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Eva Vaništa Lazarević, Aleksandra Đukić,
Aleksandra Krstić - Furundžić, Milena Vukmirović

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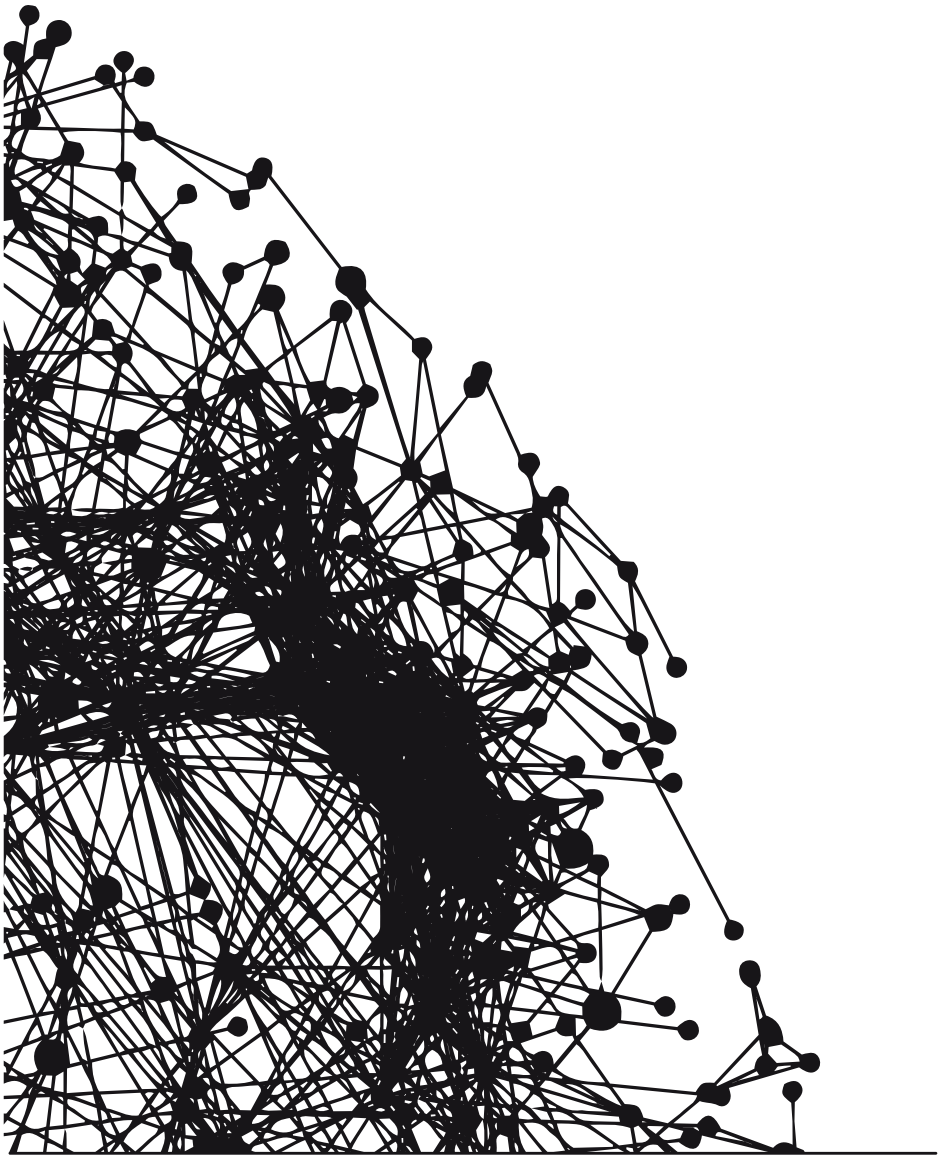

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COMFORT OF OPEN PUBLIC SPACES: CASE STUDY NEW BELGRADE

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Abstract

Open public spaces are very important for sustainable contemporary cities as important generators of users and activities. The concentration both of users and activities produces livability and vitality of districts and city (Hass-Klau, 1993; Jacobs, 1972; Whyte, 1988). Recent research has shown that the microclimate of open public spaces is important for intensity of use, as thermal conditions affect people's behaviour and usage of outdoor spaces On the other hand, the comfort of open public spaces depend on urban design and its morphological characteristics. The outdoor thermal environment, is impacted by the surrounding surfaces and objects (Ichinose et al. 1999), materialization of ground surface (Lin et al. 2007), evaporation and evapotranspiration of plants (Robitu et al. 2006), shading by trees or constructed objects (Lin et al. 2010). However, rain, wind, hot weather can greatly influence the comfort of users of open public spaces. In the paper, Block 21 in New Belgrade has been analyzed, before and after transformation, using ENVI-met simulations and direct survey of citizens. Such analysis could help designers to create comfort urban place, which could increase the number of users throughout the year, with the focus on hot summer periods.

***Keywords**: open public space, comfort, New Belgrade, users*

Introduction

The energy intensive way of life has created numerous problems that constantly threaten the endurance of ecosystems on global and local lever, while additionally the climate change begin to modify our perception of the living environment in terms of accepting its limitations and actions to mitigate the effects. The urban areas are the most affected by climate change, and the measurements have shown the increasing of temperature in densely built urban zones – heat islands (Jones et. al., 2009; IPCC, 2007). During the last 55 years, in Serbia temperature has increased by over 1.4ºC/100 years (Karadžić & Mijović, 2007). All prediction models for climate change point out an incr-easement of temperature of about 3-4°C in Serbia until the

end of 21st century. This phenomenon will have the impacts on infrastructure, physical structure, vegetation, agriculture, water resources, health of citizens and mitigation to new created circumstances.

On the other hand, open public spaces could serve as the key urban elements for enhancing gathering of users and to diminish the negative effects of urbanization.The success of open public spaces can be measured by frequentation of pedestrians and concentration of users (Gehl, 2006; Carmona et al., 2003; Hillier & Hansen, 1984). The concentration both of users and activities produces livability and vitality of districts and city (Hakim et al., 1998; Hass-Klau, 1993; Jacobs, 1961; Whyte, 1988). Pleasant conditions can attract people to spend more time outside their apartments. According Ellaway, in devastated urban areas in Europe, there are three times less users than in comfort, well equipped and safe ones (Ellaway, 2005). However, open public spaces should fulfill certain qualities, needs and requirements of users. Comfort of outdoor space, together with safety, is one of the most important qualities of open public spaces and local microclimate is the main factor which drives individual perception and assessment of the place. Identity of open public spaces as well as lighting, surveillance and urban gardens and parks can provide the positive image of the place. Litter, graffiti, vandalism, obstacles along the pedestrian paths which slow down walking, construction places and lack of greenery make walking less pleasant, but also have direct implications to attractiveness, comfort and safety of open public places (Ellaway, 2005). However, the open public spaces with high-quality standards are more vibrant and provide better image to the local community and city.

One of the main criteria for quality open public spaces is comfort. Outdoor thermal comfort is important for frequentation of pedestrians and concentration of users. It is influenced not only by physiological response to highly variable microclimatic parameters, but also by psychological and cultural adaptation. Although, the age, gender, weight, activity, clothing and exposure to the sun are very important for thermal comfort and thermal tolerance, every climatic region has its own, specific characteristics and meanings of an index (Nikolopouloua & Steemers, 2003). Thermal comfort has to be adjusted to the local situation and cannot be used globally.

METHODS

The research polygon was the territory of the Municipality of New Belgrade, Block 21 (one of the oldest blocks in New Belgrade). This research forms part of a broader research aimed at defining recommendations for the revitalization and rehabilitation of communal spaces in an attempt to create an attractive and lively place which can satisfy the users` needs (Djukic, Vukmirovic, 2012). In this paper two research scopes were discussed: one with direct surveys of citizens and another one based on bioclimatic urban design checked with virtual ENVI-met simulations. The aim of first research was to determine the users` needs in open public and

communal spaces inside the “mega blocks” and the aim of second one is to compare the situation before and after the intervention.

The first part of the research was done using the direct population survey method. 200 citizens were questioned during two weeks in September in 2011 (2% of the population of Block 21). The socio-demographic characteristics of the respondents were quite similar with socio-demographic structure of the inhabitants of New Belgrade and Block 21 (more than 48% citizens were older than 45 years with average of 41,3 year; 60% have got high school education). The questionary includes analysis of the quality of the open communal spaces by using a system of six criteria that are related to: safety, accessibility, legibility, comfort, attractiveness and livability. This section is presenting a part of the results of valuation of open public urban spaces of Block 21 according to users` needs.

In the second part of research two options of urban design have been tested with the selected microscale climate model ENVI-met, one according the original plan for Block 21 (before the transformation, during the last two decades) and second one after the transformation (present situation). ENVI-met can estimate surface temperature, along with all the other microclimate parameters, for each finite element of the computational domain. All geo-referenced data can be extrapolated using the Xtract utility.

RESULTS

The results of the survey

The results of the questionnaire show that users are the most concerned about safety, especially the lightening of communal open spaces. They are also complain about the comfort (during the different seasons, 67% think that it is not pleasant in the communal space during the summer), about the capacity of parking lots and garages (92%) and percentage of green spaces (98%). The users were divided about the quality of maintains of the green open spaces (58% think that they are good maintained), about the capacity of sports facilities (42% think there is lack of capacity and variety) and about separation of different facilities by groups of users (58% would like strictly separation of facilities by different groups of users).

Results show that communal spaces, according to the opinion of the questioned inhabitants of the Block 21 do not fulfill certain criteria used to analyze quality of urban space. However, this tool is used to establish problems that will be overcome using adequate interventions in space and surrounding area. The inhabitants put the criteria safety on the first place (more than 80%) and after that equipment and general quality of pavement (Figure 1) and facilities (50%-60%), than accessibility and comfort (37%), and livability (capacity and diverse of activities) on the last place (30%). Although the criminal rate in New Belgrade is more or less the same like in the other parts of the city, it is interesting to notice that residents are the most concerned about the safety and comfort in the block (Djukic, Vukmirovic, 2012).

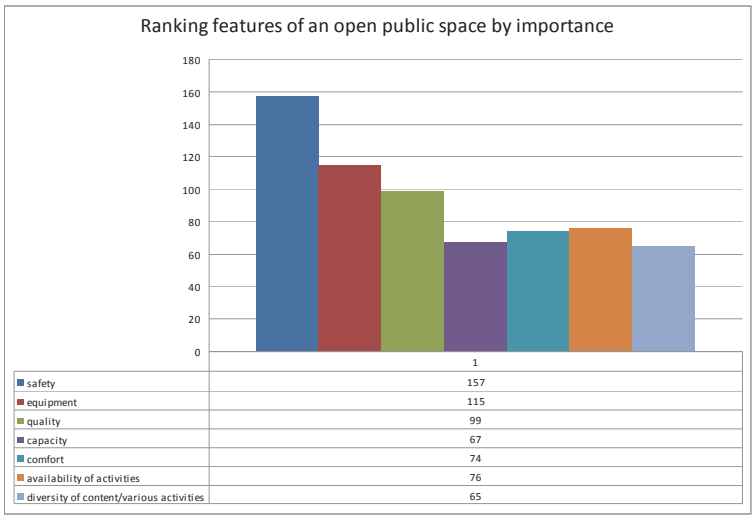

Figure 1: Priority ranking for redesign of open communal spaces in Block 21

The main goal of potential intervention in space should be upgrading the quality of communal space that people use on everyday basis, which fulfill their needs and with which they are linked with by specific feelings.

The results of ENVI-met test

The investigation is performed in summer 2013. The simulations were run for the 29th July 2013, which represents the hottest day of the year (40°C in Belgrade, 35 emergency interventions in open public spaces). The simulations were run during daytime hours, because of the concentration of users, from 10.00 until 13.00, although the model was run from 10.00 until 16.00 (in order to fulfill the minimum of 6 hours required by ENVI-met). The study area was transformed in a grid model 10m×10m×2m.

DISCUSSION

The research of valuation of communal open spaces of Block 21 according the six criteria shows what is missing and what parameters urban designer should consider during the design process as well as how to create the hierarchy between them to meet the users` needs. According the users opinion the main criteria in regeneration of communal open spaces should be safety and comfort (shading, more vegetation, equipment and general quality).

Outputs from the ENVI-met simulation for air temperature, comparing the states before and after the intervention, shows decrease due to shading and evapotranspiration of 1°C to 2°C, in the central part of communal open space and increase of temperature along the edges of the blocks (where new buildings were built). The paving material remains the same, but there are slightly difference in

covered area. Outputs from the ENVI-met simulations for mean radiant temperature shows significant reductions (between 5°C and 7°C) in shaded areas, and some increase in temperature because of the maintaining and age of paving.

Analyze of two options of urban design (before and after intervention) done with virtual simulation shows that communal open space has the potentials for improving microclimate. Improving of the paving (albedo, emissivity, impermeability), more vegetation in the central area, artificial shadings and car-free zone can improve the microclimate comfort.

CONCLUSION

Communal open spaces in mega blocks should reinstate their significance as gathering points and points for recreation and leisure, representing a reflection of urban culture. The future of these spaces, however, should not be the copy of models or good examples. The right approach to the problem of development and transformation of communal open spaces should be sought in accepting modern principles adapted to local conditions and trends that unavoidably lead to the formation of a specific model of sustainable public spaces.

Furthermore, the microclimate offered by an urban open space has a strong impact on the thermal comfort of visiting pedestrians and consequently on the perception and the usage of the open space. However, in order to improve the communal open space in “mega blocks” in New Belgrade, it is necessary to fulfill the user’s demands and follow suggested interventions as well as to apply bioclimatic urban design principles. To achieve the improvements it is necessary to integrate them into the types of interventions and guidelines into the urban plans and projects, to provide public participation and education of citizens, local authorities and experts in the field of urban planning and design. Although most listed measures should contribute to the improvement of microclimate conditions, it is obvious that problems generated within urban mega blocks require more precise instruments and impose specific measures.

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