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# Principles of climate sensitive urban design analysis in identification of suitable urban design proposals. Case study: Central zone of Leskovac competition

Aleksandra Djukic[a], Milena Vukmirovic[a,*], Srdjan Stankovic[b]

[a] University of Belgrade—Faculty of Architecture, Blvd. Kralja Aleksandra 73/II, Belgrade, Serbia
[b] Imperial College London, South Kensington Campus, London SW7 2AZ, UK

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ABSTRACT

Paper represents the analysis of the change in the outdoor comfort during the summer days of open public space of the main square in Leskovac. The analysis covers the present state, two rewarded design proposals at urban design competition and proposal resulting from the evaluation of these solutions. The article focuses on the thermal comfort in outdoor space as a one of indicators in competitions of urban design, considering the fact that the re-design of public spaces often has a negative consequences of decisions made during the competitions. Following the thesis that successful public spaces should be responsive to the needs of their users, the paper considers the thermal comfort as the main quality of open public space. Analysis of microclimate could help designers to create comfortable urban place, which could attract vast number of users throughout the year, especially during hot summer periods. The aim of this paper is to highlight the complexity of the relationship between microclimate comfort in public open spaces and urban design, especially interventions such as implementation of the greenery and new surface materialization in order to emphasize the importance that this relationship has to be taken into account in urban design competitions.



## 1. Introduction

Climate change has a variety of effects throughout the world. In southern central Europe, there has been recorded increase in temperature, leading to Urban Heat Island (UHI) effects with some extreme temperatures [1,2].

Warming in these recent decades is larger over land than over ocean [3]. Hansen et al. [3] has shown that the warming during the past decade is enhanced, relative to the global mean warming, by about 50% in the United States, a factor of 2–3 in Eurasia, and a factor of 3–4 in the Arctic and the Antarctic Peninsula (see Fig. 1).

Explicit air temperature growth trend is present on the whole territory of Serbia [4]. Geographic distribution of the sign and intensity of the trend of annual air temperature in Serbia, according to data from the period 1951 to 2007 is given in Fig. 2 (left). Based on the research results presented by Popovic et al. [4] an increasing trend is dominated on the most of the territory of Serbia, while a slight decreasing trend is characterized only on southeast. According to the data after 1991 the whole of Serbia is experiencing a rapid increase in temperature, Fig. 2 (right).

Following these phenomena, public outdoor activity continues to stay a very important part in urban design, and its elements need to generate comfortable outdoor spaces where different types of use and different activities can play a major part in the quality of urban life [5]. The concentration of both users and activities in outdoor spaces produces liveability and vitality in cities [6–11]. Recent research has shown that microclimate is a very important factor for the success of public space. Comfortable and pleasurable outdoor spaces have the higher intensity of use [12,13], so there needs to be alleviation from high temperatures. Microclimatic comfort in urban spaces depends on appropriate urban design and morphological characteristics in the built environment [14]. Previous research has identified that thermal radiation is determined by surrounding surfaces and their materials [15], ground surface evaporation and evapotranspiration of plants [16], shading effect, and artefacts placed in the spaces [17]. Understanding the relationship between environmental conditions, human behaviour and the patterns of usage, open public spaces should contribute to the design of the outdoor environment and increase positive social and environmental outcomes. The aim of this paper is in determining

* Corresponding author. Tel.: +381 63603378.
*E-mail address:* milena.vukmirovic@urbanlab.org.rs (M. Vukmirovic).

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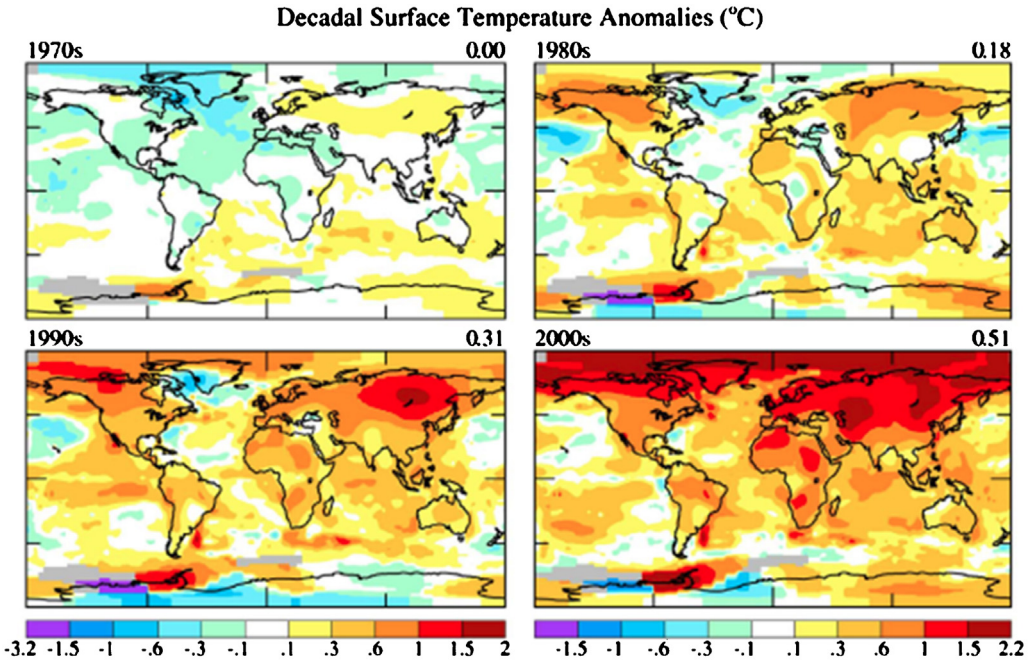


**Fig. 1.** Decadal surface temperature anomalies relative to 1951–1980 base period [3].

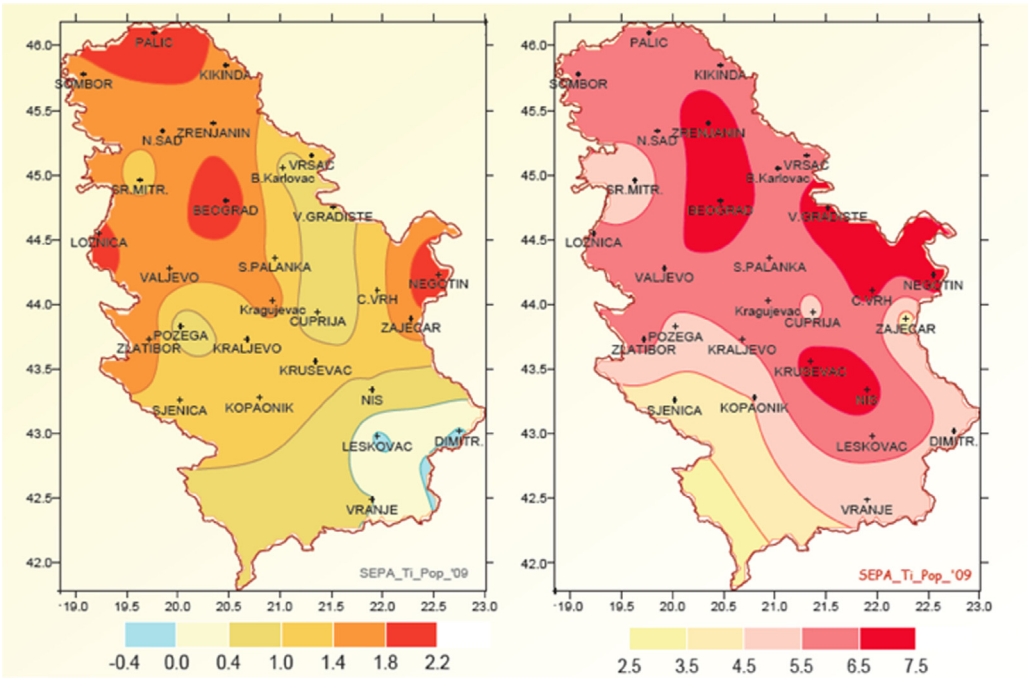


**Fig. 2.** Geographic distribution of the sign and intensity of the trend of annual air temperature in Serbia, according to data from the period 1951–2007 [4].

the climatically sensitive aspects of urban design. In cities, public spaces already exist and retrofitting has become more significant than creating new spaces. Urban design competitions have become the most significant mechanism for retrofitting process. Thus, the primary objective of this research is to test highly rated competition proposals for the main square in Leskovac[1] and compare them to the existing situation.

The paper presents a case study about the open public space in the centre of Leskovac, in which the correlation between the character of urban intervention at ground level (greenery and pavement) and microclimatic comfort has been assessed through comparative analyses of urban design competition proposals.

The focus of the research is the main square in the city centre of Leskovac. Originally built in late 1960s, after transformation of traditional planning into the principles of modernist urbanism. Over the next 50 years of its urban existence, the square has been subjected to numerous adjustments and changes of function and materialization. However, during the last decade, the local

[1] Leskovac is the city where the rapid increase in temperature was recorded.