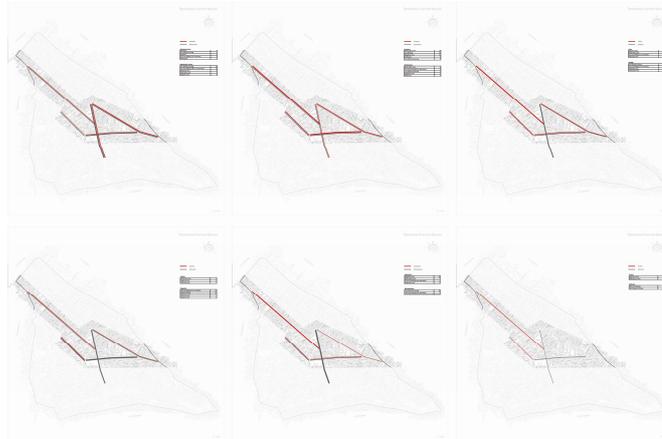


Figure 2: Results of quality evaluation analysis

### 3.3 Intensity of Pedestrian Movement and Characteristics of Direct Pedestrian Environment

The following part of research had an aim to determine actual usage of identified paths through analysis of frequency of pedestrian movement on daily basis. This analysis was conducted by using the method of Space Syntax. The results of this research revealed certain unevenness in frequency of pedestrian movement, both with respect to different time at which the measurements were conducted, and with respect to concrete part of the identified path (Figure 3).



Figure 3: Results of the path analysis using the method of Space Syntax

The measurements were conducted on workdays, four times a day. In the morning period from 8 to 9 hours, when local inhabitants perform activities such as going to work or school or grocery supply; from 11 to 12 hours, which coincide with end of school hours for elementary school students, breaks for high school students and lunch break for the employed (this period also coincides with the start of working hours for cafes and restaurants); in the afternoon, from 16 to 17 hours, when local inhabitants come back from work; and from 19 to 20 hours, in the so-called evening hours.

The results demonstrate that from 16 to 17 hours the pedestrian movement is most frequent, if we observe the entire polygon where the measurements were conducted. On the other side, from 19 to 20 hours there was least pedestrian presence. What was also concluded is that there are differences along paths in intensity of pedestrian movement or the phenomenon of discontinuity.

The continuation of research led towards determination of correlation between pedestrian movement and characteristics of pedestrian environment (Figure 4). Therefore, further investigation encompassed the analysis of activities in buildings' ground floors in the observed path, with the focus on diversity of activities, their density on certain parts of the path, and characteristics of shop fronts and entrances, i.e. transparency. These characteristics were taken into account because the current urban regulative allows for potential interventions in buildings' ground floors. This relates to transformation of housing space along street frontages for other purposes.



Figure 4: Segment of street frontages in Maksima Gorkog and Milesevska steets

Content analysis provided for certain correlation between frequency of pedestrian movement in the observed period, content attractiveness and its disposition along the paths. The analysis demonstrated that the frequency of pedestrian movement is proportionate to number activities, i.e. their density and diversity in specific segments of the investigated streets. Besides, a greater frequency is observed during afternoon, from 16 to 17 hours. This period is considered as most frequent, when the employed come back from work, while other inhabitants spend their time in the open. Important differences with respect to certain segments of the paths are observed in the early morning and evening hours. This is especially so in the areas which are characterised by density of cafes and restaurants on one side, and zones with contents which are closed in the evening hours on the other. From 11 to 12 hours there is more frequency of pedestrian movement in areas close to schools.

The continuation of this activity concerned the analysis of shop windows and entrances, i.e. transparency and direct linkage between content in buildings' ground floors and open public space. Same as above, the intensity of pedestrian movement is more frequent along frontages in which shop windows are less distant and occupy larger surface. This is particularly visible during evening hours, when the transparency of protective curtains was observed.

#### 4 GENERAL RECOMMENDATIONS

The conclusion of up-to-date research comes down to a set of recommendations related to improvement of pedestrian environment. Concrete interventions, which can come out of these recommendations, could influence the intensification of pedestrian movement along identified paths. Recommendations are related to the following type of interventions: determination of new street regulation along paths that have been characterised as unsafe and inaccessible by citizens; establishment of continuity with respect to vertical and horizontal regulation along the identified paths; anticipation of measures for stimulation of attractive activities and their even arrangement along the paths, which would allow for proportional usage of space at all period of the day; enlargement of the window shop surfaces in order to achieve greater contact between the activities in objects and open public spaces, and provide for new and more transparent types of protective curtains so as to stimulate pedestrian movement during evening hours. Besides these general recommendations, this project will carry on in the direction of determining exact indicators that will additionally embed attitudes provided through direct observation and compare results of various analyses.

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