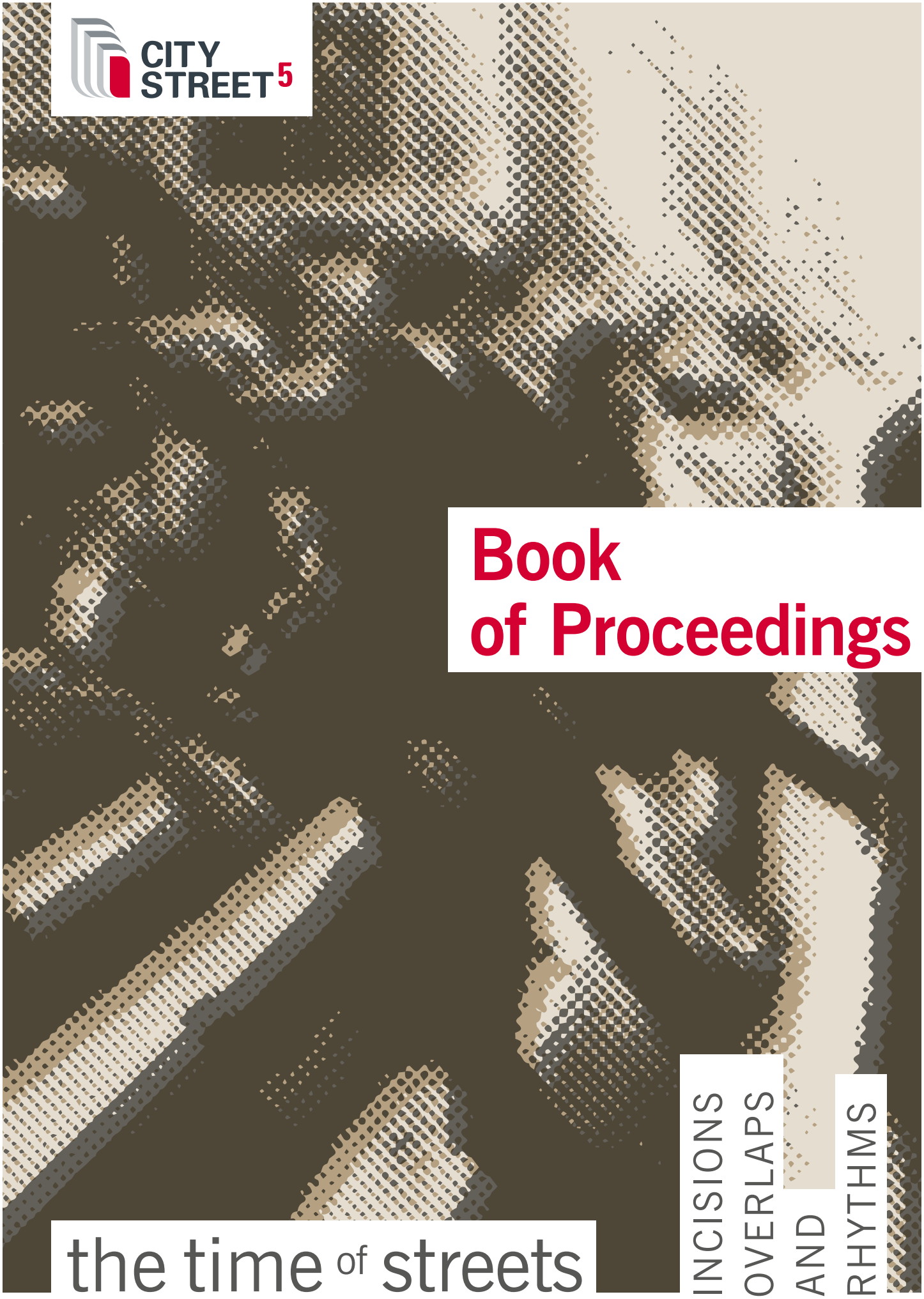
CITY STREET 5

Book of Proceedings



the time of streets

INCISIONS OVERLAPS AND RHYTHMS

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incisions, overlaps and rhythms
Book of Proceedings

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Measuring the quality of streets as open public spaces in the city center in Belgrade, Serbia

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Abstract

The quality of the environment is of vital importance for urban areas, and streets and squares, as the specific form of open public space, represent an essential part of the city. In urban areas, total road traffic kilometres will grow by 40 % between 1995 and 2030. This particular research focuses on the secondary streets that represent an integral part of a city center not only in a functional way but also in a formal, structural and cultural sense.

The research aims to analyze the overall quality of urban streets in the center of Belgrade. The paper represents the segment of the research done alongside approximately 500 students from the University of Belgrade, Faculty of Architecture, as a part of the teaching course entitled: Urban Design of Open Public Space as the research polygon of more than 100 streets from the central urban borough in Belgrade were chosen. The principal methodology is based on the Criteria & Indicators network analysis, with five selected quality criteria: safety, comfort, accessibility, readability, and liveability.

Results of the research represent the quality assessment of streets, identifying specific problems and potentials in the context of open public space in the city center. Therefore, one of the expected contributions of the paper are the guidelines and knowledge base for upgrading the pedestrian network and urban design of open public space - the streets in Belgrade's inner historical city center, thus improving the overall quality of life.

Keywords

urban streets, quality assesment, city center, urban design, Belgrade.

Introduction

The quality of the environment depends on the quality of open public space. In urban areas, one of the main types of open public space are streets. The street, as a public space, defines the common and exceptional elements of the city's urban layout. There are different shapes and forms of the street in a city. It can vary from highways to one-way streets integrated in the urban matrix. In residential areas the streets represent an integral part of everyday life. This is mostly characteristic for the historic parts of European cities[1] [2], where the quality of streets influences the overall quality of urban life[3].

This particular research focuses on the secondary and residential streets in the historic part of Belgrade. In this paper we will present the overview of the research conducted during the educational course at the University of Belgrade, Faculty of Architecture. The aim of the research is to analyze the overall street quality and to determine the main problems and potentials regarding formal and functional characteristics of residential streets in Belgrade.

The quality of streets is a rather abstract concept that cannot be easily defined. Different authors tried to tackle this issue by identifying the specific characteristics that influence the quality of streets, as part of the open public space. Several research studies suggest how urban streets with lower frequency of traffic, pedestrians and vehicle have a higher quality[4]. American Planning Association suggested several qualitative characteristics for urban design of open public space: social inclusion, urban safety, local cultural identity, participation and good maintenance[5]. Gehl (2008) analysed the behaviour, habits and movement of users in urban streets. He pointed out the two main preconditions for good open public space: protection and comfort[6]. Mehta (2013, 2014) created the index for empirical evaluation of the quality of streets, which are based on the: inclusiveness, sensitivity, safety, comfort, and overall user satisfaction[7] [8]. In the book *Urban design of public space* (2021) Đukić gives an important overview of the criteria regarding the quality of streets: safety, comfort, accessibility, readability, and liveability[9]. *Safety* is one of the first and most important aspects regarding quality of open public space. It can be observed within different modes of traffic and transportation, the protection from violence and crime and

unpleasant experiences[10]. *Comfort* is a complex phenomenon and by providing comfort in open urban space we enable pleasant usage of the space. It is characterised by the presence of natural elements, such as greenery, water or natural and soothing sounds, and sunlight[11][12]. Also, the design elements define the comfort. Interesting different material and colours, as well as protective structures that provide protection from the rain and wind or provide shading during the summer heat can influence the overall comfort of users in the street. Additionally, comfort in open public space includes different aspects: thermal comfort, acoustic comfort, air and noise pollution, space capacity and maintenance[13] [14]. *Accessibility* and *Readability* present a basic precondition for adequate usage of streets. Accessibility refers to the level of pedestrian and vehicle access, with the focus on inclusivity of all categories of users[15]. The overall accessibility relies on different physical characteristics of space, ranging from the connections to urban matrix of streets and the access to the public transportation to the specific elements of *universal design*, concerning pavement and urban mobiliar of the street[16]. Readability helps orientation for all users in different modes of transportation, especially when visiting an unfamiliar area. The readability is defined by users' perception of the environment and is closely connected to the identity and character of space. It depends mainly on the signalization, but also on the specific spatial features and urban landmarks[17]. The *Liveability* of street depends on the users, on the density, the frequency of users in residential zones and the social interaction of users[18] [19] [20] [21]. Features that enable liveability are different activities in the street followed by the attractiveness, ambient and identity of space[22] [23]. Based on these criteria the specific methodology for the paper was established.

Methodology

The paper represents the segment of the wider research done during several years, alongside approximately 500 students from the University of Belgrade, Faculty of Architecture, as a part of the teaching course entitled: *Urban Design of Open Public Space*. In this research more than 100 streets from the central urban borough in Belgrade were analysed. For the purpose of the paper the case study of Vračar Municipality was chosen, as one the historic municipalities in Belgrade, and one with the

highest density. In total, eight different streets in this municipality are presented, divided into two categories. Streets were divided into categories in order to compare the two main types of streets in the Vračar Municipality. Each category contains four streets with difference in formal and functional characteristics. Category 1 includes four main, long, wide and important streets, with high frequency of users and variety of functions: Krunska street, Kralja Milana street, Bulevar Kralja Aleksandra and Dalmatinska street. Category 2 contains four narrow and strictly residential one-way streets with low frequency of users: Vladetina street, Branka Radičevića street, Čelopečka street and Grčanička street.

Quality assessment of the streets was based on the aforementioned theoretical research with predefined set of criteria. The Criteria & Indicators network analysis included five quality criteria: C1 - safety, C2 - comfort, C3 - accessibility, C4 - readability, and C5 - liveability. The level of satisfaction with each criterion was observed and elaborated. Additionally, for every criterion a grade was awarded using the 5-point Likert scale - a type of psychometric response scale in which the overall level of satisfaction is presented typically in five points scale, from the lowest level of satisfaction (grade or point 1) to the highest (grade or point 5): (1) very dissatisfied; (2) dissatisfied; (3) neutral (4) satisfied; (5) very satisfied. Firstly, the results for each case study are presented, then the overall average grade for the five criteria and finally, the comparation between two categories of streets is given in a form of a table.

Results

The case study and the research polygon included residential streets in the Municipality of Vračar in Belgrade, Serbia. With an area of only 291 hectares, it is the smallest of all Belgrade's (and Serbian) municipalities, but also the most densely populated[24]. According to the 2011 census results, the municipality has a population of 56,333 inhabitants. Vračar is one of the three municipalities that constitute the very center area of Belgrade, together with Savski Venac and Stari Grad. It is an affluent municipality, having one of the most expensive real estate prices within Belgrade, and has the highest proportion of university educated inhabitants compared to all other Serbian municipalities[25]. The streets in this municipality are mainly residential, with recrea-

Fig.1 - Elements of urban streets in historical center of Belgrade, the Vračar Municipality, Source: Au-thor 2021

tional and cultural functions such as city parks, embassies, and museums in the proximity (Figure 1). The two main categories of streets in Vračar are presented in detail in the following text.

Category 1

01. Krunska street

Krunska street is one of the most beautiful streets in Belgrade. It is located in the historic core of the Vracar Municipality and is 1200 meters long. Many cultural heritage buildings are located in this street, as well as significant residential architecture buildings. Residential buildings are oriented towards the street, with windows facing each other, thus representing the mode of surveillance. Additionally, there are three embasys with high security in this street. Potential safety problems are unsecured and dark passages between the building. The significant parts of this residential street lack greenery or parks. Also, because of the high buildings and high density, the insolation and wind is low, making the street uncomfortable for walking during the summertime. Parking space consumes large amout of the street space. The street contains clear signalization, which makes it is easy to navigate. Vistas and urban landmarks make this street recognisable and enable good orientation. Low intensity of greenery and parks, and no facilities for laisure and recreational acitivities present the main problems regarding the overall quality of the street (Figure 2).

02. Kralja Milana street

Kralja Milana street i one of the central streets in Belgrade, 940m long. The magnitude of the street and the residential buildings in the street with the commercial use and shops in the firts floors ensure an active usage and high frequency of users, making this a rather safe street. Additionaly there are no unseured passages between the buildings. There is greenery on both sides of the street, but it is not well-maintained, and because of the high frequaancy of cars and ususal traffic jams twice per day, the polution is present, especially the noise polution. This represente the main issue of the street quality, regarding the overall comfort aspect. The position and magnitude of the street is making it easier for users to locate it, and it is well connected with the public transportation. The street contains very clear and sufficient sig-

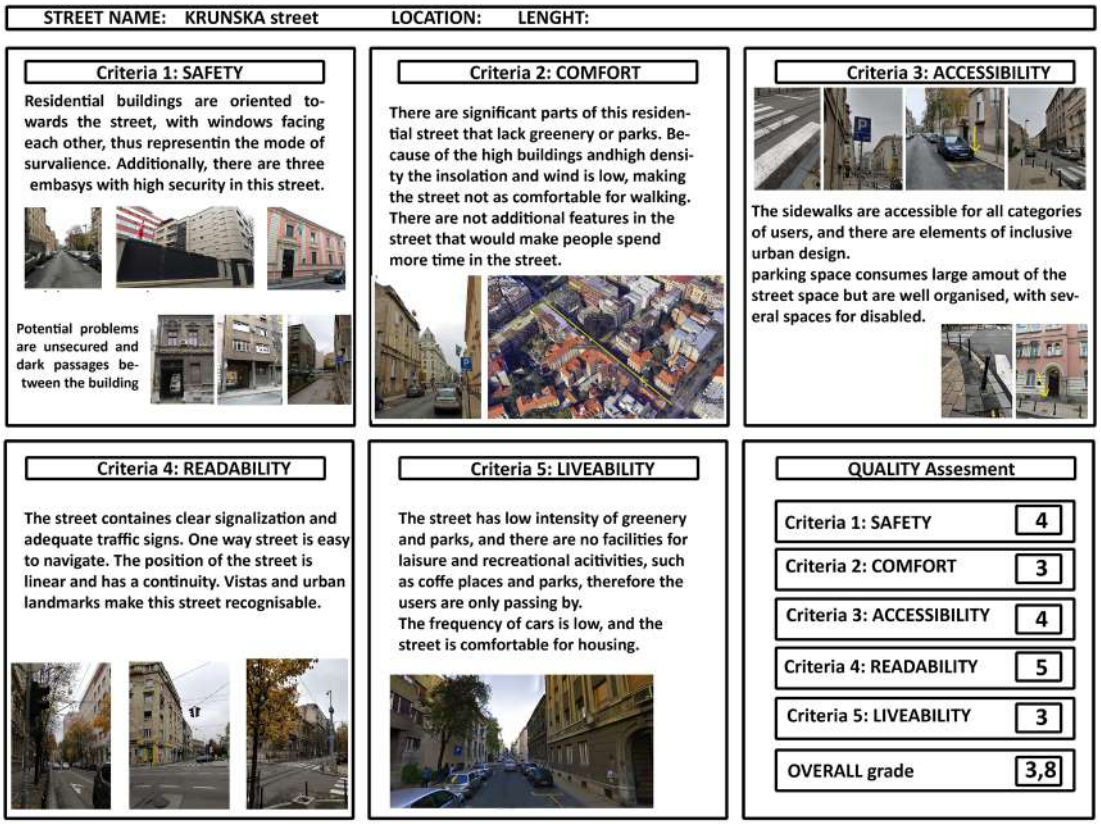

Fig.2 - Results of quality assesment analysis for the Krunska street Source: Author 2021

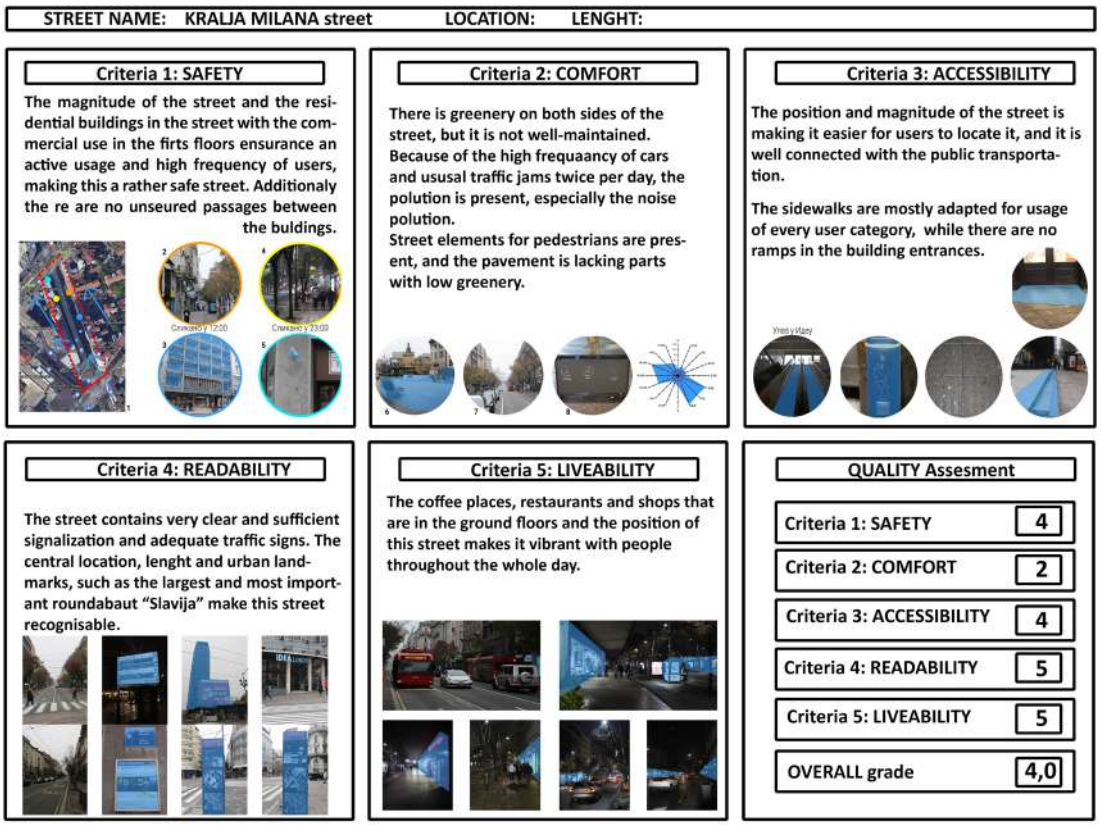

Fig.3 - Results of quality assessment analysis for the Krallja Milana street Source: Author 2021

nalization and adequate traffic signs. The central location, lenght and urban landmarks make this street recognisable. The sidewalks are are wide and mostly adapted for every user category, while there are no ramps in the building entrances. The coffee places, restaurants and shops that are in the ground floors and the position of this street makes it vibrant with people throughout the whole day (Figure 3).

03. Bulevar Kralja Aleksandra

Bulavar Kralja Aleksandra is one of the most important streets in Belgrade and second longest street (length is 7,5km), with several diferente types of transportation. Car lines, tram lines, bike and pedestrian lines are well secured . Because of the high number of shops and coffees in this "trade" street most of the area is covered with video survaillance. However, there are parks and passages that do not have adequate and suffiicient lightning, which presente a safety issue in this street during nighttime. The street is vibrant and well-maintained, there is greenery on both sides of the street, but often traffic jams and high frequency of users make this street rather poluted and not as comfortamble. As one of the main streets in Belgrade it is quite well connected in the overall trafic network. All the street elements are adapted according to the principles of The street contains very clear and sufficient signalization including traffic signs. It is filled with shops, coffee places and restauransts, parks and important educational institutions. The central location, lenght and urban landmarks, such as one of the largest sity parks "Tašmajdan" make this street recognisable and livable (Figure 4).

04. Dalmatinska street

Dalmatinska street is located in two Belgrade municipalities and is 1200 meters long. However, narrow street with high density and high-story buildings and dark and non-secured passages makes this street unsafe for users during the nighttime. There is greenery in the proximity of the street, but the height of buildings affect the insolation and wind, thus making the street not so comfortable for longer usage. Although the street is very well conected to the public transpotration lines, there are no elements of inclusive urban design, which present na acessibility problem. The signalization in the street is present, but not

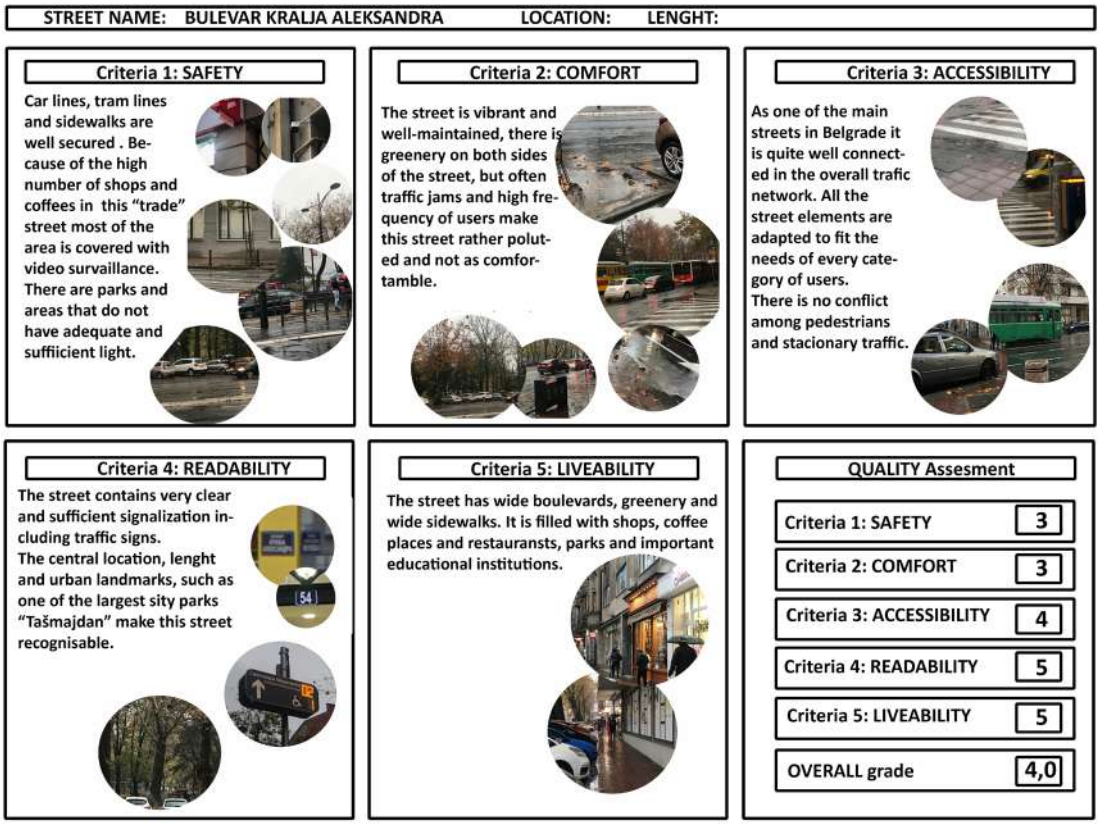

Fig.4 - Results of quality assessment analysis for the Bulevar Kralja Aleksandra: Source: Author 2021

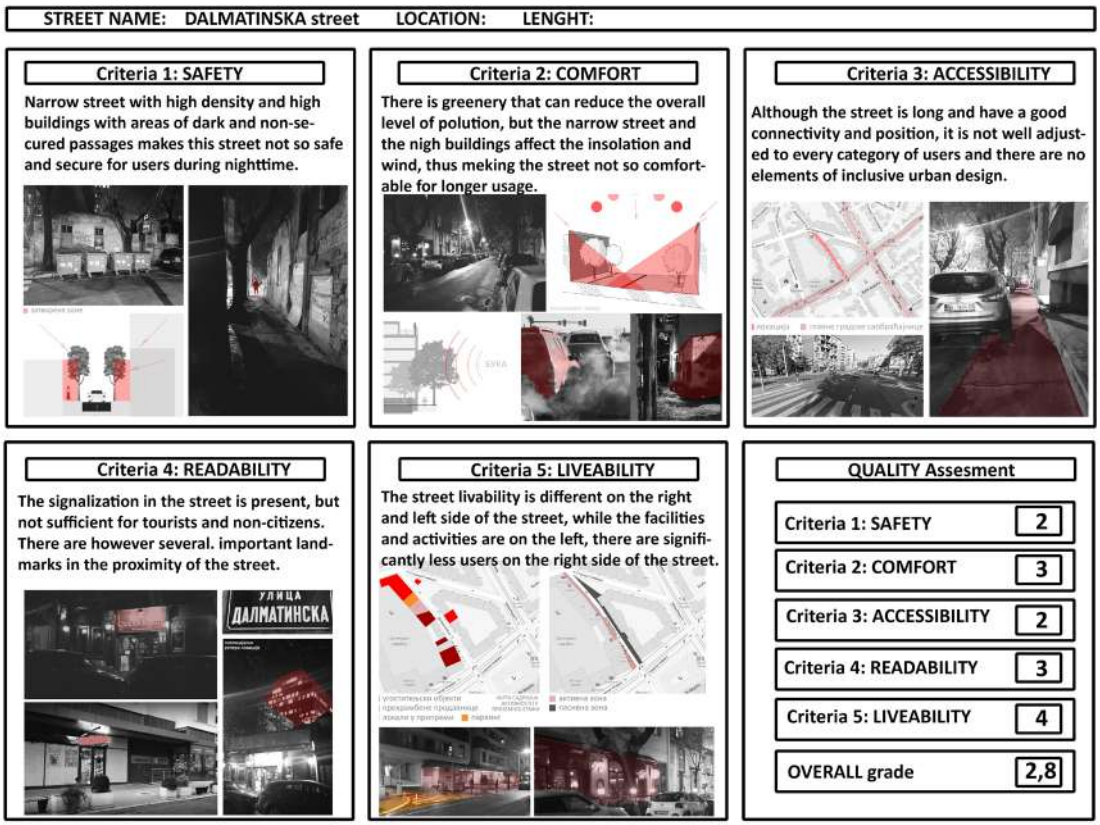

Fig.5 - Results of quality assessment analysis for the Dalmatinska street Source: Author 2021

sufficient for tourists and non-citizens. There are however several. important landmarks in the proximity of the street. The street livability is different on the right and left side of the street, while the facilities and activities are on the left, there are significantly less users on the right side of the street (Figure 5).

Category 2

05. Vladetina street

Vladetina street is 300 meters long. One of the main issues in the street is conflict between the pedestrian and private transportation. Sidewalks are used for parking, and there is a lack of artificial lighning, which makes the users unsafe during nighttime. The grenery is presente in the street, but the noise pollution is present and the overal aestetics of the street i slow. The street has narrow and damaged sidewalks, and no bike lanes, and there are no ramps and elements of universal design. Also, it is not easy accessible for users travelling by public transportation. Other than a few coffee places and a kindergarten, there aro no important urban landmarks that could help better orientation in the street. However, one of the major issues regarding this street is (non)livability. While there are cars parked on the sidewaks, the graffiti and damaged street elements, as well as the lack of interesting facilities that could generate user activity, the street has a very low level of livability (Figure 6).

06. Branka Radičevića street

Branka Radičevića street is a small street only 200 meters long. Safety issues represent a significant problem in this street due to the very narrow sidewalks that are mainly used for parking. There are no security cameras and no adequate artificial lightnning. Therefore, the percieved sense of safety is very low during the daytime and the nighttime period. There is a significant lack of greenery in the proximity of this street. The pavement, urban mobiliar and the street facades are in rather bad condition, which contributes to overall low levels of attractivness. Also, the construction in the street produces noise pollution and there is a lack of insolation during the day. The street is a one-way, local street that is not an integral part of the city street network. The lack of parking space is evident and there are no ramps and elements of

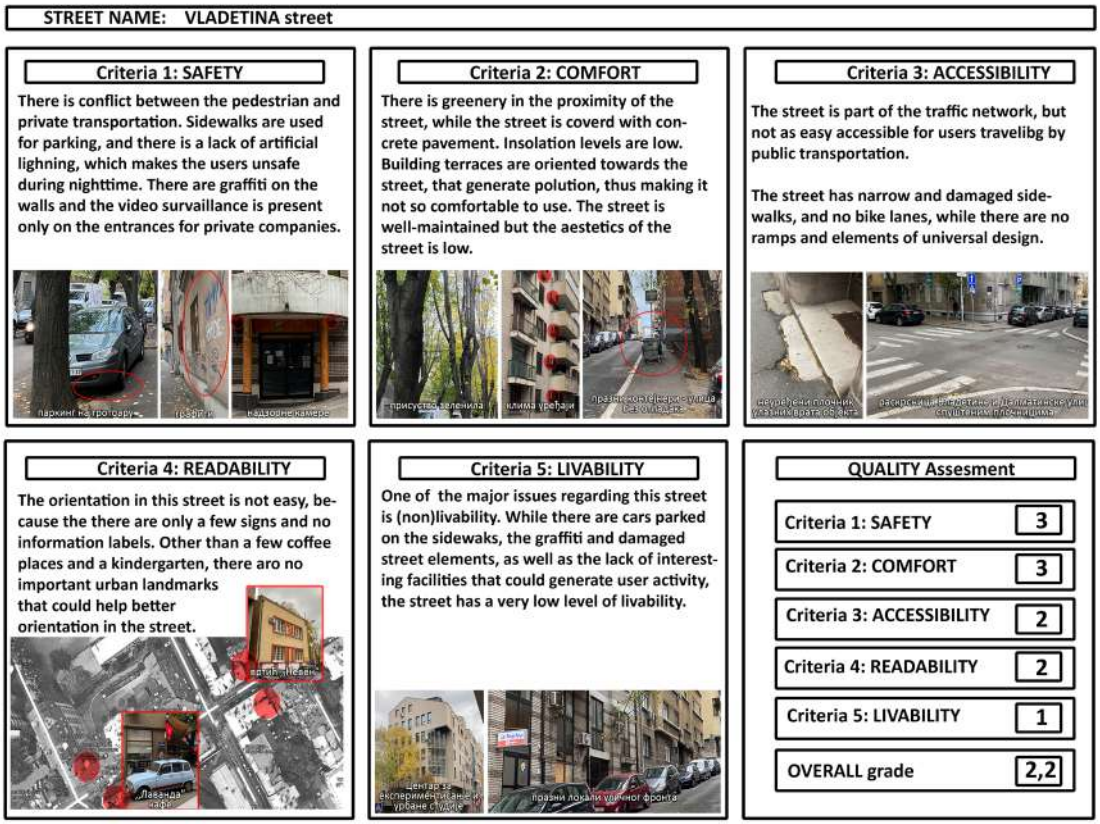

Fig.6 - Results of quality assessment analysis for the Vladetina street Source: Author 2021

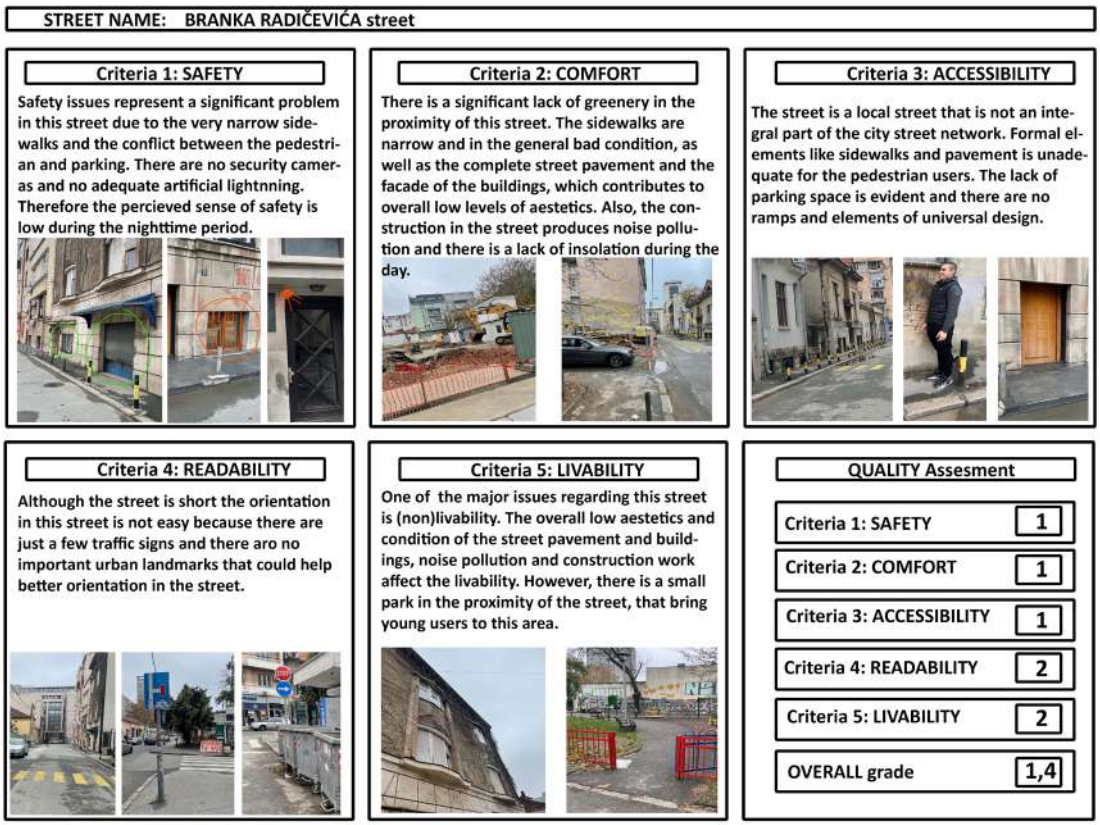

Fig.7 - Results of quality assessment analysis for the Branka Radičevića street Source: Author 2021

universal design. The overall low aestetics and condition of the street, noise pollution and construction work affect the livability. However, there is a small park in the proximity of the street, that bring young users to this área (Figure 7).

07. Gračanička street

Gračanička street is a small one-way street in the Vračar Municipality, and it is only 200 meters long. This one-way street has narrov sidewalks, but wide traffic lines for vehicles. However, there are passages with the good artificial lightning. There is linear greenery in the street, but not enough natural insolation. Noise from the street is noticable and affects the comfort in the street. One of the main issues in this street is accessibility for every uswer category. There are no stations for public transportation in the proximity of the street. Pedestrian passages are not noticable, and there aro no ramps in the building entrances, and no other elements of universal urban design. Also, the signalization in the street is rather poor. However, the biggest Belgrade church "Hram Svetog Save" is visable from this street making it easier for orientation. Although there is lack of natural sunlight during the day, the greenery and local coffee places make up for the livability of the street (Figure 8).

08. Čelopečka street

Čelopečka street is a narrow one-way street in Vračar Municipality 200 meters long. The narrov sidewalks and no surrvailance affect the safety in the street. However, the main issues regarding the quality of this street are comfor and accessibility. There is a lack of greenery, urban mobiliar and natural insolation. The narrow passages and sidewalks, followed by construction work noise make this street rather non comfortable for users. Additionally, the street is a local street one-way street that is not easily acessible by car or the public transportation. Formal street elements such as narrow sidewalks and pavement is unadequate for the pedestrian users. There are no ramps and elements of universal design. Signalization is rather poor and there are no important urban landmarks that could help better orientation in the street. The steet lacks greenery and comercial or cultural features. The users are just passing by this street without any other activity in this street.

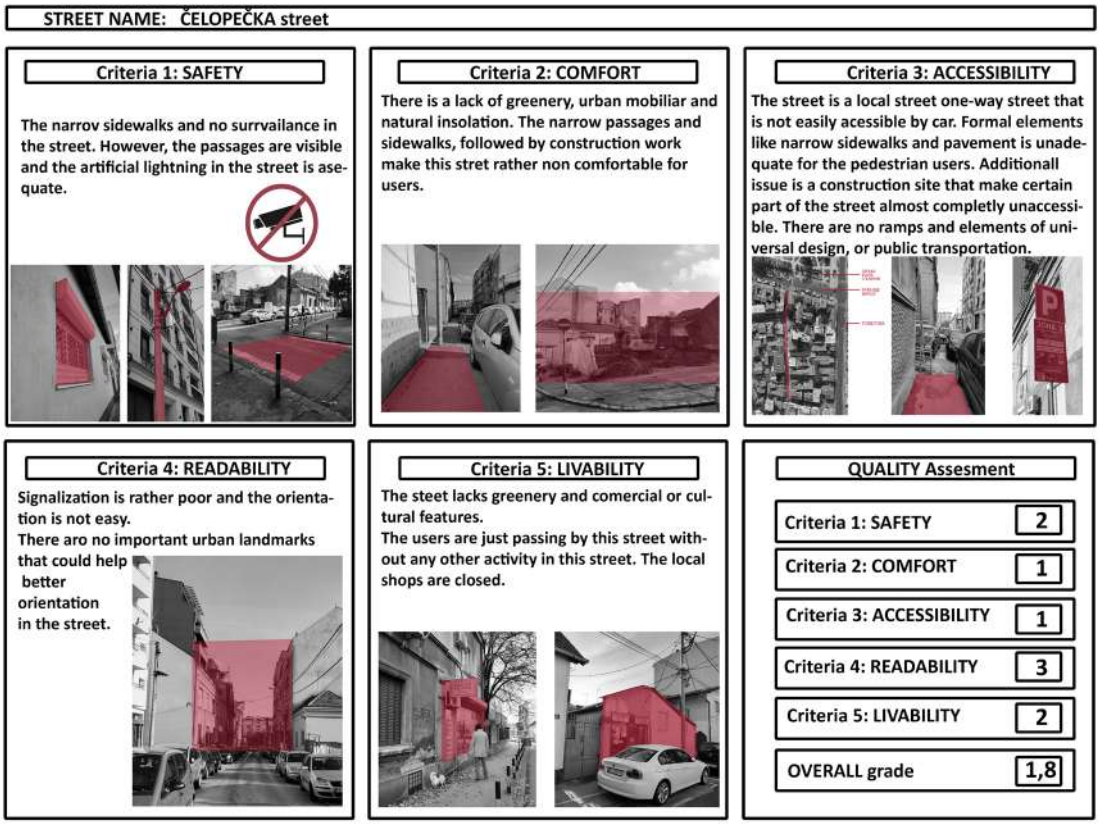

Fig.8 - Results of quality assessment analysis for the Gračanička street Source: Author 2021

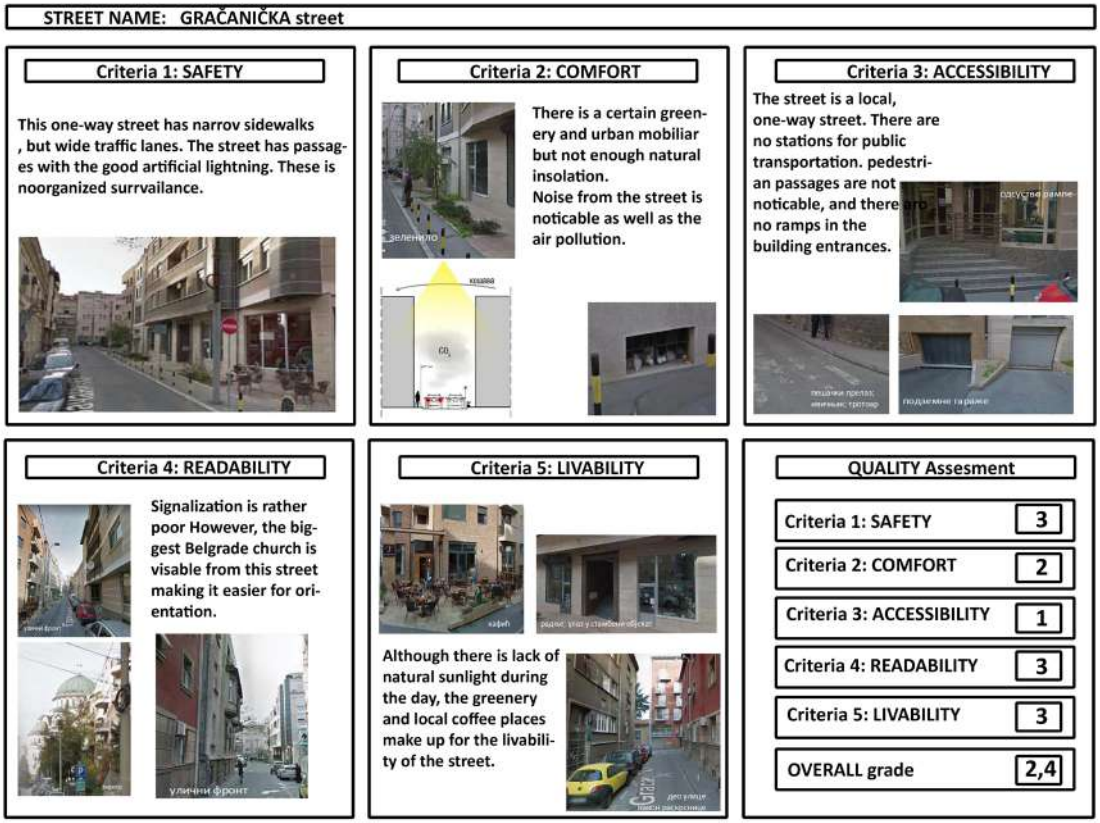

Fig.9 - Results of quality assessment analysis for the Čelopečka street Source: Author 2021

The local shops that were crucial parto f the street are now closed (Figure 9).

The overall assesment of the street quality, based on the presented results for each street is given in the Table 1, and the comparation between the two categories of streets is given in the Table 2.

In this section the results of the study were presented and elaborated, and in the next section the discussion of the results is presented.

Street/criteria	C1	C2	C3	C4	C5	avg.grade / streets
1. Krunska street	4	3	4	5	3	3,8
2. Kralja Milana street	4	2	4	5	5	4,0
3. Bul. K. Aleksandra	3	3	4	5	5	4,0
4. Dalmatinska street	2	3	2	3	4	2,8
5. Vladetina street	3	3	2	2	1	2,2
6. Branka Radičevića street	1	1	1	2	2	1,4
7. Čelopečka street	2	1	1	3	2	1,8
8. Gračanička street	3	2	1	3	3	2,4
av. grade / criteria	2,75	2,25	2,37	3,50	3,12	2,8

Table 1: Quality assesment for the chosen streets in Vračar Municipality, source: the authors. 2022.

Criteria/st.category	Street Category 1	Street Category 2
C1 - Safety	3,25	2,25
C2 - Comfort	2,75	1,75
C3 - Accessibility	3,50	1,25
C4 - Readability	4,50	2,50
C5 - Livability	4,25	2,00
C1+C2+C3+C4+C5	**3,65**	**1,95**

Table 2: Average grade for each criterium divided by street categories, source: the authors. 2022.

Discussion and conclusions

The research result showed the quality assesment of the residential streets in the historic part of European cities, on the example of Belgrade, Serbia. The analysis was conducted among the eight residential streets in the Municipality of Vračar - the historic center of the city. The quality evaluation was based on predefined set of criteria: safety,

comfort, accessibility, readability, and liveability. The overall score for all the streets according to these five criteria is 2,8 (Table 1). This suggests that there are certain issues regarding the overall quality of streets. The main problems were observed from the aspects of comfort (average grade 2,25/5) and accessibility (average grade 2,37/5) (Table 1). Three is noticeable lack of natural elements in the proximity of the streets, such as greenery and insolation, due to the high density in the Municipality. Also, narrow sidewalks of the majority of the streets are being used for parking and there is a lack of elements of universal design, which present a major problem for users. Concerning safety (average grade 2,75/5), the main issues were related to the night-time usage, because of the lack of surveillance and artificial lightning in the entrances and passages between the buildings. Although liveability got a higher average grade in comparison to other criteria (3,12/5) there is still the lack of activity that promotes or generate social inclusion and communication along the streets. Also, several construction sites on the location proved to lower the overall liveability scores. The highest average grade out of all criteria (3,50/5) was pointed to readability, suggestion that overall orientation and signalization of the streets is satisfactory (Table 1). However, there is a rather significant difference in the scores of quality assessment between the two categories of streets. The streets in the category 1 got the higher overall score (3,65) than the streets in the category 2 (1,95/5). That is the situation for every individual criterium (Table 2). In contrast to some previous research, results of the study argue how the streets with the higher frequency of users and traffic turns out to have a higher quality score. Additionally, the streets in the category 1 are wider, longer, and have more greenery and parks. These streets turned out to be safer and more accessible (Table 2). One of the main differences between these two categories of streets is regarding the criteria of liveability. The higher frequency of users creates the possibility for social interaction and recreational and leisure activities. We can conclude that the quality of street depends very much on the level of activity in the street.

This research could serve as a platform and a knowledge base for future research on guidelines for upgrading the quality of residential street in city center, thus improving the overall quality of life.

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