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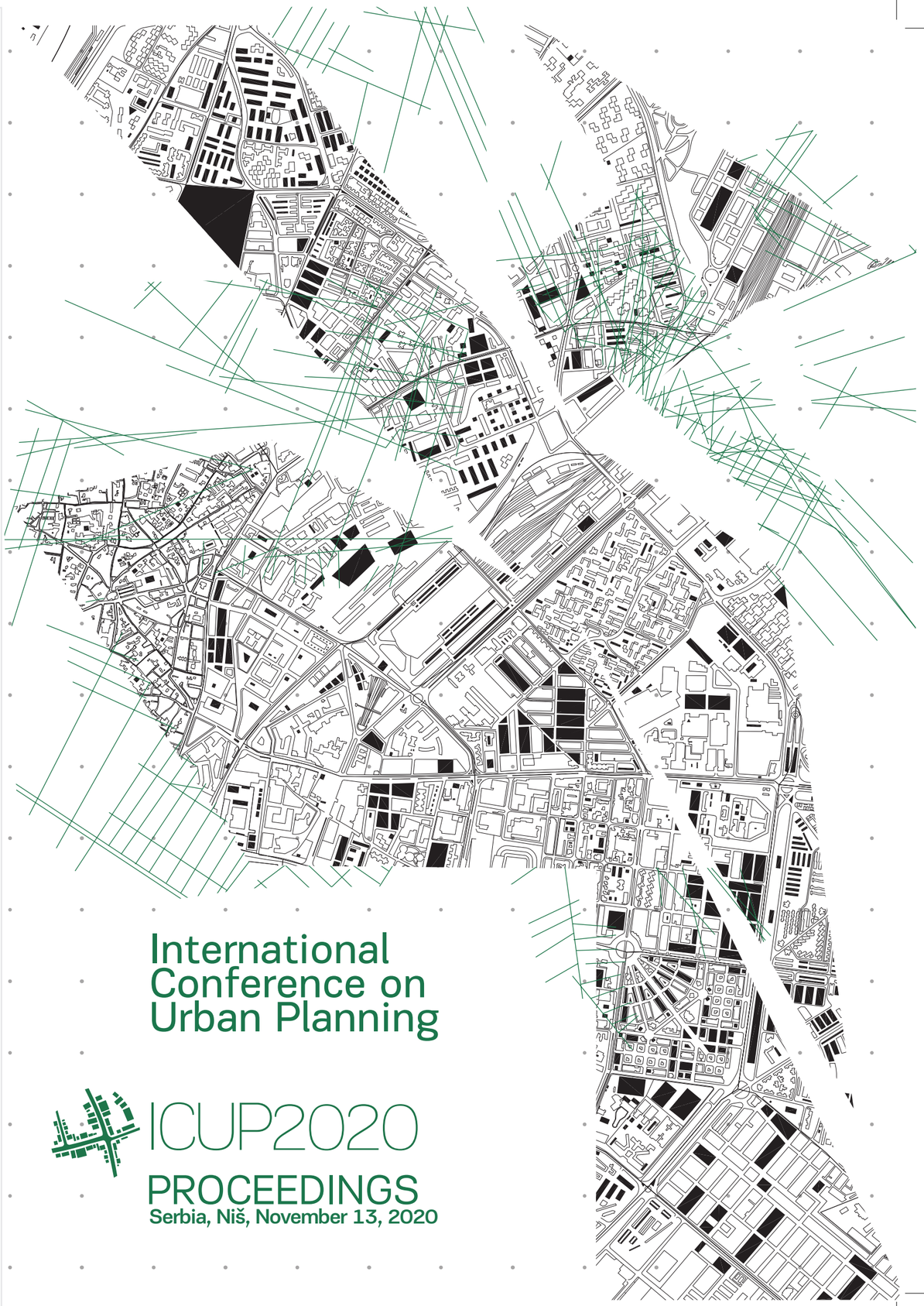

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RESIDENTIAL SPACE AS CHANGEABLE AND RESILIENT POLYGON FOR FUTURE LIVING

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ABSTRACT

Communities today are faced with increasingly dynamic changes in the city and especially in their residential parts. It is important to consider how much residential space and its residents have the capacity to accept or endure the different aspects of changes (climate, social, environmental, functional, etc.). Although almost all changes at the city level are focused on public service facilities and spaces, the residential segment of the city is another major function that must be adequately adapted to the change.

In this regard, the research focuses on observing changes and opportunities for achieving resilience in multi-family housing. The premise of the paper is that changes manifest and can be differently absorbed/mitigated at different spatial levels within the residential complex. The paper, through a case study of a selected urban block in Belgrade, presents an analysis of three spatial levels of resilience and transformational possibilities: (1) level of the building, (2) surrounding of the building, and (3) the residential block. The assumption of the paper is that different spatial levels are interdependent in terms of the possibility of transformation and adaptability to different types of changes.

The analysis of three spatial levels in the paper shows that the spatial organization and the qualities of Block 22 can be a good base for adapting to different changes. Combining different responses to change in those spatial levels paper will show how the community and the urban block can be more resilient and can contribute to the general resilience of the city.

Keywords: *resilient communities, multi-family housing, spatial levels, Serbia, Belgrade, Block 22*

1. INTRODUCTION

Architecture is dynamically changing through the 20th and 21st centuries. Economic, social, and cultural shifts enforced changes and the need for development in the field of housing. Starting at the end of the 19th and the beginning of the 20th century, a large number of the population was forced to change their place of residence and move to the cities for various reasons (Heckmann, Schneider, Zapel, 2018, Brankov, 2019a). In the past 100 years, architecture was especially seen as a tool to minimize the economy and housing shortage

crisis after both World wars. Soon afterward it became a way to introduce new, partly futuristic, living concepts in the 1960s.

The complexity of housing is also in anticipating the further development of residential space. As housing seeks utilitarianism in its highest sense it led to the intensification of the useful area and effort to improve adaptability to different forms of use through time. Aspirations to adapt housing to dynamic social changes can be recognized through different periods of development of multifamily housing during the 20th century. Each period is characterized by different needs, changes in population standards, housing standards, etc. Multi-family housing flourished during the 20th century, among other things due to improved industrial production, the use of prefabrication, and the internationalization of labor and ideas (Radović, 2001). At the same time, during the 20th century, the importance of common activities and spaces is emphasized in the design of multi-family housing. In this type of housing, all measures to increase usability can relate to different spaces: building, nearby surroundings, and residential block. That spatial division has its roots in the multi-family housing division of private or public space. The structure of private-public spaces can be divided into privacy parts in multi-family housing in terms of access and privacy: private, semi-public, and public space. In multi-family housing, residents have the opportunity to use the benefits of collective life and it is best achieved if there is a space that in some way unites the interests and needs of users from multiple dwellings or multiple buildings. Teige states that the "heart" of any housing complex that strives for collectivity in housing is its common space (Teige, 2002). Paper thus researches the possible resilience of spaces that are more collective in housing and have a common purpose, as these spaces are more dynamic, need more adjusting to various needs, and can be used by more than one resident.

2. MULTI-FAMILY HOUSING DEVELOPMENT AND COMMON SPACE

The development of multi-family housing and its rise and changeability had several phases tightly connected to the situations and movements during the 20th century. That includes the pre- and post-war years around two World Wars and the reconstruction after them. Encouraged by social changes, the previous way of producing housing was rapidly changing - the emergence of mass production and later prefabrication. The multi-family housing emerged as a way to be an adequate response to the crisis in housing but also to be a resilient solution to possible changes. That characteristic developed throughout the decades to come.

In the 1920s the housing is characterized by the fact that the design focuses on defining solutions following new spatial standards, intending to create standard solutions that allow flexible use of space for the "universal user" (Heckmann, Schneider, Zapel, 2018). The change of functions, due to the centralized mass production, follows the expansion of public/collective services in contrast to the previous functions in the service of the traditional family household. This makes it possible to increase the number of functions for shared use (Teige, 2002; Heckmann, Schneider, Zapel, 2018; Brankov, 2019a). Previously individualized housing services were transformed into centralized services for a larger number of users (outside the apartment/ individual space), to develop a new collective housing system (Teige, 2002). At the end of the 1930s, following the 1940s and postwar years the development of multi-family housing benefited with prefabrication as a tool for new possibilities (Heckmann, Schneider, Zapel, 2018). This way of production opens a path for creating adaptable and more durable (and resilient) solutions. The advantages of such systems were that they improved and speeded up the construction process concerning prior development (Trbojevic, 1975).

During the 1950s and early 1960s, the market changed from necessity housing as a result of the Wars destruction to more resident awareness design. Design lacked a basic connection between the architect's ideas and the needs of the users. This has led to the further development of alternative concepts in housing with new architectural movements (Heckmann, Schneider, Zapel, 2018; Frempton, 2004). Multi-family has focused on the ability to provide a framework for different activities of users because activities change faster than space (Schneider & Till, 2007).

In the former socialist countries, including Serbia, the processes of industrialization and urbanization intertwined. After the Second World War, preference was given to industrial complexes, while housing construction on a larger scale did not begin until the late 1950s (Baylon, 1980). Multi-family housing in Serbia starting in the late 1950s was focused on a new development with the concepts that empowered adaptability and flexibility, especially in the dwelling areas (Marušić, 1975; Brankov, 2019b). Later, at the end of the 20th century the quality in the housing in Serbia decreased, the construction slowly changed as the investors were not anymore dominant State enterprises, but more individual private investors. That shift changed the relation

to space itself, as anything outside of the dwelling wasn't seen as necessary as before and the aspects of the adaptability and resilient home were not as much important to the new builders.

2.1. Collective sphere and common space in multi-family housing

Common spaces are less analyzed segments in housing. One can be a common area inside the building or common spaces outside of the building and within the residential block. These spaces in addition to the communication role can have other contents and be a domain for the collective activities of the residents (Rabinowitz, 2012; Ilić, 1996, Brankov, 2019a). These spaces must favor spontaneous, voluntary mutual contacts of the residents as a precondition for deepening social communication (Ilić, 1996). Emphasizing better utilization of the building or outside areas increases the range of common functions.

Open common spaces on other hand are, as part of residential spaces, an important element whose quality affects the quality of life of residents. The high quality of open spaces in the city also increases the economic value of the surrounding land and makes a good basis for the processes of regeneration of urban areas. Due to the need for rest and recreation, people are daily exposed to the influence of open spaces, especially open spaces that are located near their places of residence. Considering changes, due to uncontrolled construction processes, today's open spaces are significantly reduced, both in the total area, they occupy and in terms of environmental and sociological quality (Brankov&Stanojević, 2020). The differentiation of open spaces in residential areas also depends on the degree of privacy (Lička et al., 2012): private open spaces (belonging open areas of apartments on the ground floor), common open spaces (most often available to the tenants of neighboring blocks, or whose privacy is strictly protected and the possibility of use is limited only to the tenants of the complex in question) and public open spaces. The urban design of open spaces is associated with appropriate functional, aesthetic, and ecological requirements, so they can be evaluated by their morphology, urban and architectural structure, various sociological, psychological, and ecological characteristics (Stanojević et al., 2019).

The common spaces in housing are often not as diverse as might be desired or as much as they could be. They are often forced to serve minimal necessary activities. The users, however, should have the possibility to perform from basic to complex activities in the collective sphere of housing: communication, recreation, socializing, etc. The possibilities of the space can less and less follow the needs and wishes of the users, which would stimulate the development of collective activities. Creating an atmosphere in the collective with certain activities, cooperation and help from neighbors is something that builds a stronger community.

3. CASE STUDY OF BLOCK 22 IN NEW BELGRADE

The Paper analyzes the multi-family housing complex of Block 22. This block is one of the six blocks that have been realized as part of the Central Zone of New Belgrade (next to blocks 21,23,28,29 and 30). Block 22 is located between block 21 in the north, the highway, and block 23 in the south, the congress center Sava Center in the east, and the public part of the block - Arena sports Hall in the west.

This area was selected for analysis as a significant block from the period of development of the New Belgrade. The project of the block was made according to the competition from 1968 by the design of architects B. Janković, B. Karadzic, and A. Stjepanović (Marušić, 1975). Construction was completed in 1976. Part of the block that has residential function is the subject of analysis, while the part with public buildings was not taken into account (Figure. 1).

(a) (b)

Figure 1: (a) Image of the elevated common space, and (b) Inside of the block, view to the passage; source: Authors

3.1. Buildings

Block consists of 5 lamellas buildings P + 6 + Pk and the 2 groups of towers to the west P + 4 + Pk to P + 6 + Pk (Čavdarević, 1978) (Fig. 2). Buildings in typology of lammelas are especially interesting as they inside combine continuous hallways with the modular design of the dwellings. Every modular part has its formed passage on the ground floor that forms the entrance areas. Buildings are corridor typology but are upgrade by adding the dwelling outside, so they form another corridor with the other dwellings and in the middle form a vertical shaft.

3.2. Context close to the building

Surrounding space near the build residential areas is overlapped with the communications of the block. Paper took the surrounding area of the building into analysis because of a couple of specific designs of the block and buildings itself: passages through the buildings' ground floor, denivelated open spaces surrounded by groups of buildings.

Passages are situated on the ground floor of the linear buildings in Block 22. By establishing passages architects enabled multiple entrances into the building and into the residential block itself. In that sense, the inner part of the block is treated equally with the outer part in terms of accessibility. The position of the entrance in that sense orients the user towards or from a certain open space.

Denivelation and segmentation of open spaces is an intentional division of open spaces in the block into smaller and more visible areas, the possibility for that is the use of different ground levels. The design of Block 22 succeeded with half-buried garages to create common spaces above them for the leisure and children play. Also, this directly influences the division of the whole block in 2 types of spaces: ground floor spaces (0,00m) and elevated common areas (for +1,50m). Parts on zero elevation areas are predominantly transit for people to pass or to get to some point, but these spaces are rather more static and oriented towards the residents in the buildings surrounding them (Fig. 2).

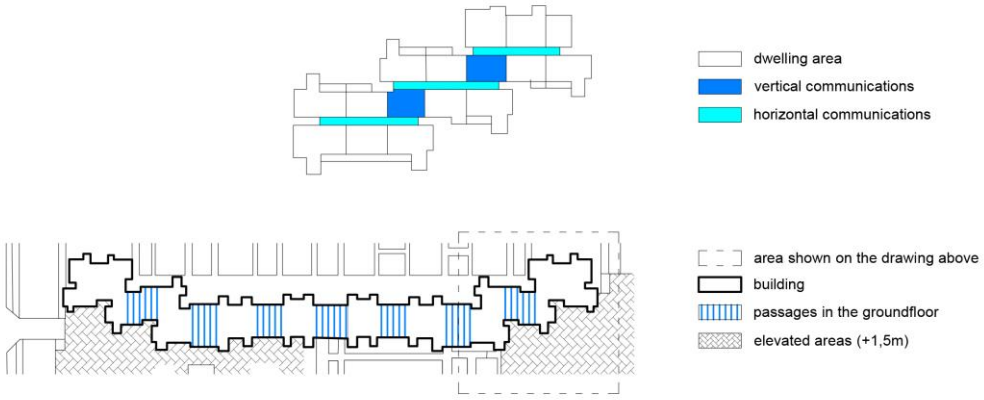

Figure 2: (a) building's typical floor scheme segment, and (b) nearby context surrounding the building in the Block 22; source: Authors

3.3. Area of residential block

The block in the central part has commercial facilities, a playground, and a kindergarten. Almost all the traffic is solved around the perimeter and there are not many internal roads inside the block so that it does not disturb pedestrians in the central part. The space between both groups of towers and longer and shorter lamellae are common spaces raised 1.5 m from the rest of the terrain and as a result of garages and underground shelters that are buried under them (Čavdarević, 1978).

The number of floors and compactness give the impression of an urban character to the block and a return to the dimensions of the city (Marušić, 1975). In the case of a lamella, the horizontal consists of two parallel strips where, by extending one, one moves to the next core, and on the ground floor, this core/ entrance to the building is accessible from the passage. Unlike them, the towers are entered from the "outer" side of the block, while the inner platform is bordered by towers without direct access from the buildings. The space of the block is characterized by a variety of ambiances and segments of space that can be used differently and the block offers smaller, partially more intimate spaces (Fig. 3). The traffic solution along the perimeter and inside the block directly affects the possibility of using open spaces in the block and the connection of that space.

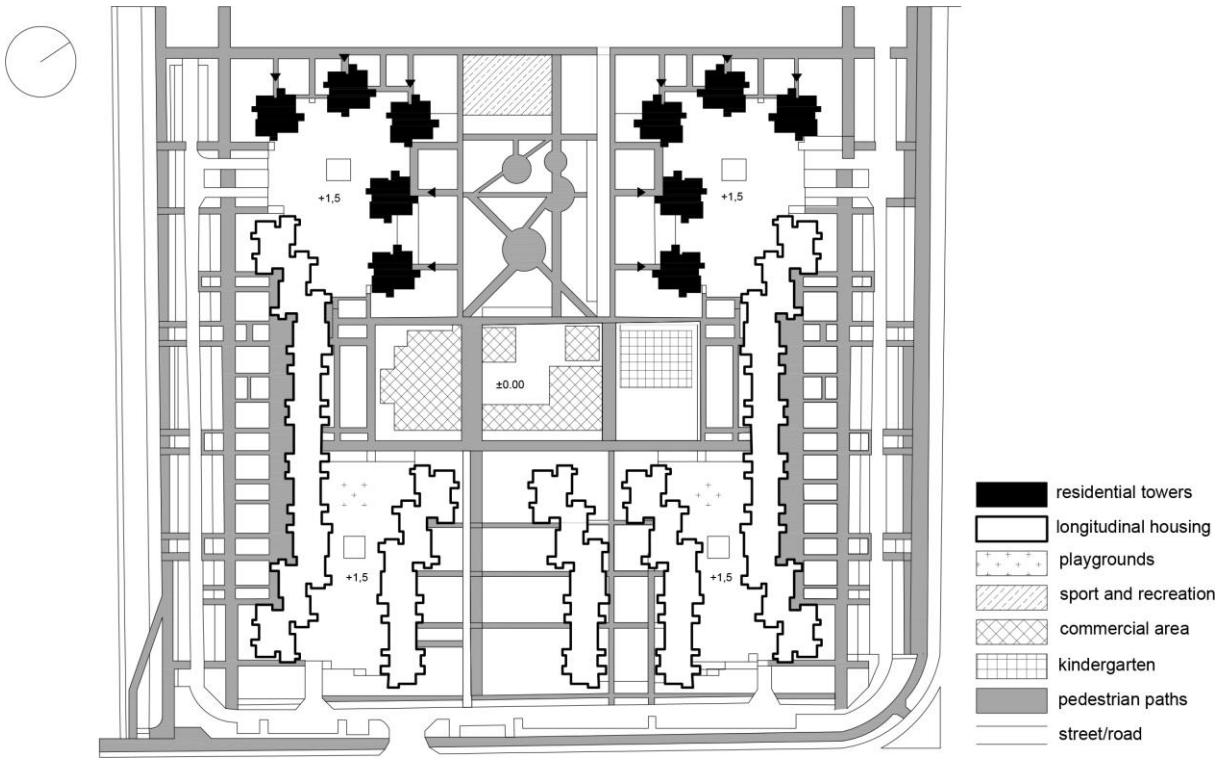

Figure 3: Drawing of the residential Block 22 with different open space areas, source: Authors

4. DISCUSSION AND RESULTS

Resilience and adaptability to change in housing are more complex than in other architectural typologies considering the various needs and problems through the process after putting the space to its use. Resilience in that sense not only should address problems surrounding urban development but should consider future changes in these spaces (positive and negative) which influence the multi-family housing. It should consider the change of its residents, their habits which influence the space they live and use.

In this regard, Block 22 has various levels of possible interventions the resilience in this sense can be in its current variety of spaces that give enough possibilities for the residents but also the future development that can upgrade and add new spaces and functions, which are compatible with the existing architectural design.

Table 1: Resilient possibilities in three scales in the Block 22

Analyzed scale	*Residents focused on specific area (number of inhabitants/users)*	*Types of common spaces*	*Number of common spaces (diversity)*	*Percentage of common space that can be used for various activities (excluding residential part)*	*Privacy level (P-private area – restricted access in the building, PP - private public area, PB – public area)*	*Possible intervention as improvement of the common spaces - participation needed of residents*	*Amount of new functionsthat are possible in common spaces*
Building area	*- smallest building: 90 inhabitants - biggest buiding: around 790 inhabitants*	*horizontal communications, vertical communications, passages, roof, common room near the stairs*	*around 2 common spaces on one typical floor*	*17%*	*P*	*minor*	*small*
Nearby building context	*around 1000 inhabitants and users*	*passages, pedestrian area, elevated common area, greenery*	*4-5 bigger common spaces nerby*	*70%*	*PP*	*medium*	*medium*
Residential block	*arround 3900 inhabitants and users*	*pedestrian area, green area, park commercial area, sports and recreation, elevated common area*	*6-7 bigger common spaces*	*83%*	*PB*	*full*	*medium*

5. CONCLUSION

The analyzed Block 22 is a significant representative of the new modern movement in Serbia in the 20th century. Its design addresses not only residential but open spaces in a manner that anticipates possible future changes in this area. Regarding that, the design of the Block focused on the continuous spaces and paths that can be used for walking, for stationary activities, and further upgraded. When compared to the original design and the present state commercial area is smaller than intended, but its modular roof and construction design make it upgradable and it seems always as this form is large enough. As authors of the Block designed four garages that form the elevated common spaces above them they bordered the central area of the block and made it difficult to force traffic inside the block. This helped preserve the pedestrian attributes of the block.

The block itself is not designed as one big area, but in smaller zones, which can function independently. Regarding that creating elevated areas in the block divides space with a visual barrier. Within the block, there are formed subunits with groups of buildings, which divide the space into areas to which the population of the whole block gravitates, and smaller interspaces between (Brankov&Stanojević, 2020). That creates an opportunity for different activities to be held in different parts of the block. The elevated areas are more prone to just residents' use, which preserved its original purpose. These spaces are not on main pedestrian paths so are not interesting for commercial main activities, which in a way left them intact after all these years.

The conducted research opens the possibility for further examination of adaptability and resilience in existing blocks, especially in New Belgrade. One of the problems in New Belgrade and some specific New Belgrade blocks is the new development which denies existing ideas of the architects or uses green and non-built areas to make more building square meters. That directly implies lower residential and overall standards.

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