ICUP2018

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2nd International Conference on Urban Planning

PROCEEDINGS

Serbia, Nis, November 14-17, 2018

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1st International Conference on Urban Planning ICUP2016 was successfully held in Niš, Serbia on 18th and 19th November 2016. Main topics of the Conference were: *Urban theory and practice; Development and planning problems; Links between planning, building and land; Urban regeneration; Land readjustment; Interaction between the natural environment and urban areas*. Conference gathered together a large number of professors, researchers and many professionals working in practice. As a result of the Conference, Conference Book of Proceedings was published with 41 scientific papers. During the Conference, round tables were organized where all participants could discuss the current issues in the field of urban planning and design. Urban planning process was contemplated on by professionals and researchers from both theory and practice. Different points of view and topics related to urban design, planning and its implementation, urban landscape, public–private partnership and smart cities were developed and discussed.

During two days, 10 Keynote speakers from different parts of the world gave lectures which were open for all participants. Keynote speakers and their affiliations at the time of the ICUP2016 Conference included: **Dr Ali A. Alraouf**, head of Capacity Building, training, research and development unit at Ministry of Municipality and Environment (MME) Qatar; **Prof. Dr Zorica Nedović-Budić**, Professor at Chair of spatial planning in the School of Architecture, Planning and Environmental Policy at University College Dublin, Ireland; **Dr Alessandro Busa**, Center for Metropolitan Studies at the Technical University of Berlin, Germany; **Dr Hossam Samir Ibrahim**, working with municipal government of Qatar and consultation firms in Regional and Urban planning projects in Egypt, UK, Qatar, and Kingdom of Saudi Arabia; Prof. **Dr Francesco Rotondo**, Associate professor of Urban planning and design at the Polytechnic University of Bari, Italy; **Dr Cristian Suau**, funding director of STUDIO POP, Scotland; **Dr Demetrio Muñoz Gielen**, IHS Institute for Housing and Urban Development Study of the Erasmus University in Rotterdam, Netherlands; **Dr Kosta Mathéy**, lecturer at different Universities in Germany, Cuba, Algeria and Egypt; Prof. **Dr Derya Oktay**, Dean of the Faculty of Architecture at Ondokuz Mayıs University, Samsun, Turkey; and **Dr Teo Keang Sood**, Professor of Law in the Faculty of Law at the National University of Singapore.

Thanks to different experiences and to different scientific and research fields of keynote speakers and participants, Conference themes were analyzed from different points of view, which resulted in interdisciplinary and comprehensive approach of complex urban planning issues. Beside professors and researchers at the Conference, numerous professionals were present. Therefore, one of the conclusions was that cooperation between science/research and professional practice is necessary in order to adopt and implement innovative solutions and to create and plan human friendly spaces according to anthropometric scale. Niš as the "host city" of the conference was an excellent research polygon for discussion, because it represents an example of the city with complex urban structure. It includes rich heritage areas but also new developing areas, thus providing a very attractive and vibrant ambient. Thus, the next conclusion was that inherited sites and built heritage can be used as a tool for city branding and can also help to improve development by learning on past mistakes and achievements. The following conclusion found that cities must be observed as the home to all residents, which must actively participate in its development and planning process, in order to present their real needs and to stop illegal constructions. Finally, it was concluded that public-private partnerships must be encouraged and promoted because it is not possible to develop and implement projects without mutual cooperation. By developing public-private partnership it is possible to achieve community wellbeing through encouraging investors to develop public spaces and community facilities.

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FOREWORD

It is with great pleasure that I present to you the following Proceedings of the Second International Conference on Urban Planning ICUP2018, held in Nis on November 14-17, 2018. This is the second conference organized by the Faculty of Civil Engineering and Architecture, University of Nis and Urban Planning Cluster, with the aim of bringing together scholars, researchers and students from all areas of Urban Planning. The ICUP conference explores a broad spectrum of Urban and Spatial Planning issues from both theory and practice. The main topic of this year's Conference is Nature - Urban Planning - Architecture.

These topics are discussed in more than 40 conference papers from various study areas and diverse places in the world, and therefore provide a valuable insight into contemporary urban policies and approaches. They also make good grounds for discussion at the conference and a good basis for further research. The authors are professors, researchers, PhD students and planning professionals. We are especially proud of our keynote speakers and the members of our Scientific Program Committee, who are eminent experts in their fields from all over the world.

We considered that it is very important and responsible that a group of connoisseurs gathered in order to contribute to integrate sustainable principles into urban design and fostering the principles of nature protection. The set of messages presented in this publication represents a contribution to the extremely important debate about the introduction of nature in the urban environment. Some of researches, whose results are presented in this proceeding, bring to our attention that the quality of urban life in ever-growing cities depends on the ecological principles applied in urban areas, from the symbiotic connections between green and gray surfaces and the sustainable use and renewal of natural resources. The crucial mechanisms of supporting sustainable and healthy lifestyle, principles of protection of inherited natural resources, are exposed. Historical and contemporary examples of good practice have been considered, which have improved the quality of life, both in the family micro-space of residential houses and in urban cores of the metropolis. We hope that this knowledge base will become an inspiration to professionals and public to improve the standard of living on the local as well as at the international level; to compete in treating quarters belonging to citizens, cities that develop in accordance with nature and state policies that contribute to the protection of the planet.

Urban structure is a complex and multidimensional system that is prone to change. Therefore, it requires to be closely monitored by continuous research, which brings up some entirely new issues or sheds new light on the old ones. Given the importance of the planning topics elaborated at the conference and numerous questions that are raised here, we firmly believe that it is our task to continue exploring this matter. Hence, we are proud that the ICUP conference establishes itself as a traditional manifestation of the University of Nis. I take this opportunity to thank all of the authors and co-authors of papers, reviewers, keynote speakers, members of the Scientific Program Committee, as well as teachers and associates engaged in the technical preparation of these Proceedings.

And finally, I am pleased to invite all authors from the academic and research community to participate and give their scientific and professional contributions to the future Conferences, for the benefit of all of us.

***Petar Mitkovic**, PhD, Full professor*
Faculty of Civil Engineering and Architecture, University of Nis
Chairman of the Scientific Program Committee

Disclaimer

The contents of the papers presented in this publication are subject to review, but the authors are responsible for the originality and quality of their papers.

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FROM DOHA TO NIS: NATURE-BASED URBAN DEVELOPMENT

TOWARDS JUST, RESILIENT AND INCLUSIVE WATERFRONTS

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ABSTRACT

In the context of this paper, waterfronts are seen as a valuable part of nature which always either neglected or overdeveloped in contemporary cities. Waterfronts, the unique places where land and water meet, are a finite resource, embodying the special history and character of each city. Some cities have long-treasured waterfront promenades, many cities have recently built ones, and others have plans to create them as opportunities arise. Beyond connecting people with urban water bodies, waterfront promenades offer many social and ecological benefits. They are places for social gathering, for physical activity, for relief from the stresses of urban life, and where the unique transition from water to land eco-systems can be nurtured and celebrated (Macdonald, 2017). The paper analyses the main transformations in people and planners' relation with nature. It also illustrates concepts and strategies for using architecture, urban design and planning as tools to restore and heal nature in the specific case of waterfronts development. The paper connects the two cities of Nis and Doha in their similar positions as privileged with a close natural waterbody. While the paper's main focus will be the case of Doha city, the capital of Qatar, yet a number of lessons learned and conclusions can be drawn to initiate a dialogue about the scenarios of developing the waterfront of Niš city. The paper also investigates unique global case studies where waterfronts were used to provide a new planning paradigm which can be best described as nature-based urban development. The paper concludes with an urban planning matrix composed of concepts, strategies, principals and patterns which can be creatively used to grantee the planning of livable, just, resilient and inclusive waterfronts.

Keywords: urban planning; Coastal Cities; Waterfronts; Doha, Qatar; Coastal Management; Coastal Development, Climate Change Impact.

1. INTRODUCTION

For a waterfront to succeed and attract people and enhance its city, a focus on quality and successful place making is highly recommended. Design-based waterfront developments should attain a number of qualities to accomplish positive planning process which would lead to vibrant and attractive waterfronts. More integrated spatial and planning patterns to guarantee the success of waterfronts will be crystalized in the lecture. A social approach to urban waterfront regeneration is an important condition too as it will guarantee that the regeneration of the waterfront is actually speaking to all people without any form of rejection, discrimination or neglect. Such an inclusive approach would create bonds between people and place. The social approach to waterfront development would affect the decision making in the planning processes. The Gulf waterbody and the extended coastline are of a great social and cultural significance to the community of Qatar. With more than 600km of continuous waterfront, Qatar is blessed with a great potential which can be vital for its urban and economic future. This natural potential can be also perceived as a great plight if the impacts of climate change particularly the sea level rise are not considered. This paper illustrates a major shift in contemporary urban development in Qatar. The shift stems from a deeper understanding of the vulnerability of Qatar as a peninsula facing the consequences of climate change in an inevitable manner. Evidently, the first cycle of globalizing the waterfronts urbanity in Qatar and particularly Doha the capital city, was characterized with an emphasis on the image of the city on the expenses of being concerned and prepared for the consequences of climate change and global warming. Plenty of skyscrapers were built along the waterfront to generate a global

city image for Doha. Additionally, a number of mega real-estate projects resorted to gulf reclamation to gain more land and create fantasy housing and recreational projects.

The paper sheds light on new planning approaches, coastal management strategies, global warming impact assessment, climate change readiness and urban development guidelines which characterize the new waterfronts development paradigm in Qatar. The related outcomes of Qatar Vision 2030 specifically the Integrated Coastal Zone management Plan for Qatar will be assessed to scrutinize its policy making, planning and implementation. More significantly, the paper traces the impact of the declaration of Qatar National Development framework and Qatar National Master plan, as calls for a better planning for the local waterfronts. The paper concludes with a holistic planning matrix which advises the development logic of coastal cities in Qatar to create a balanced relation between Gulf, city and society. It also suggests planning principles, policies, guidelines and regulations for future waterfronts and coastal areas' development in Qatar.

2. QATARI CITIES AND WATER: A UNIQUE RELATION, THE PAST, THE PRESENT AND THE FUTURE

The relation between Qatari cities and water is historical and influential. The Urban history of Qatari cities was substantially affected by the proximity of the Gulf and the economic dependence on fishing and pearl diving. Studying the urban evolution of Qatar and other Gulf States would reveal two forms of settlements allocated in an adjacency with water. The first form is fishermen villages which were distributed along the waterline in the preferred sites for starting the fishing trips and its proximity to the community Souq. This form or pattern of waterfront development was not limited to Qatar but was repeated in all Gulf States as fishing and pearl diving were the main economic pillars for all pre-oil traditional settlements in the Gulf. The second pattern of waterfront development is the portal cities. These cities grow gradually and organically around a simple port which was used to facilitate trade activities within the Gulf and with neighboring countries particularly Iran, India and other surrounding countries.

Figure 1: The economic base of the origin of Doha as a fishermen village

2.1. The Impact of the Gulf on Doha's Urban Evolution

The city of Doha is the capital of the State of Qatar and is located on the Persian Gulf. The primary industry in the city was pearl trading through the 1920s, and then collapsed due to the invention of pearl harvesting techniques in Japan. The population peaked at about 27,000 inhabitants in the 1920s (Alraouf, 2017) and consisted of traditional Islamic desert settlement patterns, as described by Hakim(1986).These patterns consisted of a vernacular road networks of cul-de-sacs, which enhanced the privacy of neighborhoods, known as ferej, and the market, located close to the port and constituting the central public realm. After national independence, Doha entered a phase in the 1970s and 80s when the discovery of oil fueled a physical growth of the city's infrastructure. While the old city centers were replaced by commercial buildings and apartment blocks for foreign labor, low-rise housing areas rapidly extended the urban periphery (Al Hathloul 1996). Studying the urbanity of Qatar and particularly Doha, would reveal the significance influence of proximity of the Gulf on the city growth pattern over the past decades. The city of Doha is the largest city and capital of the state of Qatar, and is located on the Persian Gulf. It has one of the fastest growing populations in the Arabic world (World Bank 2014). While the population of Doha was below 500 thousand just 20 years ago, it is now over 1.2 million and expected to continue rising at unprecedented rates. Even if we trace how Doha transformed from a traditional settlement to a cosmopolitan and global city, we can clearly identity the impact of the Gulf on the city morphology, roads development patter and growth directions. In other words, the urban growth dynamics of Doha were substantially relaying on the strong connection between city and water. The overall morphology of the city can also be seen as a reflection of the Gulf waterline geometry. Changes in the composition and configuration of urbanizing Doha were found due to the gradual growth respecting the genesis of the city's development; the Gulf.

Figure 2: The whole process of urban evolution in Doha, the Capital city of Qatar was based on the strong connection with water

2.2. Why Waterfronts are Significant to Qatar's Urban Future?

The Gulf and coastline assets are of great spiritual and cultural significance to the people of Qatar. As all the main cities in Qatar are basically coastal cities, planning for their sustainable future is crucial. All these coastal cities were and still represent the main centers of urbanization in the whole State. The growth of Qatari coastal cities population and the preference for living in coastal areas has resulted in their ever-increasing development. Coastal cities and waterfront areas are the most common destination, which brings in economic growth but implies additional urban development and increases the need for resources, infrastructure and services. Qatar went through different phases of dealing with waterfronts in the last decades. Most of the coastal cities were transformed from humble fishermen settlements to modern cities.

3. THE STATUS OF DOHA'S WATERFRONTS: A DECADE OF CHANGE

Historically a pearl-trading center, Doha has reinvented itself in just two decades into one of the world's busiest business, cultural and tourism centers. The Evolution of Doha's Waterfront if critically analyzed reveals profound conclusions about phases of development. The capital city Doha has witnessed a number of transformations after the discovery of oil. As per the waterfront, specific changes can be concluded as follows:

3.1. From a source of livelihood to a view

One of the main transformations that can be observed in the post-oil era is the fact that the Gulf was not perceived any more as a source of livelihood. Fishing and pearl diving are no longer the back bone of the State's economic base. Hence, the Gulf's new value, particularly for hotels and real estate developers lies in its ability to provide stunning views for hotels' guests and residential towers dwellers.

Figure 3: Doha's waterfront in the 1940s and **1960s**.

Figure 4: 1990s

3.2. The Port and the Market vs. the Glittery Towers

The post-oil era is also related to the domination of changing the image of the city so it can be easily related to global cities around the world. The waterfront which was historically distinguished with its vibrant port and lively market transformed into a setting for iconic development which constructs the new image of the city as a global urbanity. The result of such process resulted in the lining up of towers overlooking Doha Bay. Parallel to such aggressive development another form of urbanity can be observed. Considerable portions of the waterfront were designated to private entities primarily hotels, restaurants, resorts turning the enjoyment of the Gulf waterfront to private places. This privatization of the waterfront was accompanied with lack of interest in creating spaces for people and reestablishing the strong connection between the city, the community and the waterfront in Doha.

The waterfronts in Qatar were subjected to different levels of development. |While Doha's waterfront is characterized with towers, hotels and other types of development, other cities and towns along the Gulf coast were either humbly developed or not developed at all. There are plenty of positive aspects in such uneven pace of waterfronts development in Qatar. One of which is the ability to use a holistic matrix of development to be applied in a long part of the coast which is still under or not developed. Another positive aspect about lack of development is related to nature and cultural preservation particularly architecture and urban heritage. If Qatar is committed to diversifying its economy and is considering tourism as one of the prime catalysts for such diversification, then waterfronts development should balance between tourism demands and preserving local assets. The waterfronts development should inject new lives into the small towns spread throughout the coast and the urban depth adjacent to the waterfront.

Figure 5: Doha's accelerating waterfront development in the last decade

4. CONTEXTUALIZING THE WATERFRONTS OF QATARI CITIES

In addition to Doha, the Capital city, Qatar's cities are all adjacent to water. The main reason can be understood once the urban history of each city is analyzed. All these cities are originally based on fishing or trade small ports. So every Qatari city overlooking the Gulf has its history but also acquired some architecture, urban, cultural and functional roles through the last few decades. Therefore, for planning the future development of Qatari cities' waterfronts, being informed about its history and current status is significant. The idea is using the personality, historical narrative, urban character and assets of every Qatari city to articulate its

unique approach to waterfront development. For example if we compare between the other two cities following Doha in the ladder of Qatar's most important and populated cities, interesting conclusions would be revealed. In the case of Al Khor City/Municipality, the fishing port is the origin of the city. Al Khor city is located specifically on the East coast of Qatar, about fifty kilometers from Doha and come third in terms of population with its 200,000 inhabitants. The personality of the city now is weaved around a recreational role which needs to be elaborated and further explored. The future development of the city and particularly its waterfront should consider the city character, function and personality. Hence, invest more in developing the City and its waterfront as a holistic recreational development serving the community, the city and the whole country. The second important case is Al Wakrah City/Municipality. Al Wakrah, a city in Qatar is located south of Doha. The Eastern shore of Al Wakrah faces the Gulf. Originally fishing and pearling village, Al Wakrah has now evolved into a small city with a population of more than 300,000 inhabitants making it one of the largest cities in Qatar. The city has a strong history and evidences of the traditional architecture and urbanism of Qatar. It is also the location of the famous fort and traditional market. Hence, a focus on the historical heritage as a potential for developing the city's waterfront can be a key to its uniqueness within the Qatari context.

Figure 6: Partial attempts to develop parts of Al Wakrah waterfront as a manifestation of local heritage to attract tourism and serve the local community alike.

5. THE MAIN CHALLENGES OF WATERFRONT DEVELOPMENT IN QATAR

For Qatar to develop its waterfronts and coastal cities in a sustainable manner, a number of challenges need to be confronted. As explained earlier, all the waterfronts and coastal cities in Qatar are part of the country's environmental assets and also contain the most significant urban and architectural heritage due to the fact that all traditional cities in Qatar were historically portal cities connecting Qatar with the rest of the world via trade and other economic activities. Here are the main challenges as prioritized to be confronted in any strategic planning aiming at developing waterfronts and coastal cities in Qatar.

5.1. Waterfronts as a Catalyst for Urban and Economic Development

To mitigate these problems it is necessary to consider coastal cities as dynamic complex systems which need energy, water, food and other resources in order to work and generate diverse activities, with the aim of offering a better socio-economic climate and quality of life (Rodriguez & Brebbia, 2015). As a consequence, the integrated management and sustainable development of coastal cities is essential, with science, technology, architecture, socio-economics and planning, all contributing to provide support to decision makers (Rodriguez & Brebbia, 2015). As stated in Qatar National Development Framework: "Although Qatar is a coastal nation, there is a significant under provision of recreational and leisure facilities in coastal locations for the community to enjoy". Qatar National Development Framework (QNDF).

5.2. Environmental Conservation

The activities common to coastal cities and waterfronts areas require the development of well-planned and managed urban environments, not only for reasons of efficiency and economics, but also to avoid inflicting environmental degradation that causes the deterioration of natural resources, quality of life and human health (Rodriguez & Brebbia, 2015). Preserving the environmental assets allocated along the extended Qatari coastline including mangrove trees. Qatar should learn from the negative consequences of water reclamation as it negatively affected marine ecosystems. Extensive coastal development in Dubai's artificial islands is a very illustrative example of such negative impact. Another important aspect in planning contemporary waterfronts is dealing with the future consequences of climate change.

Figure 7: The view over a few mangrove trees that grow on the shores of Qatar

5.3. Heritage Conservation

The second main challenge in developing waterfronts and coastal cities in Qatar is heritage conservation. All the portal cities in Qatar from Doha to Al-Khor or Al-Shamal in the north or Al-Wakra in the south are sites for a valuable architectural and urban heritage. From the fabric of the traditional center of these cities to the unique vocabulary of architectural elements used in houses, mosques and majlises, conservation and preservation of such valuable and irreplaceable heritage should be a priority. Hence, the role of urban planning authorities in Qatar should be articulated around a more sensitive approach to waterfront development. An approach that will allow development and growth but more significantly acknowledge the importance of conserving the nation's heritage and preserve such valuable chapters of Qatar's history.

5.4. Waterfronts in Qatar as Places for All

Many scholars in the field of urbanism, through their research, have highlighted the importance of the human dimension in urbanism (Jacobs, 1961; Gehl, 2013) and offered insights into systematically studying environmental behavior (Zeisel 2006) through international studies in public life (Whyte, 1980; Gehl, 2013). Studying public life offers immense insights to urban environment professionals by bringing users back into focus when they may be overlooked in design (Gehl, 2013). The expected outcomes could play an essential role in achieving the needs of the whole social spectrum that are considered as community members dwelling within Doha and other cities. People in Qatar could belong to any of the more than 150 nationalities that make Doha and other Qatari cities one of the world's most diverse places. Hence, waterfronts development in Qatar should speak to this diversified human mosaic and take their needs and aspiration into consideration.

6. THE ROLE OF THE URBAN PLANNING DEPARTMENT IN QATAR: TOWARDS AN INTEGRATED COASTAL ZONES DEVELOPMENT

6.1. The Inevitability of Coastal Protection

Qatar coastline has come under increasing pressure as it continues to attract many new residents and visitors seeking the lifestyle and environment of coastal living. Planning for coastal communities must balance the need to provide jobs, housing, facilities and transport for a growing population while maintaining the coast's unique qualities. It was evident in Qatar National Development Framework (QNDF) that Qatar as a costal nation is not utilizing such a potential to the maximum level desired[1]. Qatar National Development Framework (QNDF) and the generated Qatar national Master plan acknowledged the lack of clear strategy to deal with the waterfront development and coastal growth. Hence, Interim Coastal Development Guidelines (ICDG) was developed with the determination to use it temporarily till the finalization of a comprehensive and integrated study dealing

[1] QNDF has proposed the preparation of a comprehensive Integrated Coastal Zone Management Planning (ICZMP) to help manage and sustain the nation's valuable coastal assets.

with Costal Zones Management. The main value of ICDG is to guide the assessment and approval of recreational, leisure, tourism and other forms of development and facilities proposed in coastal locations. Additionally, it directs public and private sector development to follow a clear set of development objectives, definitions and regulations to prevent the risk of environmental degradation in the Coastal Zones.

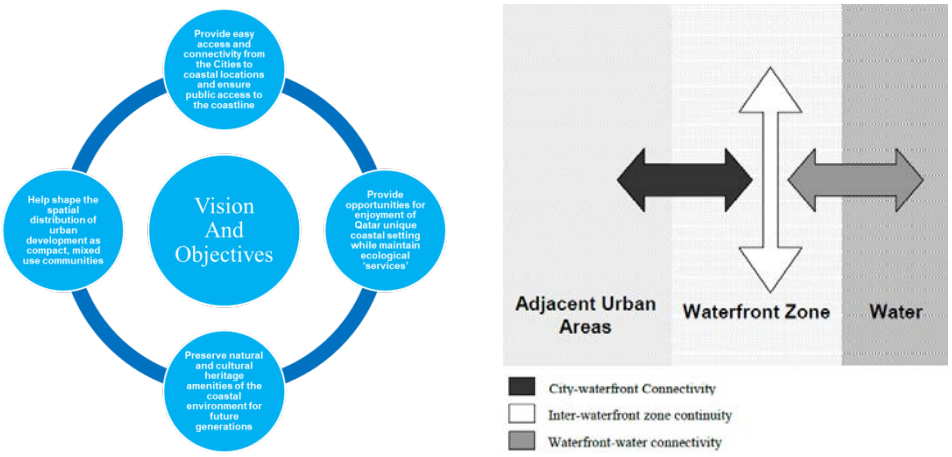

Figure 8: (Source: QNMP, ICZD)

Based on the coastal form of Qatar and the land use sensitivity analysis that has been undertaken and mapped, appropriate forms of land use and occupancy in the four major coastal zones have been identified. The Four Coastal Zone Types are Protected Areas and Aquifer Protection Zone, Developed Areas, Future Development Zone, and QP Jurisdiction Zone boundary and areas that have not been designated in the first the first three types. The third type or zone which is related to future development was also divided into three zones depending on the sensitivity of the development context. Hence, Classification of Future Development Zone was categorized as such The Future development zone with less environmental sensitivity, The Future development zone with medium environmental sensitivity and The Future development zone with high environmental sensitivity.

Figure 9: The main promenade of Doha and the connected green public spaces.

Figure 10: The interaction between people and the waterfront along the city's active promenade.

7. GLOBAL LESSONS: THE URBAN VALUE OF COSTAL DEVELOPMENT

The meaning of a city vibrant waterfront is centered on creating places for all people. Cities seek a waterfront that is a place of public enjoyment. They want a waterfront where there is ample visual and physical public access – all day, all year - to both the water and the land. Cities also want a waterfront that serves more than one purpose: they want it to be a place to work and to live, as well as a place to play. In other words, they want a place that contributes to the quality of life in all of its aspects – economic, social, and cultural". Remaking the Urban Waterfront, the Urban Land Institute (Seattle Department of Planning and Design, 2012)**.** In this section of the paper, a number of global case studies were analyzed in order to draw conclusions regarding the main features of positive and vibrant waterfronts. The selected case studies range from mega city like the Shanghai Bund Waterfront Redevelopment, the Northern Hong Kong Waterfront and Melbourne Waterfront Revitalization. The cases also include examples of small and medium scale interventions like the case of Aker Brygge Wharf, Oslo, Norway and the Cheonggyecheon River in Seoul, South Korea.

Figure 11: The best practice cases of the Shanghai Bund Waterfront Redevelopment and Melbourne Waterfront Revitalization respectively

The cases of Aker Brygge Wharf, Oslo and the Cheonggyecheon River, Seoul illustrated the value of small and medium scale interventions which aim to transform the city water potentials into a source of distinction and force to create new spatial experiences. In the two cases, the waterfronts were planned as social public spaces within the fabric of busy cities. Particularly, the the Cheonggyecheon River development illustrated the importance of small act and big Impact approach. How the Cheonggyecheon River urban design restored the green heart of Seoul. The project is intended to create a green oasis in a concrete jungle. The large scale cases like The Northern Hong Kong and Waterfront Melbourne Waterfront Revitalization deal with the waterfront not only as a social and recreational edge to the city but rather as a center of holistic development which been infused through the whole waterfront and more significantly penetrated the depth of the city. These projects have been planned in light of a development framework which sees the waterfront as a catalyst for the whole city development. In the case of The Northern Hong Kong Waterfront, the refined urban design framework provides a coherent and legible structure of uses, building forms, open space and connectivity. It is built upon the waterfront promenade and four principal design corridors to create a sense of place.

Figure 12: Aker Brygge Wharf, Oslo, Norway

Figure 13: the Cheonggyecheon River Urban Design Restored the Green Heart of Seoul

Figure 14: The Northern Hong Kong Waterfront

8. CREATING A GREAT WATERFRONT: THE SUGGESTED STRATEGIES

8.1. Planning Principles, Guidelines and Recommended Actions for Vibrant Waterfronts

This study involves an initial review of the literature on waterfront developments and urban sustainability to extract a comprehensive set of criteria that can be used to develop a vibrant, sustainable and successful waterfront (Macdonald, 2017; Andersson, 2018). Therefore, in this section, the lessons learned from the selected case studies in addition to the analysis of published literature on the new trends of planning waterfronts would construct the base for suggesting strategies, planning and design concepts which can guarantee the creation of create waterfronts. First of all, the importance of providing a diversity of attractions to create an all-time and all-season waterfront. Also, to provide a continuous waterfront promenade with an extensive greenery. The promenade as an extended spatial experience supported by green spaces would encourage social interactivity and sense of belonging to the waterfront. Such frequent usability can't be attained without allowing for public access and providing for environmentally friendly transport including green buses, bicycles, safe pedestrian routs and even effective water transportation. It was also documented that in all successful waterfronts, the main landmarks were integrated with the waterfront promenade to increase connectivity and vibrancy.

A social approach to urban waterfront regeneration is an important condition too as it will guarantee that the regeneration of the waterfront is actually speaking to all people without any form of rejection, discrimination or neglect. Such an inclusive approach would create bonds between people and place. The social approach to waterfront development would affect the decision making in the planning processes. The role of planners in public space planning is crucial but integrating the views of the community members is equally important. Hence, citizen participation in the planning and design process of any waterfront is not an option as waterfronts are one of the most social places and should by planned and designed by people and for people. Another crucial principle in planning waterfronts is to diversify uses and activities along the waterfront and within the coastal cities to include residential, commercial, cultural, institutional, and mixed uses connected with open and public spaces. For a waterfront to succeed and attract people and enhance its city, a focus on quality and successful place making is highly recommended. Design-based waterfront developments should attain a number of qualities to accomplish positive planning process which would lead to vibrant and attractive waterfronts. More integrated spatial and planning patterns to guarantee the success of waterfronts can be crystalized as such:

8.2. Waterfront as a Sequence of Public Spaces

Begin by envisioning a network of well-connected, multi-use public spaces that fit with the community's shared goals. Waterfronts should be designed as a sequence of active and vibrant public spaces speaking to the whole city dwellers.

Figure 15: Waterfronts should be designed and planned as a number of connected positive public spaces

8.3. Public Goals are the Primary Objective

Waterfronts everywhere are too valuable to simply allow developers to dictate what happens there (www.pps.org). This is not to say that private development is unwelcome and should be discouraged – on the contrary, it is often necessary to the future of a healthy waterfront (www.pps.org). But the best solutions for revamping waterfronts put public goals first, not private short-term financial objective (www.pps.org). The viability of a waterfront development is also about how to balance public and private invest to be economically sustainable.

Figure 16: the needs of the different sectors and groups of the community are the primary objectives of a successful waterfront.

8.4. Build on Existing Assets & Context

After establishing the public spaces and public goals, begin the public8.1 visioning process with the existing assets and surrounding context (www.pps.org). Therefore, it is wise to start small to make big changes. Placemaking is about doing more than planning. Many great plans get bogged down because they are too big, too expensive, and simply take too long to happen.

8.5. Create A Shared Community Vision

Unlike a master plan, a community visioning process does not lock a project into a prescribed solution (www.pps.org). It is a citizen-driven initiative that outlines a set of goals--ideals to strive for--that set the stage for people to think boldly, make breakthroughs, and achieve new possibilities for their waterfront (www.pps.org).

8.6. Create Multiple-Use Connected Destinations

Create a vibrant mixed-use community affordable and welcoming for all. The value of inserting popular destinations within the waterfront is to create a special place to draw people. The most effective way to propel a visioning process is to set a goal of creating a number of great destinations along a waterfront, an idea will guarantee extensive flow of people in different day times, seasons, weather and conditions. Such destinations along the waterfront should be connected to one another and incorporated into a vision for the waterfront as a whole. The connectivity between the selected and well planned destinations should be achieved via encouraging walkability and design the public realm which would encourage people to walk and reach the

different destinations in safe and enjoyable manner. Link: Connect the city and the water. And provide multiple ways to get around and to reach the waterfront include transit, walking and cycling. Additional aspect in terms of suggesting uses for waterfront is to focus also on suggesting water uses. Activities like boating, sailing, fishing, swimming and other related activities add positively to the vibrancy and open up options for different users.

8.7. Open the site with accessible public spaces for all.

A vital dimension in developing waterfronts which would speck to the whole community is maximizing opportunities for public access. It is essential that the waterfront be accessible for everyone to the greatest extent possible. Therefore, facilitating access and enhancing linkage would enhance the overall quality of the development. Waterfronts should be seen as a manifestation of the democratization not privatization of public spaces.

8.8. Create a green, sustainable, innovative model community.

To balance environmental benefits with human needs, waterfront development should consider environmental assets and a healthy blend with it in order to produce a showcase of authentic sustainable development. While a wide variety of uses can flourish on a waterfront, many successful destinations embrace their natural surroundings by creating a close connection between human and natural needs (www.pps.org).

8.9. Waterfront's Identity and Image.

Despite all functional aspects of a waterfront but it is also a platform to represent the identity of the city or the state. A waterfront also collectively would construct an image that can be literally printed in the minds of the dwellers or visitors alike. Therefore, the visual qualities of the waterfront are significant as it can be a representation and manifestation of identity and responsible for the city image.

9. CONCLUSIONS AND RECOMMENDATIONS

Qatar should acknowledge that waterfronts, the unique places where land and water meet, are a finite resource, embodying the special history and character of each city. Qatar's approach towards developing its extended waterfronts should be holistic, comprehensive and sustainable. The suggested urban planning principles, patterns, guidelines and actions are tools to ensure that all coastal cities in Qatar exploit its relation with water in a way which would serve people, attract tourism and promote diversified economic routes. Doha and all Qatari cities should perceive the blessing of being developed along the waterfront as a great potential for a more sustainable and livable urbanism. Towards Looking at the urbanization of Doha and other Qatari cities, waterfronts can act as a medium to achieve City/Waterfront interaction. The urbanity of Qatar needs more effort towards connectivity and continuity. The connections, corridors and vibrant green streets towards the waterfront act as the city veins facilitating the coastal development to connect with the inner parts of the city. Hence, the successful waterfront acts as an interface to connect and link the city with its surrounding waterbody. It's possible that Qatar may end up getting a sparkling, successful new waterfront districts that draws in tourists from the world's four corners. Waterfronts development in Qatar should adopt a model which would consider old heritage, forts, existing old towns inserted in the urban and natural fabric as offering opportunity to enhance the unique experience. This is a model of tourism development that offers long term guarantees for sustainable tourism. As still long waterfronts are to be developed, Qatar should lend itself favorably to a type of non-invasive tourism based on enjoyment of culture as well as natural sites. In order to strengthen the waterfront's coherence and connection, this paper pays special attention to the design of waterfronts, ensuring that promenades are maintained as pedestrian and cyclists-friendly zones. But the suggested approach implies a different definition of target groups. A definition which gives priority for the local community and hence calls for a balanced urbanism, community participation and a public and private partnership. Developing waterfronts in Qatar can be seen as physical manifestation of the memory of place. Qatar architectural and urban heritage conservation within Qatari waterfronts commemorates history while creating a new legacy.

REFERENCES

1. Alraouf, Ali A. (2018). Knowledge-Based Urban Development in the Middle East. New York: IGI Global Publishing.
2. Alraouf, Ali. (2017). Interrogating Qatar's Urbanity as a Catalyst for Building Knowledge-Based Societies and Economies. In Bertelsen, Rasmus Gjedss; Noori, Neema; Rickli, Jean-Marc (eds.) Strategies Of Knowledge Transfer For Economic Diversification In The Arab States Of The Gulf. Pp: 53 -66. London: Gerlach Press.
3. Alraouf, Ali. 2016A. "Dohaization": An Emerging Interface between Knowledge, Creativity, and Gulf Urbanity. Pp.: 47-68. In Katodrytis, George and Syed, Sharmeen. Gulf Cities as Interfaces. Cambridge: Gulf Research Centre Cambridge.
4. Al Hathloul, S. (1996). The Arab- Muslim City. Tradition Continuity and Change in the Physical Environment, Dar Al Sahan, Riyadh.
5. Andersson, Thorbjörn. (2018). Waterfront Promenade Design: Urban Revival Strategies. New York: Images.
6. Breen, Ann and Rigby, Dick (1993). Waterfronts: Cities Reclaim Their Edge. New York: McGraw-Hill.
7. Fromherz, A. (2012). Qatar: a Modern History. Washington, D.C.: Georgetown University Press.
8. Fromherz, Allen. 2013. Qatar: Rise to Power and Influence. London: I.B.Tauris.
9. Jacobs, J. 1961. The Death and Life of Great American Cities. New York: Random House.
10. Kamrava, Mehran. 2013. Qatar: Small State, Big Politics. New York: Cornell University Press.
11. Gehl, J. 2013. Cities for People. Washington, DC: Island Press.
12. Gray, Matthew. 2013. Qatar: Politics and the Challenges of Development. Boulder, CO: Lynne Rienner Publishers.
13. Gremm, Julia and (els). 2015. Kuwait is the Past, Dubai is the Present, Doha is the Future: Informational Cities on the Arabian Gulf. In International Journal of Knowledge Society Research, 6(2), 51-64, April-June 2015.
14. GSDP. (2011). Qatar National Development Strategy 2011~2016. Doha, Qatar: Qatar General Secretariat for Development Planning. General Secretariat for Development Planning. (2008). Qatar National Vision 2030. Doha. Retrieved from http://www.gsdp.gov.qa/portal/page/portal/gsdp_en/qatar_national_vision/qnv_2030_document/QNV2030_English_v2.pdf
15. Hakim, B.S. 1986. Arabic-Islamic Cities: Building and Planning Principles, University of Michigan Press.
16. Macdonald, Elizabeth. (2017). Urban Waterfront Promenades. London: Routledge.
17. Qatar National Development Framework (QNDF). 2016. The Ministry of Municipality and Environment.
18. QSDP. (2011) (Qatar General Secretariat of Development Planning) National Development Strategy 2011–2016. Gulf Publishing and Printing Company, Doha, Qatar.
19. Qatar Statistics Authority. (2015). QSA Population. Retrieved February 22, 2015, from http://www.qsa.gov.qa/eng/populationstructure.htm
20. Richer, R. A. Sustainable development in Qatar: Challenges and opportunities, QScience Connect 2014:22 http://dx.doi.org/10.5339/connect.2014.22.
21. Rizzo, A. (2013). Metro Doha. Cities, 31, 533–543. doi:10.1016/j.cities.2011.11.011
22. Roberts, David B. 2015. Qatar: Securing the Global Ambitions of a City-state. London: C Hurst & Co Publishers Ltd.
23. Rodriguez, G.R., & Brebbia C.A. (editors), 2015. Coastal Cities and their Sustainable Future. WIT Press, Southampton, Boston.

24. Shandas, V., Makido, Y. and Ferwati, S. (2017). Rapid Urban Growth and Land Use Patterns in Doha, Qatar: Opportunities for Sustainability?. European Journal of Sustainable Development Research, 1(2), 11. doi: 10.20897/ejosdr.201711

25. World Bank. (2014). Data: Qatar. Resource document. http://data.worldbank.org/country/qatar. Accessed August 2017.

26. https://www.pps.org/article/stepstocreatingagreatwaterfront

BRINGING NATURE INTO THE CITY

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Re-naturing cities, an overview and indications for a research agenda.

ABSTRACT

Strategies for re-naturing cities using nature based solutions are proposed as a policy strategy for addressing urban challenges, including climate change and adaptation to climate change impacts. The present reflection provides some insights into definition of key concepts, and explores potential benefits and shortcomings of these strategy. It finally points to some key research areas to be covered for successfully operationalizing the concept for a climate resilience policy.

1. BACKGROUND

Since a couple of years, and especially with the growing concern about how cities can meet their needs for adapting to a changing climate, there is an increasing interest in strategies for "re-naturing cities" based on so-called "nature-based solutions" as an efficient and versatile alternative to traditional or "grey" infrastructures for the mitigation of impacts from natural hazards. nature-based solutions as an option for climate change adaption are particular attractive, as they provide cost-effective solutions for societal challenges, including climate resilience, while simultaneous generating environmental, social and economic benefits, and contributing to build resilience. They promise to bring more, and more diverse, nature and natural features and processes into cities, landscapes and seascapes, through locally adapted, resource-efficient and systemic interventions [1], and they simultaneously provide benefits for biodiversity and human well-being" [2].

2. CONTEXT

Conservation of biodiversity, human well-being and climate change mitigation, some of the main challenges NBS respond to, are indeed among those which cities struggle with and which, under increasing urbanization trends, need to be addressed urgently. The percentage of people living in cities is continuously growing. While in 1950, a 30% of the global population lived in urban areas, by 2018 this share has risen to 55% with highest growth rates in Asia and Africa, while in Europe in some countries, urban population is in decline.[3].

Urbanization is leading, since more than one century, to a consistent deterioration to living conditions (quality of air and water, noise, etc.) with air pollutants being the single major cause for premature deaths in the EU [4].

While vegetation and water and their growth used to be a "natural" component of urban living conditions in the past and the knowledge about the management of natural processes represented an important asset conserved in urban societies [5] with the rise of industrialization and development of new technologies, many of these processes (food production, but also wastewater treatment, flood protection, climatization, but also transport) have been substituted by technological processes and constructions, with the aim of improving efficiency of processes (production, functioning) and outcomes (water quality, security, etc.). These technological developments have without doubt increased quality of urban living conditions for humans and to some extent for the environment (e.g. wastewater treatment), many of these infrastructures and solutions actually come under discussion when urban environmental qualities are perceived as increasingly unsustainable and reveal their fragility under the prospective of changing climate conditions. Climate change has furthermore added arguments to this review of technologized urban life, recognizing cities and urban

activities as the most important sources of greenhouse gases with over 70% of emissions originating from urban areas [6]. Impacts from climate change increasingly show limits of technological solutions and shed a new light onto the capacities of natural processes for resolving societal and urban challenges. This is supported by the increasing awareness about the capacity of ecosystem services to provide the needed services, and address the urban challenges, which have furthermore produce series of additional advantages of which the fact that they "bring the nature back to the city" has positive connotations also from a cultural point of view, as the perception of nature conveys positive physical and mental health effects [2].

The present note will briefly describe definitions related to current practices of "re-naturing cities" and point to solutions such strategies can provide in the field of urban climate change adaptation and policies for the increase of urban resilience. It will furthermore point to some potential drawbacks and further research needs.

3. DEFINITIONS

The "re-naturing cities" concept is based on two slightly different but interconnected notions, "green infrastructures", and "nature-based solutions". Green infrastructures are understood as "an interconnected network of natural areas and other open spaces that conserves natural ecosystem values and functions, sustains clean air and water and provides a wide array of benefits to people and wildlife", and is "the ecological framework for environmental, social and economic health-in short, our natural life-support system" [7]. Green infrastructures consist of planned networks of ecosystems, created explicitly for restoring, conserving, improving and connecting terrestrial or aquatic ecosystems. Further to the conservation of biodiversity, the creation or conservation of networks of ecosystems aims at ensuring the delivery of ecosystem services for the society [8].

While green infrastructures are created and enforced as they support of biodiversity for the sake of supporting human activities in general, the definition of nature-based solutions is, albeit similar and partly overlapping, more focused on specific responses to socio-economic challenges. nature-based solutions are commonly defined as solutions "inspired and supported by nature and use, or mimic, natural processes to contribute … to addressing societal challenges ." [9,10 Annex 1]. An important feature of nature based solutions lies in the fact these do not necessarily involve "natural" ecosystems, but rely on "… natural processes [...] being proactively managed" to achieve a predefined objective" [9]. Following this definition, "an NBS can involve conserving or rehabilitating natural ecosystems and/or the enhancement or creation of natural processes in modified or artificial ecosystems.". A similar definition is used also by the EU expert group, which makes some further clarifications, so that mimicking "how non-human organisms and communities cope with environmental extremes" is part of the concept as how it is understood in the realm of the EU agenda, pointing to the innovation potential of "innovative application of knowledge about nature, inspired and supported by nature" (EC 2015 Annex 1) which is expected to create, inter alias, also new economic opportunities.

A key element for both concepts are ecosystem services. Following the definition provided by The **Economics of Ecosystems and Biodiversity** Initiative (TEEB), ecosystem services are, "the direct and indirect contributions of ecosystems to human wellbeing"[1]. Based on this conceptualization, in the Millennium Ecosystem Assessment (MEA) the initiative has produced fundamental framework for the monetary or economic quantification of the contribution these services provide for the global society [11]. This framework attempts for establishing an accounting system for those services which normally are not quantified, and in doing so, raising the attention among decision makers for the economic importance of conservation of biodiversity.

In the realm of urban policies, the term "nature based solutions" explicitly frames the use of ecosystem services in a way which compares to other types of investments into so called "grey" solutions. Assuming implicitly that ecosystems provide more than one service, the calculation of costs and benefits of urban investments in green infrastructures should take into account also of those costs and benefits, ecosystem services provide in addition to the challenge they are addressing. The attractiveness of nature based is determined in particular by this capacity of ecosystems to provide more than one service of socio-economic importance. In most cases, nature based solutions not only respond to the societal challenge they are designed for, for instance climate mitigation or flood protection, but provide additional direct and indirect advantages

[1] http://www.teebweb.org

and benefits which, in the context of an economic assessment for a comparison of costs and benefits, can be assessed as additional services [12] and valuated in monetary terms.

4. RE-NATURING CITIES AS A STRATEGY FOR ADAPTING CITIES TO CLIMATE CHANGE IMPACTS

An increasing number of natural hazards like the hurricanes Sandy and Katrina, or the European heat wave of 2003 as well as extreme precipitation events like those in Copenhagen (2011) Genova (2011, 2014) or Livorno (2018) to name only a few, have revealed the vulnerability of cities, increasing the attention for adaptation options. Looking closer at vulnerabilities and exposure of urban population to hazards, the continuous substitution of natural areas with artificial structures (buildings, streets parking lots, etc) is recognized as a factor which contributes to the increasing severeness of climate impacts. In fact, high degrees of soil sealing, low percentages of vegetation and reduced space for ecosystems like rivers and coastal estuaries have increased exposure of cities and urbanized areas to hazards more than an increase in frequency or intensity of such events [13]

Front of the challenges represented by climate change, nature based solutions have become part of international research agendas. The European Commission which has introduced legislation and several strategies which aim at creating institutional space for the protection of biodiversity and the inclusion of green and blue areas in national and local policy making, such as, inter alia, the Green Infrastructure Strategy [14]) and the Biodiversity Strategy [15]). The latter is paraphrased as “our life insurance”, stressing the fact that biodiversity, while not representing an economically produced service, represents a fundamental contribution to social and economic activities. In addition a research agenda was defined [10], which has since being implemented with a consistent number of research and innovation projects with the aim of increasing knowledge and operationalizing the concept of nature-based solutions and testing and their implementation . The EU is not alone with a policy agenda for the promotion of nature-based solutions; also international organizations like UN, and NGOs like IUCN have specific programmes and agendas promoting nature based solutions [2,9,16]).

There is an increasing number of examples for nature based solutions in urban areas, starting from stormwater management systems as in housing areas as the case of Augustenborg in Malmoe[2] strategies for increasing the number of green roofs set in place in Basel (CH)[3] or London (UK)[4] for green roofs and walls or projects for temporary or permanent forms of urban gardening[5], and a series of web based databases as Climate Adapt[6] or Oppla[7] showcase successful cases in order to encourage their wider implementation.

4.1. Contributions to urban climate resilience

As said, green or nature-based solutions contribute to the city’s (and their inhabitants’) capacity of withstanding a broader range of negative impacts from future changes, making them, according to the policy agenda “resilient”. The term “resilience is of a certain importance in this context: it is frequently applied in the domain of Disaster Risk Reduction, but has, since some time, entered the rhetoric (and thinking) of climate change adaptation discourses as well: starting from the 1990s, in a first place the disaster risk reduction community had discovered the concept as a positive alternative to policies based on passive protection measures. Assuming that resilient systems (and in this sense cities can be perceived as highly complex socio-ecologic systems) to behave in a way that Holling [17] had observed on ecosystems, that is recovering from external shocks and return to a stable functioning state. The question of how to conceive stability front of a

[2] https://climate-adapt.eea.europa.eu/metadata/case-studies/urban-storm-water-management-in-augustenborg-malmo

[3] https://climate-adapt.eea.europa.eu/metadata/case-studies/green-roofs-in-basel-switzerland-combining-mitigation-and-adaptation-measures-1

[4] https://climate-adapt.eea.europa.eu/metadata/case-studies/climate-proofing-social-housing-landscapes-2013-groundwork-london-and-hammersmith-fulham-council

[5] https://climate-adapt.eea.europa.eu/metadata/case-studies/ghent-crowdfunding-platform-realising-climate-change-adaptation-through-urban-greening

[6] https://climate-adapt.eea.europa.eu/

[7] https://www.oppla.eu/

situation which has proved to be unsustainable under a shock from a hazardous event is key to the resilience debate in relation to adaptation strategies, giving way to framing of resilience in relation to the characteristics of “basic system functionalities” to be conserved.

The power of this metaphor applied to socio economic systems and their ability to react to shocks without loosing their essential characteristics is powerful and attractive, especially as it leaves large space for interpretation regarding the amount of activities needed for absorbing shocks (how much resilience is needed, which leads to the more fundamental problem of how can resilience be measured), and the eventually even more challenging question of which are the essential characteristics of the system which need to be conserved and protected [18]. In this sense, resilience is evolving from a powerful term increasing the attractiveness of climate policies on the ground and is actually at risk of developing into a buzz-word which can be used without reference to precise actions, thresholds and measures.

nature-based solutions or concepts for re-naturing cities, being based on the same concept of resilience of ecosystem processes, bear a similar problem: again the delimitations of socio ecologic systems, and the canon of measures, measurements and thresholds remain vague, and leave wide room for interpretation. In this case the wide room for interpretation is determined by the dimensions which distinguish them from engineered “grey” solutions: being based on socio-ecologic systems, parameters for delimitation, dimension, efficiency and performance are difficult to define and subject to changes over time as the characteristics of ecosystems differ due to local conditions, dimensions, composition, and evolve over time (e.g. age of trees) and human systems are even more challenging to be delimited [18]. It should thus come to no wonder that quantitative information on efficiency of nature-based solutions is not frequently available.

The EKLIPSE working group [19,20] has proposed a formal framework for the assessment of efficiency and effectiveness of NBS in the urban context. Yet, a review of literature yielded mainly punctual assessments, and single values valid only for the precise context of the local case study and not transferrable to other places. This relates to one of the basic characteristics of NBS which are necessarily adapted to the local (regional, climatic) context and furthermore can eventually change their characteristics also over time (with plants growing and ecosystems becoming more complex over time).

Rather than providing quantitative guidelines and indicators for the “construction” of nature based solutions, the EKLIPSE framework is intended to be applied as a guideline for the assessment of urban projects for nature based solutions, by identifying the challenge, the solution needs to respond to, and then select among a proposed set of indicators in order to assess their performance and benefits with regards to the challenge itself, co-benefits and costs of measures. The ten societal challenges identified for the framework are oriented towards the principal challenges for urban policies, relating to: (1) climate resilience, (2) water management, (3) coastal resilience (4) green space management, (5) air quality, (6) urban regeneration, (7) participatory planning and governance, (7) social justice and social cohesion, (9) public health and well-being, and (10) potential for economic opportunities and green jobs [20].

Beyond the capacities of nature-based solutions of responding to these challenges, benefits and co-benefits of nature based solutions are include, for instance for measures aiming at increasing urban vegetation, an increase of evapo-transpiration rates in the urban area, contributing thus to a reduction of the urban heat island effect which increases the effects of heat waves [21,22], while providing additional benefits in terms of climate mitigation [23,24], public health and well-being[24,25] and reduction of air pollution [26] to name only a few.

The implementation of nature based solutions has, on the other side also some risks and potential trade-offs: while the presence of urban trees in terms of mitigation of air pollution or urban heat island has positive impacts at the micro (neighbourhood) scale, its impacts at urban scale can be neglected, even in the case of considerable quantities of urban forests in relation to the urban surface [27] or produces at least mixed results [28,29].

Most urban green solutions require furthermore irrigation at least during longer dry periods. This requirement puts important limits to the use of nature based solutions in arid and semi-arid climates in terms of water consumption [29] and requires the choice of specific species as well as innovative solutions for water re-use in order to be sustainable.

With regards to urban regeneration policies, the use of nature based solutions poses also potential questions of equity, nature-based solutions have a great potential for enhancing social cohesion, equity and social justice, if requirements for distributional and procedural justice are respected in planning, implementation and management, and ownership of solutions by users is actively promoted [20]. If not adequately addressed, the implementation of nature-based solutions adds a further level of potential injustice. The well-appreciated co-benefit of environmental qualities in the urban areas translates, on urban real estate markets, into increasing land values and higher costs for housing: There is consistent evidence that greening strategies can transform into instruments for gentrification, or the quantity and quality of nature based solutions is not equally distributed among different socio-economic groups, with high income groups benefitting from higher quality of ecosystem services and nature based solutions [see for instance 30,31,or 32–34]. Yet, strategy for addressing inequalities and different vulnerabilities are not well developed [35] and positive examples are limited mostly to single, small scale experiences, based on bottom-up approaches.

Implementation of nature based solutions is furthermore hampered by a series of barriers related to the lack of awareness and capacities at institutional level as well as in civil society, [36], as well as a dominance of expertise and market solutions oriented towards “grey” solutions which results in a low level of awareness about the effectiveness of green solutions compared to engineered solutions [9]. The resulting inertia and bias against green solutions is actually addressed, for the EU, with the EU policies and research agenda, but other general draw backs of nature-based solutions in the urban context (e.g. space and water requirements) will be equally challenging to be addressed and require further research, testing and development of quantitative indicators based on local experience in different geographic and climatic contexts.

5. CONCLUSIONS

While representing a powerful and potentially efficient contribution to addressing present challenges urban areas are facing, re-naturing cities with nature based solutions nevertheless must not be considered a “miraculous” or “do-it-all” solution [37] as it still bares some technological and practical limits and relevant knowledge gaps and the need for policy innovation for a better integration of bottom-up strategies which need to be addressed for a more successful application.

REFERENCES

1. European Commission Policy Topics: Nature-Based Solutions. Environment - Research and Innovation Available online: https://ec.europa.eu/research/environment/index.cfm?pg=nbs (accessed on Oct 30, 2018).

2. Cohen-Shacham, E.; Walters, G.; Janzen, C. *Nature-based Solutions to address global societal challenges*; IUCN: Gland (CH), 2016;

3. UN *World Urbanization Prospects: The 2018 Revision*; United Nations,Population Division: Washington D.C., 2018;

4. EEA *Air quality in Europe — 2017 report*; EEA Report; EEA: Copenhagen, Denmark, 2017;

5. Barthel, S.; Parker, J.; Ernstson, H. Food and Green Space in Cities: A Resilience Lens on Gardens and Urban Environmental Movements. *Urban Stud.* **2013**, *52*, 1321–1338, doi:10.1177/0042098012472744.

6. World Bank Urban Development - Overview Available online: http://www.worldbank.org/en/topic/urbandevelopment/overview (accessed on Oct 30, 2018).

7. Benedict, M.A.; McMahon, E.T. *Green infrastructure: linking landscapes and communities*; Island Press, 2012;

8. EC *Commission staff working document — technical information on green Infrastructure (GI)*; European Commission: Brussels, Belgium, 2013;

9. WWAP *The United Nations world water development report 2018: nature-based solutions for water; 2018*; UNESCO/United Nations World Water Assessment Programme (WWAP): Paris, 2018;

10. EC *Towards an EU research and innovation policy agenda for nature-based solutions & re-naturing cities final report of the Horizon 2020 expert group on “Nature-based solutions and re-naturing cities”: (full version)*; Publications Office of the European Union: Luxembourg, 2015; ISBN 978-92-79-46051-7.

11. *The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A synthesis of the approach, conclusions and recommendations of TEEB*; TEEB, Ed.; The economics of ecosystems & biodiversity; 2010; ISBN 978-3-9813410-3-4.

12. Brondízio, E.S.; Gatzweiler, F.W. Socio-cultural context of ecosystem and biodiversity valuation. In *The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations*; Kumar, P., Ed.; Earthscan: London and Washington, 2010.

13. Barredo, J.I. Normalised flood losses in Europe: 1970-2006. *Nat. Hazards Earth Syst. Sci.* **2009**, *9*, 97–104.

14. EC *Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of the Regions 'Green infrastructure (GI) — Enhancing Europe's natural capital';* 2013;

15. EC *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions — Our life insurance, our natural capital: an EU biodiversity strategy to 2020*; 2011;

16. World Bank *Implementing nature-based flood protection Principles and implementation guidance*; World Bank: Washington D.C., 2017;

17. Holling, C.S. Resilience and stability of ecological systems. *Annu. Rev. Ecol. Syst.* **1973**, *4*, 1–23.

18. Alexander, D.E. Resilience and disaster risk reduction: an etymological journey. *Nat. Hazards Earth Syst. Sci.* **2013**, *13*, 2707–2716, doi:10.5194/nhess-13-2707-2013.

19. Raymond, C.M.; Frantzeskaki, N.; Kabisch, N.; Berry, P.; Breil, M.; Nita, M.R.; Geneletti, D.; Calfapietra, C. A framework for assessing and implementing the co-benefits of nature-based solutions in urban areas. *Environ. Sci. Policy* **2017**, *77*, 15–24, doi:10.1016/j.envsci.2017.07.008.

20. Raymond, C.M.; Berry, P.; Breil, M.; Nita, M.R.; Kabisch, N.; de Bel, M.; Enzi, V.; Frantzeskaki, N.; Geneletti, D.; Cardinaletti, M.; Lovinger, L.; Basnou, C.; Monteiro, A.; Robrecht, H.; Sgrigna, G.; Calfapietra, C.; Munari, L. *An impact evaluation framework to support planning and evaluation of nature-based solutions projects: an EKLIPSE Expert Working Group report.*; Centre for Ecology & Hydrology: Wallingford, United Kingdom, 2017; ISBN 978-1-906698-62-1.

21. Reder, A.; Rianna, G.; Mercogliano, P.; Castellari, S. Parametric investigation of Urban Heat Island dynamics through TEB 1D model for a case study: Assessment of adaptation measures. *Sustain. Cities Soc.* **2018**, *39*, 662–673, doi:10.1016/j.scs.2018.03.023.

22. Lauwaet, D.; Hooyberghs, H.; Maiheu, B.; Lefebvre, W.; Driesen, G.; Van Looy, S.; De Ridder, K. Detailed Urban Heat Island Projections for Cities Worldwide: Dynamical Downscaling CMIP5 Global Climate Models. *Climate* **2015**, *3*, 391–415, doi:10.3390/cli3020391.

23. Davies, Z.G.; Edmondson, J.L.; Heinemeyer, A.; Leake, J.R.; Gaston, K.J. Mapping an urban ecosystem service: quantifying above-ground carbon storage at a city-wide scale: Urban above-ground carbon storage. *J. Appl. Ecol.* **2011**, *48*, 1125–1134, doi:10.1111/j.1365-2664.2011.02021.x.

24. Gomez-Baggethun, E.; Ruiz-Perez, M. Economic valuation and the commodification of ecosystem services. *Prog. Phys. Geogr.* **2011**, *35*, 613–628, doi:10.1177/0309133311421708.

25. Völker, S.; Kistemann, T. "I'm always entirely happy when I'm here!" Urban blue enhancing human health and well-being in Cologne and Düsseldorf, Germany. *Soc. Sci. Med.* **2013**, *78*, 113–124, doi:10.1016/j.socscimed.2012.09.047.

26. Sicard, P.; Agathokleous, E.; Araminiene, V.; Carrari, E.; Hoshika, Y.; De Marco, A.; Paoletti, E. Should we see urban trees as effective solutions to reduce increasing ozone levels in cities? *Environ. Pollut.* **2018**, *243*, 163–176, doi:10.1016/j.envpol.2018.08.049.

27. Baró, F.; Haase, D.; Gómez-Baggethun, E.; Frantzeskaki, N. Mismatches between ecosystem services supply and demand in urban areas: A quantitative assessment in five European cities. *Ecol. Indic.* **2015**, *55*, 146–158, doi:10.1016/j.ecolind.2015.03.013.

28. Escobedo, F.J.; Kroeger, T.; Wagner, J.E. Urban forests and pollution mitigation: Analyzing ecosystem services and disservices. *Environ. Pollut.* **2011**, *159*, 2078–2087, doi:10.1016/j.envpol.2011.01.010.

29. Pataki, D.E.; Carreiro, M.M.; Cherrier, J.; Grulke, N.E.; Jennings, V.; Pincetl, S.; Pouyat, R.V.; Whitlow, T.H.; Zipperer, W.C. Coupling biogeochemical cycles in urban environments: ecosystem services, green solutions, and misconceptions. *Front. Ecol. Environ.* **2011**, *9*, 27–36, doi:10.1890/090220.

30. Miró, A.; Hall, J.; Rae, M.; O'Brien, D. Links between ecological and human wealth in drainage ponds in a fast-expanding city, and proposals for design and management. *Landsc. Urban Plan.* **2018**, *180*, 93–102, doi:10.1016/j.landurbplan.2018.08.013.

31. Haase, D.; Kabisch, S.; Haase, A.; Andersson, E.; Banzhaf, E.; Baró, F.; Brenck, M.; Fischer, L.K.; Frantzeskaki, N.; Kabisch, N.; Krellenberg, K.; Kremer, P.; Kronenberg, J.; Larondelle, N.; Mathey, J.; Pauleit, S.; Ring, I.; Rink, D.; Schwarz, N.; Wolff, M. Greening cities – To be socially inclusive? About the alleged paradox of society and ecology in cities. *Habitat Int.* **2017**, *64*, 41–48, doi:10.1016/j.habitatint.2017.04.005.

32. Wolch, J.R.; Byrne, J.; Newell, J.P. Urban green space, public health, and environmental justice: The challenge of making cities "just green enough." *Landsc. Urban Plan.* **2014**, *125*, 234–244, doi:10.1016/j.landurbplan.2014.01.017.

33. Kabisch, N.; Haase, D. Green justice or just green? Provision of urban green spaces in Berlin, Germany. *Landsc. Urban Plan.* **2014**, *122*, 129–139, doi:10.1016/j.landurbplan.2013.11.016.

34. Cohen, M.; Baudoin, R.; Palibrk, M.; Persyn, N.; Rhein, C. Urban biodiversity and social inequalities in built-up cities: New evidences, next questions. The example of Paris, France. *Landsc. Urban Plan.* **2012**, *106*, 277–287, doi:10.1016/j.landurbplan.2012.03.007.

35. Rutt, R.L.; Gulsrud, N.M. Green justice in the city: A new agenda for urban green space research in Europe. *Urban For. Urban Green.* **2016**, *19*, 123–127, doi:10.1016/j.ufug.2016.07.004.

36. Kronenberg, J. Why not to green a city? Institutional barriers to preserving urban ecosystem services. *Ecosyst. Serv.* **2015**, *12*, 218–227, doi:10.1016/j.ecoser.2014.07.002.

37. Fernandes, J.P.; Guiomar, N. Nature-based solutions: The need to increase the knowledge on their potentialities and limits. *Land Degrad. Dev.* **2018**, *29*, 1925–1939, doi:10.1002/ldr.2935.

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URBAN–BY–NATURE: TOWARDS A HOLISTIC CONCEPT OF HEALTH AND THE DIMINUTION OF ENVIRONMENTAL EXTERNALITIES

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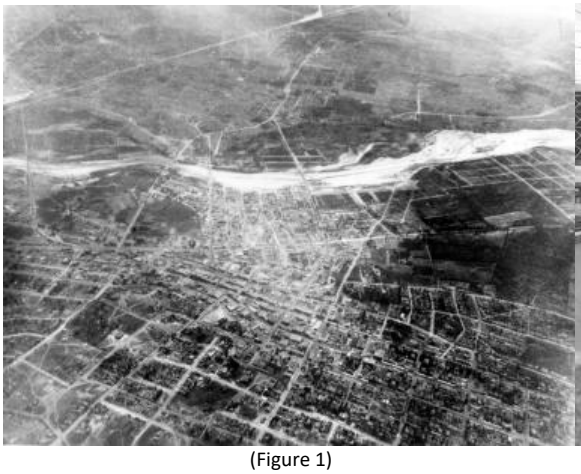
ABSTRACT

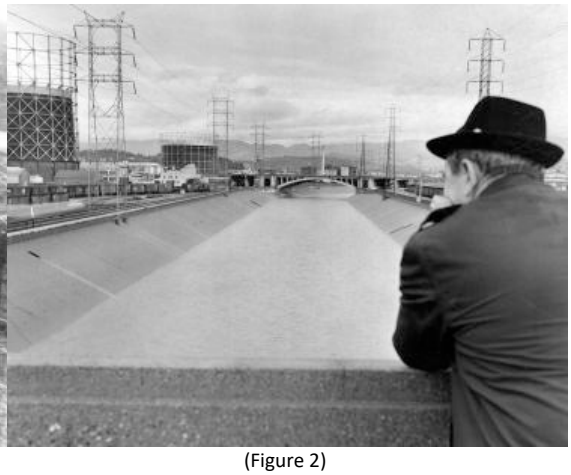
The Los Angeles River's seasonal alluvial river (aka wash) ran freely across the flood plain. After a great storm flooded one third of the city of Los Angeles in March 1938 the Army Corps of Engineers began the 20-year project to create the permanent concrete channel confining the riverbed until today. The former right of way of the River has been designated as a NO TRESPASSING territory due to its single functional as a seasonal flood channel - even if only utilized for a few days each year. Since 2013 the realm of the river has become legal for public access again. A citizen driven movement has opened up the realm of the river by trespassing. The paper explores the ambiguous circumstances of trespassing relative to human health and environmental health, urban hygiene and self-determination as a broader health concept of unimpaired human existence. The hypothesis underlying this paper is that the people of Los Angeles rediscover and civilize the realm of the river by trespassing in order to reinstate a self-determined relationship between the citizen and the lifeline of their city. This offers new relationship between individual well-being and environmental health and public health.

Keywords: urban planning; trespassing, public health, urban theory, cultural theory

1. INTRODUCTION



(Figure 1)



(Figure 2)

Figure 1: Los Angeles downtown (unregulated 'wash' 1887. balloon aerial) Source: Los Angeles Public Library **Figure** 2: Contemplating Los Angeles Rivers new concrete bed. Source: Los Angeles Public Library est. 1930

This paper begins to establish an argument for a qualitative understanding of a mutual relationship between individual and environmental health and how it constitutes and reflects cultural evolution of public space.

Conventional assessment of public and environmental health is typically determined by metrics of pollutants, contamination and other quantifiable environmental data catering to decision-making protocols and policies predominately hocked on data as well. If spreadsheets are one rational to represent quality of life - the WHO (5) already provides a more holistic and open qualitative definition of health. Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity. (WHO)

If the sum of individual choices of everyday practice can accumulate to environmental degradation and negative impacts on health e.g. by an automobile centred lifestyle and its emissions, can self-determined actions in a public space also unleash positive changes for a site and its accessibility and appreciation of others?

Alternative hedonism (Soper, 2011) outlines a set of non-affirmative practices to overcome the predominant cultural determinism of capitalist consumerism by a set of self-determined practices. Instead of assuming the good life consists of rewarding oneself by purchasing dispensable consumer goods, alternative hedonism suggest the good life resembling around collective activities. Sharing, lending, recycling, repairing and other non-consumptious practices are celebrated as a self-determined collective and joyful experience. A self-determined everyday life may also be associated with choices. Practices of alternative hedonism and self-determined actions in public space may constitute a critical societal moment of place making and aggregate to a sense of belonging to a place.

2. MANAGING URBAN RIVERS

How can the changing objectives of managing and appreciating urban rivers be understood relative to the above concepts of personal and environmental health? The channelization of the Los Angeles River can be understood as an emblematic project of subduing nature. Taming and controlling the seasonal ›wash‹ into a concrete lined storm-sewer channel represents the far end of the paradigm of domestication and sanitation. While the projects main intent is to protect the residents along the river from rare flood events, it also prevents access of any citizen to the river as a public space at all other times.

The more recent grassroots rediscovery and advocacy for the Los Angeles River by “Friends for the L.A. River” among others provokes a closer reading of the shifting perception. Since 2013 Los Angeles citizens may access parts of their river again without risking a $1.000 fine or imprisonment for trespassing the rivers otherwise fenced off territory.

In 2013 coinciding with the 75th anniversary of the channelization, the same US Army Corps of Engineers, which lead the 1930s public works project, pitched a billion dollar proposal to undo 11 of the 51 miles of their own project and ‘*re-naturalize’* the concrete channel profile.

3. HOLLYWOOD AS REGISTER OF CULTURAL TRANSFORMATIONS

The recent sequence of Hollywood movies offers a changing perception of the river. In retrospect the regression of crime scene in *Chinatown* (feat. Jake Nicholson) to car-chases, to illicit car races in *Grease* (feat. John Travolta) to domestication in *Drive* (feat. Ryan Gosling), can be understood as a logical and necessary cultural evolution of relearning the realm of the river.

Figure 3 + **Figure** 4 Movie Stills: *Drive,* 2011

The epic ‘boy meets girl’ scene is located in the same concrete channel, but this time turns into a quasi romantic get-away (Drive, 2011). After a short joy ride in the channel the main character stops the car at one of the soft bottom sections for a stroll. When the camera pans away from the couple the glimmering tree leaves in the late evening sun are littered with plastic bags and other residue of the last flood. Still one perceives a moment of dignity, sincerity and integrity of the characters being in sync with the space. The chosen site for this particular retreat is not in a pristine place outside the city limits, but in the midst of an urban industrial ecology with the appearance of an emergent riverine forest. The biographies of the single mom and the motorcycle stunt driver are just as obscured, complicated and contradictory as the urban ecology of the river, which trickling base-flow on any dry day is in essence the effluent of the L.A.’s sewage treatment plants upstream.

4. TRANSGRESSING OUTER NATURE

How have we arrived at a fenced-in, mono-functional, hostile corridor, which has sunk in as a collective image of a place for illicit activities? Let us unpack the transition of the ›No trespassing‹ imperative from its original aim of protecting the individual physical integrity against assault, to the projection of harmful intrusion towards private property and finally to its odd outcome: the exclusion of humans from formerly public territory. The deliberate trespassing to the L. A. River turns into a moment of healing the obscured and ill-conceived relationship between the citizen and their river. The fact that Los Angeles citizens have recently started to approach their rivers again suggests that trespassing can be an act of maintaining personal health and an expression of self-determination – contradicting the previous top-down mandate of dogmatic spatial segregation for security - no trespassing.

Going down to the river implies a first appreciation of an obscured yet animate nature that we begin to acknowledge as marginalized. The grass-root movement (FOLAR) suggests a new link between inner and outer nature - neither of them understood as pristine, both reflecting its own hybridized condition, while contesting the modernist paradigm of purity. The limits of reductive modernist planning strategies of specialization, cleansing and exclusion become evident in an overregulated condition of the river. These paradigms are slowly beginning to be re-adjusted from regimes of control and order to negotiation and collaboration of natural and social processes, again.

Trespassing to the territory, as a legal constraint of citizen's behaviour is the far end of a cleansing operation that reduces entire territories to one exclusive function and declares other uses e.g. human occupation to be incompatible with it. Statistically few episodic risk events designate the storm water channel as a zone to be "cleansed" from any other conflicting use at all times.

A self-determined human activity of going down to visit the river for the pleasure of it, has been prevented by separation of functions and the resulting exclusive use of space. Leisure activities are being substituted by driving to other mono-functionally designated urban areas; e.g. - get in your car to drive to a shopping mall.

5. A NEW COHERENCE BETWEEN INNER AND OUTER NATURE

The growing disconnect between inner and outer nature can be reconciled by accepting both their imperfect states by showing interdependencies between altered urban nature and urban culture. The free will to express human nature by acts of transgression and trespassing begins to undermine the authoritarian spatial and functional divisions of space of modernist planning Athens Charta (CIAM 1933). In the case of L.A rediscovered riverfront provides an arena for mixed-use, urban renewal and recreation. This transition of societal values expresses a beginning shift of managing the long shadow of modernist planning paradigms - more precisely the paradigms of ordering and controlling nature in the on-going project of modernity. Recent ecological concepts still refer to a distinct realm of nature - distinct and external of us – aka. *environment*. We begin to reflect our cultural construct of rationalizing nature as a phenomenon sufficiently described by natural sciences. The deliberate and severe training of discrediting animate nature needs to be reflected as a late outgrow of secularization and enlightenment. Any notion of an animate or vivid nature would immediately be condemned as naïve or worse esoteric - don't go there. Only slowly we begin to realize how rationalized nature concerns the self-perception of human nature. A new interest in the animate qualities of nature can be perceived as we are bridging from our inner to outer nature - both understood as products of on-going cultural co-evolution and an innately living nature (natura naturans).

Figure 5: Access ramp for horseback riding in the riverbed.

Figure 6: Emergent forest in the rivers 'soft bottom' section.

6. TRANSGRESSION OF INNER NATURE

Current research of the "human biome" provides material evidence of inner and outer nature being closely interwoven, not only in their default state, but in various degrees of their intended modification and unintended alteration. E.g. nitrogen chemically synthesized by the Haber-Bosch-Process is widely spread as artificial fertilizer in our environment. Besides supplying the metabolism of today's world population at an industrial scale, its abundant residual presence can be found in any eutrophic water body including the nitrogen fixed in the cells of the human body. We are beginning to understand that the human cells are not only influenced by the environment, but coexist and interact with the human biome - the sum of all bacteria in our bodies has long been underestimated in their performance. The "human biome" is understood no longer only essential to human gut functions, but also closely related to key function of the nervous system; all the way to brain functions (Mazmanian, Cryan, 2014). The human biome resembles a fluent exchange with the physical world permeating the body as an only alleged boundary of inner and outer nature. Current biome research even suggests a personal microbial cloud, which continuously permeates the non-discrete boundary of our skin, while remaining associated with us. (Luke Groskin, 2016) Analogue to microbial transgresses between body and environment, it seems only logical to consider transgressing other boundaries between inner and outer nature. The deliberate act of trespassing to the territory appears as the cultural counter-act of engaging an experience of bridging inner and outer nature.

The spatial division of functions in modern urban planning and the division of functions by disciplinary specialization in sciences (e.g. in neuron- and gastro medicine) both express the same mind-set. Despite their great success and productivity, we are learning about exclusionary dichotomies as shortcomings, revealing the limits of over-specialization as an intrinsic modern condition. Actively demanding access to the excluded urban areas by individuals or grass root movements may be the necessary expression of cultural counteracting these projects of a reductive and technocratic planning period. In the most simple terms: the intuitive human act of *going down to the river* cracks open the legacy top down planning regime an its assumptions of non-compatible uses of recreation, infrastructure and urban streams.

Figure 7: Choice of site for professional wedding photos refelcts the L.A. River as a significant place of new identity. Photo: Sieweke 2013

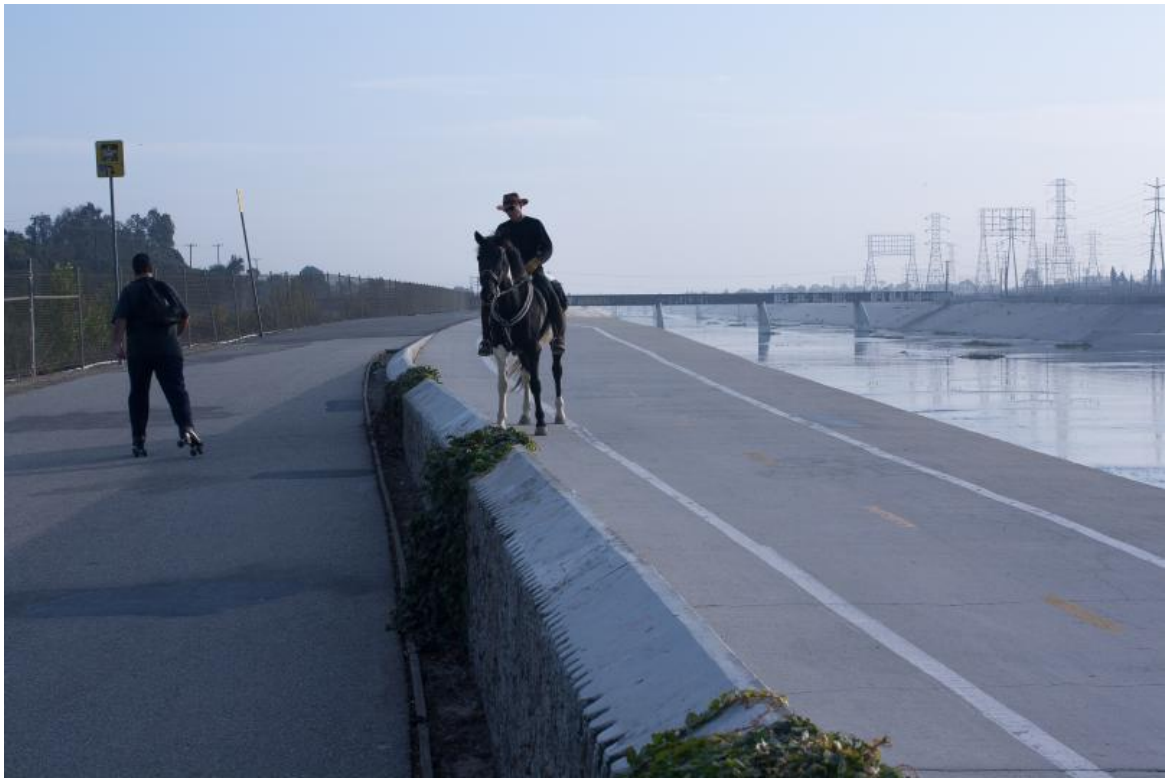


Figure 8: Lonesome rider. Photo: J. Sieweke 2013

REFERENCES

1. Drive, 2011, motion picture, director: Winding Refn
2. Friends of the Los Angeles River. https://folar.org/ 20.10.2018
3. Mazmanianm S. and Cryan, J., Can the Bacteria in Your Gut Send Messages to Your Brain? Science Friday Podcast 22.08.2014 www.sciencefriday.com/segments/can-the-bacteria-in-your-gut-send-messages-to-your-brain
4. Grosk, L., Your Very Special Microbial Cloud, Science Friday Podcast 25.01.2016 www.sciencefriday.com/videos/your-very-special-microbial-cloud/
5. Soper, Kate, Alternative hedonism, cultural theory and the role of aesthetic revisioning. 2011. Cultural studies and anti-consumerism: a critical encounter. Routledge, London, p. 49-69
6. World Health Organization (WHO) 1946, Preamble to the Constitution, New York

URBAN DESIGN AND URBAN PLANNING AS COMMUNICATIVE PROCESSES FOR SUSTAINABLE PLACES

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ABSTRACT

The concept of urban design varies in relation to the social practices of space production. This relationship defines urban design as a product or process. The practice of space production is determined by socio-economic, cultural, institutional and political relations of social organization (Lefebvre, 1991). It varies in relation to a local context, as well as in relation to the connection of the local and global networking. According to Castells, being outside the global network means to live in a "local cage" without being able to enjoy the benefits that globalization and the new way of networking entails (Castells, 2000). The potential for enjoying the benefits of globalization is in direct relation with the development of the identity of local communities with the aim of their recognition in the global network of identities (Castells, 2004). The process of building and development of local identities in the urban development is determined by the two disciplines urban design and urban planning. Our assumtion is that the prevaling identity that local communitis should build through regeneration process is environmental one.

So to say, globalization defines new relationships in social production of (urban) space, while sustainable development tends to their mutual ethical integration. Globalization and sustainable development together define new principles of space production, and therefore relationships with the urban design and planning. Taking into account the fundamental principle of ethical integration in a sustainable development, urban design and urban planning are becoming a process-oriented discipline. Process orientation opens up the possibility of inclusion of different rationalities and their ethical integration into the communicative process. So, both disciplines are today inseparable from the communicative process in different social arenas. Urban design is prefixed "process", and urban planning "collaborative". The aim of the paper is to make linkages between urban design and urban planning in collaborative paradigm in order to distinguish thier mutual relations in creating sustainable places exploring case study: URBANIZACIJA. Also, to prove that nowadays trigger for urban regeneration is social healing through environmental paradigm. The scope of the research is bounded by the urban design process in line with rational and collaborative approach in urban decision making. Expected results of the research are definition of basic principles that urban design should lien on to provide sustainable places in regeneration.

Keywords: Sustainable Places, Urban Regeneration, Urban Planning, Urban Design

1. INTRODUCTION

Urban design and urban planning are challenged by contemporary concept of place regeneration. Regeneration means creating sustainable places, with specific identity, protection and promotion of cultural and ecological values, social cohesion and economic prosperity. The aim of the paper is to discuss a role of urban design as a transformative instrument in the regeneration process. It will question the possibilities of urban design in relation to urban planning to provide strategic framework for regeneration places in sustainable manner through the process that enable creative milieu for integration of different developmental aspects and interests in plural society.

Therefore, urban design will be considered as a process in which it is possible to integrate different paradigms into a coherent whole for sustainable urban regeneration. Specifically, what will be discussed is environmental rationality, as a holder of a specific identity in contemporary society marked by taking care of a healthy environment. In this sense, urban design is placed in relation to urban planning within ecological paradigm - the segment of integrated, sustainable, noting its role in the integration processes of urban regeneration. Consequently, urban design will be seen in a broader sense, as a process that involves different development systems of urban life: from identity to policies integration (eg, waste management, social integration, etc.), participation of stakeholders to design - shaping in a narrower sense. The analysis of examples has a role to prove that process-oriented urban design enables smarter and environmentally healthy communities.

Principles of sustainable development have a tendency for integration of different rationalities. The issue of selecting leading rationality in urban regeneration, forms the hypothesis that environmental rationality needs greater usage of integrated urban design. Research addresses ecological rationality in relation to urban regeneration and urban design. Urban design is to be considered as an instrument for the integration of different aspects and dimensions of sustainability.

2. CREATING-REGENERATING PLACES TOWARDS SUSTAINABLITY

Urban regeneration from the etymological point of view represents a complex process. "Term regeneration / regenerare / is defined as the re-establishment, re-generation, spiritual rebirth, renewal, making something better (especially after deterioration), an act of complete reformation or improvement, rebirth. This conceptual definition highlights three aspects of regeneration. The first is that regeneration is an act, action or activity. The second is that regeneration relates to improvement that is based on the full, radical reformation, or the regeneration of a previously devastated thing. The third is that it represents a spiritual rebirth. To actually re-generate means to re-generate things on new or existing foundations" (Mrđenović, 2013).Urban regeneration of the 50s and 60s of the last century was tied to the comprehensive approach, in the mid 60s and late 70s for wellbeing, in the 70s for economic growth, in the 80s for the regeneration led by the private sector, while in the 90s it was based on the formation of local strategic partnerships. Today the concept is linked to the creation of sustainable places as spaces for sustainable communities (McDonald, Malys, & Maliene, 2009). The study considers phenomenon and notion of urban regeneration wider than the spatial coverage, including micro, meso, and macro level.

The process of creating the place depends on the manufacturing practice of the area that is in a certain social context practiced. In the context of sustainable development and the relationship between modern, postmodern and new communication modernity, this process is in a function of mediation between the different rationalities, needs, interests and power. It should create conditions for socially and culturally sensitive decisions through communicative action. The quality of the place is measured by the quality of the decision making process, while the very solutions are generated by the participants in the process. Adequate decisions must be sensitive to cultural, economic, social and environmental variables. This sensitivity is important for the promotion and creation of identity and environmental values through inclusiveness and building bridges between different rationalities: political, economic, physical, social, environmental.

Generally sustainable urban regeneration covers all aspects of sustainability, including environmental protection in relation to the preparation of development strategies, programs, plans and projects. In relation to the spatial coverage it may include regional, city, settlement or micro level. It is significant to point out that in a sustainable urban regeneration the integrity among different sectors and stakeholders in the process leads to the integration of different rationalities, including ecologically coherent whole (Mrđenović, 2013). Therefore, the subject of sustainable urban regeneration is the improvement that integrally relates to different rationalities. The position we stand for is putting environmental rationality in focus of sustainable urban regeneration, especially in cases of high urban density, ecological hazards and brownfield regeneration.

Environmental rationality in urban development can be related to environmental movement or as Reeves defines it environmental tradition / paradigm (Reeves, 2005). This tradition, also known as the movement of "green", occurred as a reaction to the previous paradigms of urban development, particularly anthropocentric, such as economic and social. In the center of ecological rationality is the philosophy of ecocentrism or favouring nature as core value. Ecocentrism identifies already stated criteria and represents an antipode to anthropocentrism. From the perspective of sustainable development, ecocentrism represents only one of the types of sustainable development. Author Baker recognizes it as the ideal type and sets it as opposed to pollution control as its opposite on a scale antropocentrism-ecocentrism (Baker, 2006). In relation to the principle of integrity, urban regeneration is prefixed smart, and with respect to the inclusion of ecological

rationality, it is prefixed environmental. Environmental urban regeneration is a subset of a sustainable, or smart and sustainable urban regeneration. Urban regeneration is based on the principles integration of plural rationalities and all preformed traditions and paradigms of urban development. Environmental rationality is just one of a multitude of rationalities to be developed and integrated into a higher level, or "New Universality". The integration of rationalities opens up the question of the main discipline that can manage this process: Urban Design or Urban Planning.

3. URBAN DESIGN VS URBAN PLANNING IN THE PROCESS OF SUSTAINABLE URBAN REGENERATION

Urban regeneration from the etymological point of view represents a complex process. "Term regeneration / regenerare / is defined as the re-establishment, re-generation, spiritual rebirth, renewal, making something better (especially after deterioration), an act of complete reformation or improvement, rebirth. This conceptual definition highlights three aspects of regeneration. The first is that regeneration is an act, action or activity. The second is that regeneration relates to improvement that is based on the full, radical reformation, or the regeneration of a previously devastated thing. The third is that it represents a spiritual rebirth. To actually re-generate means to re-generate things on new or existing foundations" (Mrđenović, 2013).Urban regeneration of the 50s and 60s of the last century was tied to the comprehensive approach, in the mid 60s and late 70s for wellbeing, in the 70s for economic growth, in the 80s for the regeneration led by the private sector, while in the 90s it was based on the formation of local strategic partnerships. Today the concept is linked to the creation of sustainable places as spaces for sustainable communities (McDonald, Malys, & Maliene, 2009). The study considers phenomenon and notion of urban regeneration wider than the spatial coverage, including micro, meso, and macro level.

The process of urban planning can be presented from the aspect of understanding the city as a set of problems or as a developmental concept. The disadvantages of the first thought is in the fact that object of planning in that case is solving the problems, which is mostly connected with Lindbloms science of “muddling through” (Lindblom, 1959), that answers to present situation whitout developmental caracteristics. Therefore, the focus of planning are problems that according to Rittel and Weber can be diferentiated as soft, simple, complex, and the core of planning is understanding the problems, towards generating corrective actions to present condition which leads to incremental approach to planning. On the other hand, the second concept is oriented towards future which move focus of planning form present conditions to future situations and processes. This approach brings new categories such as uncertianty, dyniamic socio-economic relations, and developmental dimensions that goes beyond phisical planning, and integrated different dimensions of sustainability. The type of planning process varies to wider developmental paradigms, therefore if sustainability is global orientation, planning process should integrate different dimensions of sustainability: multilevel governance, economy, and equity through participation, natural and built environment.

Urban planning as developmental process generates elements of strategic planning, meaning structuring it in phases of strategic decision-making: description of desirable future, analysis of present situations, generating developmental alternatives in form of programs, projects or actions. The question is in which arena the phases are generated. In rational paradigm, where positivistic approach understands scientific reality the solutions are generated in decsiplinary and interdicsiplinary science and political arenas. Planners are consultans to decision makers creating solutions to universal values. The main problem with the approach is in Simon’s rational constrains where it is not possible to generate and evaluate all possible alternatives because of constrains of human thinking. On the other hand Lindbolm’s incremental approach brings planners into position of advocacy consulting which moves their position from neutral to socially and interests’ engaged. This questions the planning process as one that integrates plural interest into coherent whole. At this point we are talking of collaborative planning (Healey, 1997) as a way of integrating fragments of reality in relation bottom-up, which questions ideal picture of future, meaning that we are not certain what we will get as a complete picture at the end. In general rational and collaborative paradigm are product of modern and postmodern thinking, top-down or bottom-up.

Therefore, planning is process of adopting particular interests and values to universal picture, or a process of creating universality through collage of plurality. Constrains of the first is that plurality is united in a way of “melting pot” where richness of diferencies is flattened by universality. On the other hand, collage approach can lead to “Frankenstein” image if the process of putting fragments together is not well led. Also, collaborative planning can be a manipulative process, where different pictures of reality are “rotated” to desirable one. The paper is led by idea that integrative process is posible, the one that integrates fragments into coherent whole framing future by golden lines of colourfull universality This means new rationality that is in line with modernizm and cosmopolitan culture. “I believe in rationality, and in the possibility of calling upon reason,

without worshipping its goddess. I believe in the chances of meaningful social action and transformative politics, without necessarily drifting toward the deadly rapids of absolute utopias." (Castells, 2000). This "new universality" questions means and methods of its production, where leading, mediation and negotiation of the process are not enough for reaching the "goldness".

Speaking of means and methods we will introduce urban design as a holistic proces of integration different realities into coherent whole using imagination and creativity as golden lines for plural richness. Urban design, as well as urban planning is related to wider social context. That means urban design is seen more as a product of higher levels of planning, or more as a process of imagining, evaluating and producing desirable future. Firstly, we can say that it is a space of imagination and creation of urban designers when it is subjective-expressive process of creating specific identity of places. Secondly, in the context of social production of space it is more objective-rational or socio-communicative process of creating new socio-spatial relations and its visual artifacts. Thirdly, it is an interdisciplinary process as a field for communication of different expert's view points through argumentation. Fourthly, urban design can be seen as a technical process that represents politics and regulation form higher level of governance (Madanipour, 1996). Compared with urban planning we would say that urban design carries creativity of urban designes as overlaying inter-subjective process that lines future for unity. This means Foresters's "designing as making sense together" using Habermasian communicative action this iner-subjective process can become wider socio-creative process creating Landry's "creative mileu" for integration (Forester, 1989) (Habermas, 2002) (Landry, 2005).

Communicative action and creative mileu become means for "golden unity" using disciplinary, intediciplinary, argumentative, creative, and collaborative methods and tecniques in the proces of framing future, promoting local identities into global relations. The second notion of integration is that both disciplines are relevant on different spatial scales. Hildebrand Frey defines role of urban design as strategic process of framing places on different spatial levels with emphasis on identity as a core factor of integration (Hildebrand, 1999). Talking of global dynamics these integrated process should provide framework for action, defining strategic alternatives for future conditions. This means integration of different developmental aspects, such as governance, legislative, identity and caracter of the place, mobility, marketing and promotion of place. Also, flexibility means that desirable future can be reframed and implemented in phases, choosing most sustainable actions or group of actions that in temporary contitions has most positive externalities to different dimensions of sustainability.

In relation to environmentaly or so called "green" places integration of all aspects of sustainability is needed: environment, society, economy, and institutions. The way of integration is directly related to type of sustainability society stands for, meaning is it more ecocentric or antropocentric. This means that "green" places needs more ecocentric phylosophy which is more sutable to urban design process, colaborative urban design as a mean for social healing in polluted spaces of any kind. Therefore, collaborative or integrates urban design, described above, should question the effects of our future actions in place creation. Also, it deals with not only with normative aspects of greening like urban planning mostly does, but with process of learning how to constantly grow our contious on environment in regards to more natural solutions and nature mimicry modes and models of our behaviour in place design.

4. CASE STUDY: INITIATIVES FOR SUSTAINABLE AND ECOLOGICAL DESIGN: "URBINIZACIJA" PROJECT

4.1. Idea creation – beginning

The idea of the project "urBINizacija" occurred in 2011 during the work on the subject of Urban structure, within in the third semester of undergraduate academic studies at the Faculty of Architecture in Belgrade (prof. Nada Lazarevic Bajec, ass. Tatjana Mrđenović), which examines urban structure (natural, built, social, economic) according to the principles of sustainable development. Work on the subject is designed to work in randomly formed teams. Team "Pygmy Cormorant" consisted of students: Miloš Nikolić, Jelena Petrović, Blagica Petrićević, Kristina Petković, Maja Nikolić, Katarina Petrović.

The subject processed the location of Ada Ciganlija, microlocation Čukarica sleeve. During the multidisciplinary and interdisciplinary research of the given microlocations, it was concluded that Čukarica sleeve is environmentally the most vulnerable part of Belgrade, due to the high pollution of water, air and land and the growing phenomenon of ecological disaster. The problem gains in importance when one considers that Čukarica sleeve is located on Ada Ciganlija, "green oasis of Belgrade" and recreational area of urban character, which during the season has several hundred thousand visitors a day. (Scheme 1)

Figure 1: Mapping problems and opportunities, source: authors

4.2. Initiative development

Upon successful completion of work on the subject the team expressed a desire to continue working together. This was followed by the application to the competition "Responsible young people - sustainable future," announced by AIESEC Serbia, in cooperation with "Coca-Cola Hellenic" company. The competition topic was the creation of a project idea whose backbone is sustainable development, or any segment thereof. The initial project idea was based on research conducted on the subject "Urban Structure", which by competition project received its continuation and the beginning of solving problems. In the conception of the project idea there was a blend of creative and practical work, on one hand, and theoretical and multidisciplinary work, on the other hand. As a narrow field of activity, both thematically and practically, the project is based on the problem of waste in all its aspects, which will result in a creative intervention in the space. Therefore, the project idea was named "urBINizacija" (ref. garbage bin).

When developing a project idea that, "Pygmy Cormorant" still had intensive support from its mentors from the subject, as well as official support of the Faculty of Architecture during the application. Also, prior to the submission of the competition idea, the team had provided preliminary support of PE "Ada Ciganlija", PCE "Gradskačistoća".
The competition received a total of 72 project ideas, of which 6 project ideas (including "urBINizacija" -u) was selected to go to the finals. The finals of competition was held on 10 April 2012 in the National Bank of Serbia, in Belgrade, where all six teams defended their projects before a commission made of the competition organizer and donors, as well as all stakeholders. After the presentation, discussion and voting, the "urBINizacija" project was selected as the winning. The prize in the competition was providing financial resources for the implementation of project ideas.

4.3. Establishment of the association

Author team "Pygmy Cormorant" after the application and victory with the "urBINizacija" project in the competition "Responsible young people - sustainable future", in accordance with the provisions of the conditions of the competition, registered as a legal entity. Thus the name "Pygmy Cormorant," used by the team since the beginning of the joint work changed. Association of citizens "Urban Eco Architects" (UECA) was registered in 2012 in the Business Registers Agency in Belgrade. As young enthusiasts, facing long-term plans and goals, defined in the general activities of the association related to spatial and urban planning, environmental protection and promoting sustainable development. "Urban Eco Architects", as non-profit association, has been working with a number of colleagues and other interested enthusiasts, with the idea of increasing the number of members. After the "urBINizacija" project, the Association, within the framework of its general activities, continued cooperation with some sponsors, but also other organizations (Faculty of Architecture, Technical Students Club "KST", student organization AIESEC Serbia, Green Fest, and others). The Association has participated in several competitions and achieved remarkable results.

4.4. About the project

The project, "urBINizacija" is tackling the problem of lack of knowledge about the role of urban design and visual identity in management and recycling of waste. The subject of this project was Čukarica sleeve (Ada Ciganlija, Belgrade, Serbia), as it has already been a part of the previous research in teaching at the Faculty of Architecture. Realizing that the pollution of the area is too high, further jeopardizing the surrounding sites, a serious problem that needs to be solved, it was decided to initiate an efficient and sustainable resolution of the

issue. The problem had a lasting impact on the urban structure of Čukarica sleeve in the form of negligent dumping by stakeholders and visitors, which directly led to the pollution of water and coastal part of the Čukarica sleeve.

Čukarica sleeve was created by damming the Sava Lake. In this way the flow of water in the sleeve was prevented, while the only flow of water, the river Topčiderka, is its biggest problem, because it deposited sludge, garbage, wild settlements sewage and factory wastewater of the Rakovica basin to Čukarica sleeve. Belgrade sewage is also a problem, because it flows into the sleeve, and in it system there is no filter, so pollution is higher. Waste is not a problem that affects only the water, but it is also located on the peripheral parts of the sleeve. These are precipitated deposits of Topčiderka, but a certain part is the result of littering by unscrupulous citizens who are not aware of their negative impacts on the environment.

The impact of these factors has increased with the construction of the bridge at Ada, when water level in the sleeve reduced, which has contributed to frequent occurrence of environmental disasters in recent years, such as fish dying, ducks dying, draining of coastal flora part of the sleeve. Work on the new bridge have led to cuts White willow on the tip of Ada, the natural habitat of pygmy cormorant, rare species of birds protected by law in our country. The aim of the project "urBINizacija" was to, through the training, with the presence of professional staff, come to the desired results of raising awareness and knowledge of stakeholders on the role of urban design and visual identity in the protection of the environment through waste control. Overall, in the domestic context, there is no awareness of the importance of structuring and control of discarded waste as well as on the role of urban design and visual identity in improved waste management. In Serbia only 6-8% of the total waste is recycled, while the European average is 75% of recycled waste. Because of this lack, it was decided that the workshop dealt with precisely this problem.

The problem to be solved belongs to the segment of sustainable development that deals with the protection of the environment, both natural and man-made, through the building of social networks as elements of institutionalization (the fourth pillar of sustainable development). In this way, the problem is directly related to the society, economy, and other pillars of sustainability. (Scheme 1) Early attempts at solving the problem of the Čukarica sleeve were unsuccessful because they lacked coordination and continuity, lack of media attention and lack of awareness of the importance of addressing this issue. The analysis of these actions has observed previous omissions, and conceived a project for solving problems ranging from lack of adequate connections, cooperation and partnerships between citizens, public companies and investors as well as relevant stakeholders. Citizens, as part of the civil sector are an important link of sustainable development, which was the key to solving the problems. Therefore, special attention is given to citizens, which should primarily refer to the importance of this problem, in order for them to become the dominant driving force.

The vision of the project is to establish lasting partnerships between different stakeholders from the public, private and civil sectors that take part in improving the quality of life in urban areas. The mission of the team is to provide an open dialogue through active participation of stakeholders from the public, private and civil sector in achieving the vision. The overall objective of the project is to raise the awareness of citizens and relevant stakeholders on the importance of urban design and visual identity in recycling and waste management through training "urBINizacija". Training provided for the establishment of primary networks and connections for further cooperation and partnership in solving the problems identified.

By pointing stakeholders to their huge impact on the environment and encouraging the action, the tendency was that in a few years this part of the city becomes a space for more pleasant stay. During the previous attempts to solve the problem care was not taken of merger of sectors, which is the underlying cause of their failure. The project concluded partnerships with all sectors (private, public and civil) which drove the institutional development (Chart 2) and achieved another step towards the realization of the vision. Specific objectives of the project are that young people and relevant stakeholders exchange opinions, ideas and experiences on waste management in urban areas according to the principles of sustainability. Specific objectives (with indicators of realization of objectives) are:

1) Adoption of knowledge about recycling and waste management, which is an indicator of success measured by the level of acquired knowledge and skills of stakeholders through the evaluation (surveys, billboards ...);
2) Providing opportunities for participants to apply knowledge about the importance of urban design in waste management, as shown by the quality of designed garbage bins;

3) Raising awareness of the importance of community participation in waste management, which is achieved by taking the participation of a large number of people of different profiles in training and workshop.

Creating problems was participated by members of all sectors, hence their involvement in solving problems was of great importance in order to spread influence to all and achieve the goal of the project more successfully. The target group of project "urBINizacija" were not only citizens, as members of the civil sector, but also the private and public sector, participants in training through company representatives. Analysis of visits to this part of Ada pointed out that the most numerous users are aged 12 to 35 years, so the project largely relies on them in solving this problem. Advocating for the institutional development of this part of Ada Ciganlija, in addition to daily users of space, other stakeholders who are not directly involved, but the consequences of their actions affect Čukarica sleeve were also essential. Recreational facilities of Čukarica sleeve, such as rowing, kayaking, tennis have also been threatened, and therefore their interest in solving the problems of the sleeve was essential. This, however, did not exclude members of other age groups to participate in this project contributing and increasing the efficiency of the project implementation.

The "urBINizacija" is an interactive training through a series of lectures and workshops at which participants acquired basic knowledge about the role of urban design and visual identity in recycling and waste management. In lectures the participants got acquainted with the problems of Čukarica sleeve, created opportunities for the development of urban design through schemes and concepts and acquired knowledge about the impact of the visual attractiveness of the elements in the waste management system on the people in the process of collecting garbage.

Two scenarios for the realization of the project were planned in relation to the dynamics and changes in time and environment. The first scenario concerned a one-day training, which as an expected result had raising awareness among stakeholders on the importance of their impact on environmental protection. The second scenario represented the following interactive cycle of one-day training through the dissemination of its results and a higher level of citizen participation. The second scenario as the expected result had the direct participation of stakeholders in the active work on the site in terms of waste collection and sorting of the same, with the help of the fittings obtained at a workshop under the first scenario. This means that the workshops that are producing posters on the theme of recycling, urban design and design of waste containers on the basis of lectures were planned. Project activities were completed after the public exhibition of the Faculty of Architecture in Belgrade. The exhibition presented designed buckets, as well as photo documentation of the project, where in this way also the students of Faculty of Architecture, University of Belgrade took part in the campaign.

The success of the workshop reflected through a partnership with PE Ada Ciganlija and the possibility of expanding activity in the form of workshops of similar type referring to other problems at Ada Ciganlija and beyond. This success represents another step in realizing the vision: to become one of the main links in the environmental improvement of urban structure.

The evaluation of the success of the project was dealt by several team members who followed the development of the project from its beginning to the last action. Implemented project performance assessment, according to the other scenario, was exercised through the quality of conclusions of discussions and anonymous surveys, workshops on photography, movies and products produced during operation. Then the second day, after the workshop to design fittings, as the continuity of the previous day, with the available resources, the behavior of the stakeholders in the process of waste disposal and the choice of appropriate bins was observed. In this way it was estimated to what extent the idea of participatory urban design and design of fittings (garbage bins) was successful. The project results were presented at the exhibition of fittings, which also showed the success of the work in the recycling and waste management through the media attention that was paid to it, as well as the number of visitors and participants in the action that followed.

As seen in the problem tree waste is the most alarming problem of Čukarica sleeve, so the project was based specifically on resolving this problem. However, the project advocated for institutionalization, ie. partnership between different sectors (partners PE "Ada Ciganlija" PUC Gradska čistoća and others), to ensure the viability of the project and allow the re-organization of workshops of this type. The following workshops could be focused on solving other problems, would have the same creative and practical approach. They could last for several days, and depending on the topic, would be organized for certain sectors of society. This project is interested the general public, which led to obtain new ideas for solving problems, where there is a tendency to extend the operation of organizations from Čukarica sleeve to the entire city, and perhaps beyond.

The effects of the project are reflected through the creation of preliminary schemes, concepts and design of the visual identity of garbage bins in a collaborative process of urban design, facilitated by an expert team. In this way, there was a chance to reduce the waste by the principles of sustainability. The training is designed by a team of students of the Faculty of Architecture and implemented according to principles of adult education with the facilitation team of students and experts from the Faculty of Architecture, certified in this field by the UN-Habitat. In this way it was possible to attain the expected results in a relatively short period of time. Training contained interactive lectures and practical application on the ground through separate conclusions in communicative consensus on issues on the site of Čukarica sleeve, the concept of sustainable development, waste management, recycling, participatory urban design, color and material impact on the efficiency of waste management. People obtained information presented their observations by designing the bins.

The expected result of the project is to increase the level of knowledge and awareness about the existing problems of waste management and ways to overcome them through an active participatory process of urban design by participants in training. The results were evaluated by an expert team and the very participants at the workshop in relation to the quality of design in order to improve waste management. The evaluation used different techniques (surveys, monitoring, and logging).

Project sustainability is ensured through high-quality urban design concept for waste management and quality designed bins to institutionalize (achieved strong partnership with PE "Ada Ciganlija") for the realization of a similar type of training in order to encourage the protection of the environment on the site and beyond. The bins themselves are a symbol and association to sustainability action, and this project continues to live.

4.5. About the training

The pursuit of "urBINizacija" project is to enhance the human and institutional capacity in the area of Ada through education and raising awareness of its problems and ways of solving them in an innovative and creative way. This was achieved by a series of training workshops that are designed in relation to the priority problems.

The first part of the project, training "Design and sustainable development of the wider area of Čukarica sleeve, with special emphasis on waste management", was carried out on 22 September 2012 at the Center of water sports on Ada Ciganlija in Belgrade, at the site which was the subject of the action. The training is designed according to the UN-Habitat methodology with the help of certified UN Habitat coach, Tatjana Mrđenović, PhD, B.Sc, in Arch, and renowned speakers and experts from various fields of spatial planning, sustainable development, recycling and design took part in its realization: B. Sc. in urban planning Valentina Sterđević, Aleksandra Đukic, PhD, B.Sc, in Arch, Tatjana Mrđenović, PhD, B.Sc, in Arch, Vladimir Parežanin, M.Sc.Arch, Vladimir Kovač, M.Sc.Arch, Hranislav Milanović, B. Sc. in landscape arch., with the keynote speech of Dean for Academic Affairs, of Faculty of Architecture in Belgrade, prof. Dejan Miletić.


Figures 1,2,3,4: Using Integrative design tools like brainstorming, problem tree, possibility tree to build awearnes on ecological problems in local community, source: authors




Figures 5,6,7,8: Process of visioning, formulating strategies and actions, using artistic tools as well as rationalization in proces of creating ecological identity, source: authors

The training consisted of five modules whose topics are respectively: "Sustainable development, urban design and participatory approach to decision making", "Identification of the potential and problems of Čukarica sleeve", "Integrated urban design, visioning, strategies and measures"," Recycling and waste management "and" The importance of the visual identity in the design of urban waste management fitting", which aimed to familiarize the participants of the training with the problem of the Čukarica sleeve and alternative ways of solving the problem of waste in the form of recycling and waste management.

The success of the idea was based on the inclusion of members from different sectors (public, private and civil) with similar interests to connect with each other and achieve sustainable partnerships. The training was closed, with about 60 participants registered. Of all the applicants, 20 participants from different areas and interests were selected, who, together with representatives from the public and private sector accounted for 25 trainees of "Design and sustainable development of the wider area of Čukarica sleeve, with special emphasis on waste management".

In cooperation with lecturers, participants were indicated that the waste does not necessarily have to pollute the environment, but that its re-use and application it can speak in favor of recycling and sustainability. At this training, participants acquired knowledge and skills that helped them the next day at the creative workshop, but also in the future, to solve the problem of waste in a creative way in the form of its re-application to affirmatively affect by the visual attractiveness of urban fittings the correct disposal of waste. (Images 1,2,3,4,5,6,7,8)

4.6. ABOUT THE WORKSHOP: Why this type of workshop?

Based on the fact that annually Serbia recycles only 6-8% of discarded waste, which is far below the European average of 75%, the intention was to influence the minds of people in an innovative and creative way, and to be showed that the waste does not always pollute the environment. Every person in the course of the day produces a certain amount of waste. In order to realize the idea we started from the first link in the chain of pollution, or man (see problem tree). The biggest problem that occurs as a result of human action is waste, that is why the workshop focused on raising awareness among people about the importance of waste management and recycling. It is scientifically proven that people have visual memory most developed, so on that basis, it was the most effective to come to the minds of people through wise and associative thought out design and visual identity of urban fittings.

Figure 8: Using marketing tools to atract participants, source: authors

Figure 9: The process of the workshop, source: authors

Workshop on producing and designing bins and their distribution in space Workshop that deals with the design of bins and exploration of the impact of their design on people's awareness of recycling and waste management was held on the second day, after educational training, on 23 September 2012. In front of the Center of water sports, on a secured grassed area of 150m2, a large number of interested citizens of all ages gathered. In addition to the great response of students and young people, the number of elderly people, and parents with small children, who gave their contribution through interesting and creative drawings is not negligible. Workshop was aimed to raise participants' awareness in a practical and entertaining way about the importance of recycling and environmental protection, and to demonstrate how they can use the waste that is produced the previous day, in the course of training (cans, plastic bottles, cartons) to design recycling bins. The concept of the workshop is based on practical application of knowledge acquired during the educational training in the form of design and painting bins for recycling.

Thus designed bins – by the use of colors, shapes, artistic techniques and materials (plastic, metal or paper) remind us of the kind of waste that can be disposed of there. 3 to 5 members in the teams worked on the realization of one bin. The whole process of work and painting was monitored by two members of the professional jury: Vladimir Parežanin, M.Sc.Arh. and Vladimir Kovač, M.Sc.Arh, with the help of the Team Coordinators: Andrej Žikić, Marko Veljić and Marija Grujić. After the workshop, the jury made the evaluation according to certain criteria. Ten bins were designed, being the great accomplishments of the participants on a given topic. In addition to this number, the project authors proposed a prototype of a bin for waste recycling, which by its unique design, designed by one of the coordinators - Andrej Žikić, represented a solution of disposal of all types of waste. (Image 9)

This was followed by a short exhibition of painted cans, which offered visitors of Ada to evaluate and choose the smartest waste sorting bin, ie. bin that clearly conveys the message of waste being thrown into it. It constituted a feedback on the success of the project. (Image 10)

The project envisaged conceived and designed cans after the workshop to be permanently placed on Ada Ciganlija as a symbol of the concept of sustainability, and because of its unusual and creative looks to represent emphasis in space. Also, the success of the workshop and achieved results would be overviewed through the verification of their effect on users of Ada.Team strength is in the obtained official support by the Faculty of Architecture in Belgrade and partnership with PE "Ada Ciganlija" for this project and vision, as well as in the response of a large number of interested citizens. The professors, assistants and associates from the Faculty of Architecture also took part in the project. Official partners of the project are, in addition to the Faculty of Architecture, PE "Ada Ciganlija", Secretariat for Environmental Protection and Coca-Cola Hellenic, student organization AIESEC, Tourist Organization of Belgrade (TOB), Club for Students of Technology (KST). The promotion was supported by the City of Belgrade as well as a large number of faculties, organizations, platforms and newspapers. News of the "urBINizacija" was promoted at over 20 websites and portals, and more than 5 faculties. Articles in newspaper "Politika" and "24 sata" were published. The promotion was joined by television and radio broadcast station Studio B, Kopernikus and Radio Belgrade.

Figure 10: Impementing one of the measure from Integrated Urban Design Strategy for Čukarica sleeve for raising awernes for waste managament using art and imagination, source: authors

4.7. Results and postproduction

The "urBINizacija" lasted for two days, but behind it there was the constant work for more than ten months, from idea to realization. It all started with a desire to raise awareness about the importance of the environment of the river zone Čukarica sleeve and ended in the lectures and workshops. It pointed to the current problems and possibilities of their solutions in the field of sustainable development and environmental protection, with an emphasis on integrated urban design, waste management and the importance of the visual identity of urban fittings or redesign of bins for public use. After completing "urBINizacija", percentages and numbers were the most relevant indicator of the success of the project.

4.7. Participants

Since the first day of "urBINizacija" was a closed training, selective approach of participants was organized. The target group was young people up to 35 years, with specific expertise in the area of sustainable development. Training has received over 60 applications, of which 20 participants were shortlisted by selection, students from different faculties, but also completed studies.

The workshop's second day was open, intended for all age groups. The total number of participants was over 100. The youngest participant was 3 years old and the oldest 72. Of all the participants of the workshop, 62% were young from 14 up to 35 years, 18% of children up to 14 years, 11% 36 to 59 years old and 9% over 60

years old. Performance Assessment and Evaluation refers to the number of interested visitors and participants during the two days of the workshop. By strong promotion and support, the project was designed to be very successful. These data indicate the great interest of people of different professions and age structure in the issue of healthy and sustainable communities. Consequently, it opens up the possibility for further action.

4.8. Production

Results of the first day of "urBINizacija", ie. training, were in the form of sketches, drawings, strategies, based on acquired knowledge, which were presented on the second day of the workshop. Some sketches were used in the realization of the products on the second day. On the second day of the workshop ten redesigned bins for metal, plastic and paper, as a prototype of a bin with a combined classification of three types of waste were produced. Prototype of the bin was devised by "UECA" team and artist and graduate engineer in Architecture Andrej Žikić worked on painting. The idea for this kind of bin was to, after the understanding of the problems and visual identity propose the way of its wise usage.

4.9. Exhibitions

Even though the "urBINizacija" according to the project lasted for two days, it has continued after its completion. The "urBINizacija" was accompanied by two exhibitions. One after the completion of the workshop, where the on-site participants and passers-by also start using the product. The products from training, as well as drawings of the youngest participants created during the workshop were also displayed. This also achieved raising awareness, both among the project participants and visitors of Ada Ciganlija that in a direct way learned about the problem of waste and proper manner of its disposal.

A few days later, there was an exhibition at the Architecture Faculty in Belgrade, where the products of workshops and the prototype of a combined bin were presented. As the buckets were owned by PE "Ada Ciganlija", they have been returned and now one part of them is used in the areas of company employees. Their installation in public space of Ada is still being planned. Bin prototype remained on the premises of the Faculty where it is actively used in sorting waste. Painted bins during the exhibition were used for waste disposal, which by monitoring positive effect and sorting of waste in accordance with the purpose of bins was observed. Evaluation of the project completed one small segment of action on the environment and the community. As project "urBINizacija" passed with very positive reviews from all participants, there is an idea for its extension and organization of similar actions on the territory of our country.

Thanks to the great success achieved during the realization of project "urBINizacija", the following year, as upstanding students, team members have become associates in teaching, on the subject of Urban structure, where it all started. This way they have shared their theoretical and practical knowledge with younger colleagues and encourage them to get actively involved in projects of a similar nature and contribute.

This display is another form of idea of presentation of postproduction to re-examine possible systems for sustainable development and continue raising awareness on environmental protection.

What distinguishes this team is their own initiative association and activity. It is rare that students of architecture are acting in the civil sector, and even rarer that they establish their own associations. In this way, the team has shown that the role of architecture students is not solely in the domain of design at the faculty and development of project competitions, but also an activist one. It is necessary that students already on the studies realize their strength through multidisciplinary association and action. The width of education allows them to realize spatial changes in the city in this way as well - through workshops, discussions, and trainings. After almost 3 years of working together on various projects, first as a team "Pygmy Cormorant" and then as the members of the "Urban Eco Architects" still equally enthusiastic and optimistic continue to work on various projects.

5. CONCLUSIONS

Theoretical discussion showed that Urban design has greater power of integration than Urban planning specifically related to creation of positive atmosphere for communicative action in regards to the fact that we are all creative in the sense of problem solving, imagination, artistic expression. According to Forester art and imagination are strong means of integration especially in overcoming obstacles in communication in stakeholders inclusion. In that sense, urban design seen as a process has subjective-imaginative dimension that can be shared among all participants in the process of placemaking. Furthermore, process oriented urban design has also strategic and technical levels that are mutual to urban planning. Therefore, we can conclude that in the process of sustainable and participative urban regeneration urban design is more powerfull than

urban planning. On pragmatical level we can say that urban design with its participative tools of integration becomes a part of wider policies for sustainable cities and regions. We can say that urban design as a process is upgrading urban planning creating puzzle of instruments and tools for integrating different rationalities into coherent whole.

Case study showed that environmental rationality, or climate change fight, can be a key initiator or "trigger" of urban regeneration. We can say that environmental paradigm is in the focus of nowadays regenerative processes, making linkages to other dimensions of sustainability: society, economy, institutions; where ecocentrism is put in a strong relationship with other factors of urban regeneration: economics, identity, institutionalization, inclusiveness, social equality; opting for a strong type of sustainability. On the other side, cities of underdeveloped countries and developing countries consider ecocentrism endemically, as the intrinsic value of the regeneration of towns and settlements, opting for the most ideal type of sustainability.

Urban Design is considered strategically as a part of vertical and horizontal integration of development and urban instruments: from the level of settlement strategies through local plans, to the principles of energy efficiency of construction. The sectorial strategies concern sustainable transport systems, waste management strategies, the green economy as the key to fighting climate change and the reduction of carbon dioxide emissions are recognized. The education and empowerment in local community become integral part of the urban regeneration process.

The need for urban design as an instrument of integration is recognized in the elements of strategic principles and methodological process: including stakeholders in a various creative and artistic arenas, leading to consensual commitments for green cities, that by their visual, spatial programming, volumetric representations, create a new identity, and attract new investment, together with special institutional and legislative arrangements.

Research results shows that integral, process urban design indirectly through integrated policies, strategies, plans and measures is identified as an integral instrument of urban regeneration relying on the following principles:

- Inclusiveness through wide participation of public, private and civil sector, interdisciplinary;
- Education, through the empowerment of marginalized groups in the form of subsidies for local initiatives for green cities,
- Institutionalization in terms of the development of modern management, instruments and legislation that ensure wide participation, civil society development, attraction of investments, job creation and poverty reduction;
- Environmental spatial-programming arrangements through the application of zoning plans and the principles of integrated activities for the production and use of alternative forms of energy;
- Green identity to attract investment and create glocal places for job creation and poverty reduction.

6. REFERENCES

1. Baker, Susan.Sustainable Development. New York : Routledge, 2006.
2. Castells, Manuel.*The Power of Identity.* Oxford : Blackwell Publishing, 2004.
3. Castells, Manuel.*The Rise of the Network Society.* Oxford : Blackwell Publishing, 2000.
4. Forester, J. Planning in the Face of Power. London: University of California Press. 1989.
5. Habermas, Jyrgen. Postmetafizičko mišljenje. Beograd: Čigoja štampa. 2002.
6. Healey, Patsy.*Collaborative Plannig: Shaping Places in Fragmenteted Societies.* London : MACMILLAN PRESS LTD, 1997.
7. Hildebrand, Frey.*Designing the City: Towards a more sustainable urban form*. London : Routledge, 1999.
8. Landry, Charles.*The Creative City: A Toolkit for Urban Innovators.* London : Earthscan, 2005.
9. Lefebre, Henri**.***The Production of Space.* Oxford, UK : Blackwell Publishing, 1991.

10. Lindblom, Charles.,The Science of Muddling Through. Public Administration Review, 1959,19, pp. 79-88.

11. Madanipour, Ali**.***Design of Urban Space: An Inquiry into a Socio-spatial Process.* Baffins Lane, Chichester : John Wiley & Sons Ltd., 1996.22.

12. McDonald, Sally, Malys, Naglis and Maliene, Vida. *Urban Regeneration for Sustainable Communities a Case Study.* 2009, Technological and Economic Development of Economy, pp. 49-59.

13. Mrđenović, Tatjana, Urban Regeneration and Integrated Urban Design: the challenge for the Serbian legislative framework, IAUS and University of Glasgow, 2013.

14. Radović, Ranko, On cities, Planning and Urban Design: Finnish Experience 1991-1995. Helsinki: Helsinki University of Tecnology, Centre for Urban and Regional Studies. 1996.

15. Reeves, Dory**.***Planning for Diversity.* New York : Routledge, 2005.

THE POLICY FRAMEWORK AND THE ACTIVE MOBILITY IN BULGARIA

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ABSTRACT

When people use only their physical activity for the need of travel it is known as 'Active mobility'. Often we use also terms like 'active transport', 'active transportation' or 'active travel', as synonyms for that kind of transport. The most popular forms of active mobility are walking and cycling, though other mobility means such as the skateboard, kick scooter or roller skates are also forms of active travel. In Bulgaria, like in most of the world, we are experiencing similar urban transportation problems. The congestion seems to be greater each year in Bulgaria's big cities and this affects the active transportation too. Pedestrian and cycling activities are slowly gaining popularity but still the dominance of the private car in our everyday life remains. In general it seems that the active forms of transport are being neglected. To change this trend an integrated transport policy is required, in which the pedestrians will be placed in the centre and not in the margin of the daily agenda. One of the very important components to support the active mobility is the policy framework. It should guarantee that all forms of active transportation have equal rights as users of the streets and are not neglected in the planning process. The current study aims to analyze the existing relevant national regulations regarding walking and cycling and to evaluate the degree of policy support in order to respect their rights and needs. The subject of the study are the relevant policies and how they are implemented. The collected data about the regulatory framework from European and national levels are evaluated using content analysis method. At the end we establish to what degree the acts and regulations respond to the needs of active mobility and what changes in the regulatory framework are needed to facilitate the pedestrian and cycling mobility.

Keywords: active mobility, pedestrian and cyclists rights, policy framework

1. INTRODUCTION

1.1. Description of the problem

Urbanization processes in Bulgaria are very similar to those in most parts of Europe, with 73.5% of the country's population living in cities at present (National Statistical Institute, 2017). In Bulgaria, as in most of the European cities, motorised transport occupies a leading position among all other modes of passenger transport. Between 1991 and 2016 the number of vehicles has increased almost 3 times and currently the motorization level exceeds 455/1,000 (Ministry of the Interior, 2016). Like in most of the European cities the cars dominate the streets of the Bulgarian cities too. The congestion seems to be greater each year in Bulgaria's big and medium sized cities and this affects the active transportation too. Despite the dominant character of the private car in our everyday life pedestrian and cycling activities in Bulgaria are slowly gaining popularity. Contrary to the motorised transportation modes, the crowded sidewalks and bike - lanes are not a problem for walking and cycling mobility, but often a requirement for pedestrians and cyclists to feel safe to walk or cycle

through urban roads. One of the very important components to support the active mobility and to help in giving the streets back to people is the policy and regulatory framework. They should guarantee that all forms of active transportation are not neglected in the planning process. To solve these problems, cities would obviously need relevant strategies that should identify the directions to overcome the barriers to sustainable traffic modes and improve their productivity, attractiveness and accessibility.

30 years ago, on 12 October 1988, the European Parliament adopted a European Charter of Pedestrians' Rights. Since the start of the 2000s, several EC documents (e.g., the 2001 Transport White Paper, the 2007 Green Paper and the 2011 White Paper) highlight the main directions and guidelines for enhancing the sustainability of urban mobility. Despite this efforts for promoting the sustainable urban mobility and, in particular, the active forms of transport nowadays most of the provisions of the above mentioned documents are still far from being implemented in some of the European countries. It will be not an exaggeration to claim that the existing policy and the relevant legislation neglects the problem in general. As a result the design and the building of infrastructural urban projects, including these co-funded by European Union, often jeopardise the lives of pedestrians, cyclists and other forms of active mobility. We see examples of new streets planned and build with too narrow sidewalks and bike lanes or even without a place for pedestrians, cyclists, disabled and other representatives of active mobility forms. According to the provisions of the Action Plan on Urban Mobility the responsibility for urban mobility policies lies primarily with local, regional and national authorities. Nevertheless, decisions adopted at local level are not taken in isolation but within the framework provided by national, regional and European policy and legislation. The European Union provides basic guidance for sustainable urban development and with European programs and projects creates mechanisms to stimulate countries to implement sustainable urban mobility mechanisms. However incorporating these principles into the legal framework is the responsibility of national and local authorities.

1.2. Scope of the study

In terms of the active mobility issues the current research is limited to existing policy and regulatory framework, related to the process of planning and building of transportation systems in urban areas. As main target this paper focuses on pedestrian and bicycle traffic. The time frame for the current study are the last 11 years since the topic for active urban mobility, as part of sustainable urban development, was presented in Bulgarian society after the country's accession to the EU (2007).

1.3. Definitions used

For the purposes of the current study, it is necessary to clarify some basic terms used and the definitions used by the authors. During the survey, it was established that the terms 'pedestrian' and 'bicycle' are defined by the Bulgarian legislation, but there are not definitions for 'bicyclist' and 'active mobility' in the meaning of an active form of transport.

According to the Road Traffic Act, 'Pedestrian is any road user, who is located on the road outside a vehicle and does not perform any work on the road. Pedestrians are also considered those pushing or pulling a stroller, a wheelchair or other non-motorized vehicle with a width of less than 1 meter. Also those pushing a bicycle, moped or a motorcycle, and those moving with wheelchairs powered by their own force or by an engine if they are traveling at the speed of a pedestrian.' The same law regulates the concept of ‘bicycle’ as ’a road vehicle with at least two wheels that moves with the muscular force of the person driving it, except for wheelchairs.’ From the latter, the authors accept as a definition, that 'A cyclist is everyone who is riding a bicycle'.

There are not great differences in the definitions used worldwide for ‘active mobility’ (in some countries is used active travel or active transportation). The definition accepted by the authors is that ‘active mobility’ refers to any form of human-powered transportation that only uses the physical activity of the human being for the locomotion. The most known forms of active mobility are walking and cycling, though other such as jogging/running, non-mechanized wheelchairing, skateboarding, in – line skating or kick scooter are also a form of active transportation. In certain parts of the world and in certain periods of the year, active transportation may also include cross-country skiing and snowshoeing.

2. EMPIRICAL STUDY OF BULGARIAN POLICY FRAMEWORK

The main research papers, used as a basis for this analysis at the national level are related to the problems of active mobility: strategic and normative documents, reports and analyzes. For the purposes of the study, monitoring methods (monitoring), description, logical and comparative analysis were used.

2.1. Main strategies concerning active mobility

Since the late 1980s the problem of sustainable development, is a concern for the world politicians, scientists, urban planners and citizens (Report of the World Commission on Environment and Development: Our Common Future, known as Brundtland Report, 1987), while in Bulgaria this paradigm is relatively new. When joining the EU in 2007, Bulgaria took steps to bring national legislation in line with the European rules. During the first Programming Period (2007-2013), government institutions had been focused mainly on infrastructure measures, thereby neglecting the mobility issues. In the National Reform Program of Bulgaria (2011-2015), adopted in April 2011, the planning and implementation of Sustainable Urban Mobility Plans (SUMP) is foreseen for 35 municipalities with a timeframe set till the end of 2015. In 2018 there are only 7 municipalities that have adopted SUMP but the plan is not mandatory for implementation. It is perceived as a strategic document and is a mandatory condition for Bulgarian municipalities to apply for a second Integrated Urban Transport Project under Priority 1 "Sustainable and Integrated Urban Development" of the new Operational Program "Regions for Growth" 2014-2020. Since 2007 the development of urban mobility in Bulgaria relies on the implementation of several EU projects on municipal, regional and national level. The sustainable development of urban passenger transport has been included as Priority 8 in the new Transport Operational Program 2014-2020. However, the SUMP concept is still new in Bulgaria. It is not obligatory and is considered only as desirable in the current regulatory framework.

The National Strategy for Regional Development stipulates the development of Integrated Urban Transport Plans for seven of the largest Bulgarian cities through the Operational Program 'Regional Development' during the first programming period, 2007-2013 and the OP 2014-2020, 'Growing Regions'– for the second one. One of the main principles in the Strategy for Development of the Transport System in the Republic of Bulgaria for the period up to 2020 is to place users at the center of policy attention as well as to manage the consequenses of globalization processes. The sustainable urban mobility in Bulgaria must ensure the long-term economic development of cities, to increase the quality of life of their inhabitants and protection of the environment. The new concept of urban mobility encourages the use of varios modes of transport as well as combination of different types of public transport with different types of individual transport. New objectives and measures have been also provided in the National Strategy for Improvement of the Road Traffic Safety of the Republic of Bulgaria as well as in the National Strategy for People with Disabilities 2016-2020.

At national strategic level the municipalities are responsible for the policy and decision-making related to the urban planning and development of the municipal territory. According the Spatial Planning Act, each municipality has to prepare a Master Plan which includes a transport communication scheme.

2.2. Main regulatory documents concerning active mobility

According to the preliminary review by the authors of the regulations related to the problems of planning and design of the transport infrastructure in urban territories, it may be assumed that there are two related documents, together with the previous ones, described in tabular form in the report. Generally, the legislation and the existing regulatory framework in Bulgaria may be divided in two categories which are related to planning and development, as well as the rights and obligations of the participants in the traffic movement:

Table 1: First category - documents reflecting the needs of pedestrians and cyclists regarding the planning and design of transport communication systems in urban territories.

Previous	Current
Ordinance No 2 (prom. 29.06.2004) for planning and designing the communication-transport systems of the urbanized territories	Ordinance No. RD-02-20-2 (prom.20.12.2017) for planning and designing the communication-transport systems of the urbanized territories
Ordinance No.6 (prom. 26.11.2003) for building an accessible environment in the urbanized territories	Ordinance No. 4(prom. 1.07.2009) for the design, execution and maintenance of buildings in accordance with the requirements for an accessible environment for the population, including for people with disabilities.

Table 2: Second category - laws and ordinances regulating the way of movement and the rights of pedestrians and cyclists.

Previous	Current
Road traffic act (prom. sg. 53/….. 1973)	Road traffic act (prom. sg. 20/5 mar 1999)

2.2.1. Main regulatory documents related to the planning and design of the communication - transport systems in urban territories

One of the basic laws that directly regulates the public needs related to the spatial planning, investment design and construction of the Republic of Bulgaria, is the Spatial Planning Act (SPA). In its essence, the SDA defines the basic rules and establishes the legal grounds for additional regulations, defining specifically the planning and designing of the urban fabric. Following above guidelines, additional regulations for the Transport Communication Systems (TCS) in the urbanized territories (Art.75al (5)) and the Ordinance for a Public Accessible Environment have been created, defining the norms and methods in the planning of the urbanized territories.

The main document, conserning the rules and planing for the urban street system in Bulgaria is Ordinance No RD-02-20-2 from 20 Dec. 2017. This ordinance defines the principles, criteria, norms and rules for planning and designing of Transport Communication Systems (TCS) in urbanized areas, including: the street network, public transport for passenger transport, pedestrian traffic, cycling, parking, transport service facilities (repair workshops, etc.) and traffic management. The requirements of the Ordinance apply both to the planning and design of new TCSs, as well as the reconstruction, major repairs and ongoing maintenance of existing streets.

The previous regulation, (Ordinance No. 2 OF 29 JUNE 2004 on planning and designing the transport communication systems of urbanized territories) was in force up until 2017 during the implementation of most of EU projects for sustainable urban mobility. During the process of implementation of strategic and operational programs for regional development, it has proved to be ineffective. One of the main shortcomings became apparent during the implemtation of cycling networks in the big cities (Varna, Sofia, Plovdiv), executed under the previous regulations. In the texts of the Ordinance in place in during the period of 2007-2010, (the period of construction of the first bicycle lane (in Sofia) and the design of the first cycling networks (Varna and Sofia) had no specific definitions and criteria reflecting the needs of pedestrians and cyclists. The regulation was aimed mainly towards the motorized traffic – width of lanes, turning radius, cross sections, etc.

Following the public objections and opinions of experts and NGOs, working on urban development projects, some major additions to the Ordinance were made in June 2015. During the next two years, it has been constantly updated which led to complete revamping of regulations for planning and designing of Transport Communication Systems (TCS) in urban areas. The new ordinance published at the end of 2017 sets out basic principles for ensuring optimal conditions for all participants, which corresponds to and reflects the European directives for planning and designing of TCSs. One of the main changes is an introduction of a priority re-arrangement of all the participants in the traffic movement. In order of importance they are as follows - pedestrians; passengers using public transport; cyclists; cars; cargo vehicle; transit car traffic.

According to the Ordinance, the Transport Communication Systems (TCS) and its elements has to be designed in accordance with the structure and needs of urbanized territory and the adjacent territory. They must be also in accordance with the projections of the spatial development concepts and the spatial plans. In the general provisions of the new regulation of 2017, texts that define the scope and content of Sustainable Urban Mobility Plans are added. In this section are also the main additions (changes) that specifically reflect the integrated policy of the state and its principles for sustainable urban mobility.

Table 3: The main objectives and tasks of the planning and design of the Transport Communication Systems, which are set forth directly in the Ordinance, are:

Objectives	Tasks
1. Ensuring the effective use of the territory of the urbanized areas according to the parameters and the projections of the Master plan;	1. To offer optimal opportunities for the development of the different types of movement in the urbanized territory, ranking by the following priority:

	(a) pedestrian (traffic); (b) public transport; (c) cycling (traffic); (d) the movement of passenger cars; (e) freight traffic; (f) transit carriage for the urban territory;
2. Providing fast and convenient transport links between the different parts of the urban territory and the municipalities as well as their connection with the republican and municipal road network;	2. To provide opportunity for co-modality through quick, easy and convenient transfer;
3. Creating premises for the economic development of the territory;	3. To move (To guide) out transit traffic outside urban areas;
4. Enhancing sustainable mobility by encouraging the use of public transport, supporting pedestrian and bicycle traffic, creating preconditions for reducing the use of cars, motorcycles, mopeds and other motor vehicles causing air and noise pollution in urban areas;	4. To offer alternative roadway activities, depending on the time, weekly and seasonal characteristics of the traffic.
5. Achieving maximum safety and security for all road users, reducing and limiting potential road accidents;	
6. Ensuring public health by reducing noise, vibration and harmful gases;	
7. Providing effective design, based on international standards for sustainable, green and mobile urban environments;	
8. Reporting, preservation and development of the existing architectural, historical and cultural environment (especially for city centers and areas of cultural and historical heritage).	

Another major change in the Ordinance are the new applications, which are expanded and supplemented with graphs explaining the clearly defined requirements, precluding misinterpretation in planning and designing of the Transport Communication Systems (TCS).

In conjunction with the Ordinance for planning and designing the Transport Communication Systems (TCS) of the urbanized territories was issued the next ORDINANCE № 4 OF 1 JULY 2009 - for the design, execution and maintenance of buildings and structures in accordance with the requirements for an accessible environment for the population, including for people with disabilities, which has a direct relation to the mobility needs of the citizens. This Ordinance is issued on the basis of Art. 169, para. 2 and Art. 107, item 5 of the SPA, in connection with Art. 33 of the Law on the Integration of Persons with Disabilities and establishing the basic principles and criteria for universal design, as formulated in the "European Concept of Accessibility".

The Ordinance was issued for the first time in 2004, and replaced the existing Ordinance No. 1 of 1995 (on the establishment of the environment in the inhabited places with a view to its use by disabled people (SG 112/95). Up until 2009 it is known as Ordinance No 6 of 26 November 2003 for development of an accessible environment in the urbanized territories. During all the changes in the years, the differences in the regulations concerning the accessible environment are substantial, both in terms of its scope and content, as well as in the very titles/headings of the document. Currently, the Ordinance defines the requirements for the design, implementation and maintenance of the elements of the urbanized territory, to ensure an accessible architectural environment for the entire population, considering the specific needs of the people with reduced mobility, incl. people with disabilities. The Ordinance complies at the same time with the requirements of the

normative acts on the scope and content of the spatial planning schemes and plans that are essential for sustainable and integrated urban planning. Major changes are made in the general section of the existing Ordinance, where in the revisions from 2009 had certain texts removed (article 3 of 2004) that defined methods and procedures for the development of programs and measures for adaptation in urban areas. In the current regulations there are only texts referring to reports on the results of the audit, which are carried out according to the ordinance under Art. 176a, para. 6 SPAs. The information in the reports containing an accessibility assessment for compliance with the requirements of this Ordinance and technical measures for their satisfaction.

2.2.2. Main regulatory documents regulating the way of movement in urban territories and the rights of pedestrians and cyclists

In Bulgaria the legal basis for road traffic regulation, including pedestrian and bicycle movements (elements of "active mobility"), is the the Road Traffic Act and its Implementing Rules. They define the rights and obligations of all road users, thus including pedestrians and cyclists, both in and outside of urban theritories. Road Traffic Law is the only one that directly defines the term "pedestrian" as any road user who is on the road outside a vehicle (for example, a car) and does not work on the road (doing road repairs etc). Pedestrians are also people who push or pull a stroller or wheelchair (including a wheelchair driven by a pedestrian-speed motor), as well as cyclists and motorcyclists who have dismounted their respective vehicles and push them on foot. Other definitions limited in the law and its statutes, which concern "active mobility", are the definitions of bicycles. It can be argued that the law has summed up all other forms of active mobility such as skateboarding, roller skating, jogging, or all other means of movement with use of muscle power. According to the law, anyone who pushes or pulls another vehicle without a motor which has a width less than one meter, is considered a pedestrian.

The current Road Traffic Act, adopted by the National Assembly in 1999, is more than 150 pages. There are only two sections dealing with all fundamental rights and obligations of the pedestrians and cyclists. In detailed review of the law, it is obvious that there is a negligent attitude towards active forms of mobility. In all 78 amendments and additions to its adoption on September 1, 1999 until the last change of 27 July 2018, only one is related to the pedestrians (Article 119, paragraph 5, new in force from 26.01.2017) and a single one related to the cyclists (Article 80, Amended, SG No. 60/2012, in force as of 07.08.2012). This, in view of the content of the law, unfortunately does not mean that in the above aspects the legislator has exhausted all the problems related to the active forms of transport, and in this case shows a tendency to neglect the problems and needs of those traffic participants. And although the new Ordinance № РД-02-20-2 has rearanged the order, giving priority to the pedestrians, according to the Road Traffic Act, the motor vehicles continues to be the dominant form of transport in the cities of Bulgaria.

3. PROBLEMS IDENTIFIED

The problems identified in the context of the study can generally be seen in two main aspects: problems that are related to the regulatory framework, and others that are related to the interest, knowledge and behavior of different stakeholders involved in planning and building of an accessible urban environment, such as executive and local authorities, specialized national organizations of pedestrians, cyclists, disabled people, professional organizations (Chamber of Architects, Chamber of Engineers), NGOs and others.

In terms of regulatory issues, two groups were identified: legal and implementation issues. The legal issues concern mainly the quality and the adequacy of the regulation introduced by it. The problems affecting the implementation of the legal framework are due to the legislator's inclination to solve every problem through legislative changes. The frequency of these changes is extremely high in recent years and is mainly related to partial amendments to the old regulatory framework. Regarding the speed with which regulations are adopted and changed, those who should implement them often find out with delay for the changes in legislation. In fact frequent legislative changes lead to ignorance, non - compliance and non - implementation of the most recent regulatory framework.

The subjective problems are mainly related to the general ignorance on the subject, its underestimation and its failure to be taken as a priority by the stakeholders. Society probably does not appreciate enough that it is from this accessible urban environment that every one has different needs during different phases of his life. This leads to low activity in the processes of finding and implementing effective solutions to the active mobility issues. At the same time, the government at national and local level does not show any political will to involve stakeholders in decision-making concerning issues that are common to all urban users.

As main drivers of the problems outlined above were identified the following:

- Insufficient prioritization of active transport at national level;
- Uncertainty and inconsistency of the legal framework related to the subject;
- Incomplete compliance, partial non-compliance and non-enforcement of existing legislation;
- Unfamiliarity to the requirements for providing a publicly accessible environment due to the low level of information provided on the problem;
- Insufficient funding and failure to provide incentives for activities aimed at providing a generally accessible urban environment.

4. CONCLUSIONS AND FURTHER WORK

In the process of studying the national legislative framework, connected to the problems of planning and design of the communication - transport systems, the way of movement in urban territories and the rights of pedestrians and cyclists, the authors did not found other related strategic and normative documents than those already reviewed in the paper. The World and European practice in the countries where the active mobility has a high modal split is the pedestrian and bicycle traffic to be governed by additional rules and regulations, which so far is missing in Bulgaria's policy framework.

A major problem with the implementation of rehabilitation projects for urban street network and public spaces is the insufficient political understanding of the problem of active forms of transport and their neglect in legislation over the years. Additional problems are presented by the inadequate estimation of funds and their insufficient level of spending during implementation phase for projects concerning the development of urban infrastructure elements. The low level of public participation (citizens and NGOs) in the process and realization of the mentioned projects is mainly due to the unwillingness of the government to organize and conduct beneficial, non - formal, mandatory public debates. As a result of the insufficient presence of the problem for active mobility in the public space and low level of awareness of the interested persons, there is also some apathy on the side of the citizens about the subject. All this reflects in the incomplete and often poor design and build of the projects for renovation and construction of new elements of cities' transportation system (sidewalks and walkways, pedestrian zones, bicycle lanes, etc.). To reverse and change the situation described above, an integrated transport policy framework is required, in which the active transportation become the priority for the urban development of Bulgarian cities.

Although in the context of the current topic we focus on the pedestrian and bicycle movements, for they represent the largest percentage of active forms of transport, they do not exhaust the problem on a European and global scale. From the studies conducted to date, it was found that the regulatory framework in Bulgaria does not adequately consider (only in one sentence, in the Road Traffic Act), the other forms of active mobility and their place in the road traffic.

In additional studies should be addressed the following problems:

- The local policy framework and active mobility in Bulgarian cities;
- Possibilities for improvement of the existing Bulgarian legislation, regarding active transportation;
- Other forms of active transportation and their connection with pedestrian and bicycle transport.

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REFERENCES

1. Haufe, N., Millonig, A., Markvica, K., (2016), 'Developing Encouragement Strategies For Active Mobility', in Transportation Research Procedia, Volume 19, Pages 49-57, ISSN 2352-1465
2. Kovachev, A., Slaev, A., Nozharova, B., Nikolov, P., Petrov, P., (2018), 'Can public participation contribute to sustainable mobility? The experience of Bulgarian cities', in 'Bolay, J.C., Maričić T.,

Zeković, S. (Eds.) (2018), A Support to Urban Development Process', pp.59-79, Belgrade: EPFL & IAUS., ISBN 978-2-8399-2394-1.

3. Nourian, P., Rezvani, S., Valeckaite K., Sariyildiz, S., (2018) 'Modelling walking and cycling accessibility and mobility: The effect of network configuration and occupancy on spatial dynamics of active mobility' in 'Smart and Sustainable Built Environment', Vol. 7 Issue: 1, pp.101-116, Emerald Publishing Limited, 2046-6099, DOI 10.1108/SASBE-10-2017-0058.
4. Papaioannou, P., Basbas, S., Konstantinidou, C., Politis, I., (2010). A Policy Framework for the Facilitation of Pedestrians in Thessaloniki, Greece. 23rd International Cooperation on Theories and Concepts in Traffic Safety (ICTC) workshop in co-operation with COST-358 Pedestrian Quality Needs (PQN) 11th International Walk21 Conference, "Getting Communities Back to their Feet – Promising approaches to support walking for a sustainable future". 23rd International Cooperation on Theories and Concepts in Traffic Safety (ICTC) workshop in co-operation with COST-358 Pedestrian Quality Needs (PQN). Hague, The Netherlands.
5. Van Audenhove, F.J., Korniichuk, O., Dauby, L., Pourbaix, J. (2014) The Future of Urban Mobility 2.0 – Imperatives to shape extended mobility ecosystems of tomorrow. Arthur D. Little and Union Internationale des Transports Publics.
6. ACTIVE TRAVEL,. ACTIVE SCOTLAND. Our journey to a sustainable future. Cycling Scotland. Living Streets Scotland. Paths for All. Sustrans Scotland, 2012. https://www.pathsforall.org.uk/component/option,com_docman/Itemid,69/gid,784/task,doc_download/ [Accessed: 21st September 2018].
7. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Action Plan on Urban Mobility. Brussels, Commission of the European Communities, 2009. http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:52009DC0490:EN:NOT. [Accessed: 21st August 2018].
8. Government of Canada/Public Health Agency of Canada. https://www.canada.ca/en/public-health/services/health-promotion/healthy-living/physical-activity/what-active-transportation.html [Accessed: 24th September 2018].
9. National Strategy for Regional Development of the republic of Bulgaria for the period 2012 – 2022. http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=772 [Accessed: 11th August 2018].
10. National Strategy for improving the safety of movement on the roads of the republic of Bulgaria for the period 2011 – 2020. http://www.strategy.bg/StrategicDocuments/View.aspx?Id=714 [Accessed: 11th August 2018].
11. Ordinance No. RD-02-20-2 (from 20.12.2017) for planning and designing the communication-transport systems of the urbanized territories. http://dv.parliament.bg/DVWeb/showMaterialDV.jsp?idMat=121406 [Accessed: 11th August 2018]
12. Ordinance No. 4 (from 1.07.2009) for the design, execution and maintenance of buildings in accordance with the requirements for an accessible environment for the population, including for people with disabilities. https://www.mrrb.bg/bg/naredba-4-ot-2009-g-za-proektirane-izpulnenie-i-poddurjane-na-stroejite-v-suotvetstvie-s-iziskvaniyata-za-dostupna-sreda-za-naselenieto-vklyuchitelno-za-horata-s-uvrejdaniya-dv-br-54-ot-2009-g/ [Accessed: 11th August 2018]
13. Pedestrians and Cyclists, European Commission, Directorate General for Transport, September 2015. https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/ersosynthesis2015-pedestrianscyclists25_en.pdf [Accessed: 18th September 2018]
14. Road traffic act (from 01.09.1999) https://rta.government.bg/images/Image/n_uredba/zdvp.pdf [Accessed: 11th August 2018]
15. Strategy for the Development of the Transport System of the Republic of Bulgaria for the period until 2020. http://www.strategy.bg/StrategicDocuments/View.aspx?lang=bg-BG&Id=604 [Accessed: 11th August 2018].
16. Spatial Planning Act (from 31.03.2001) https://www.lex.bg/laws/ldoc/2135163904 [Accessed: 11th August 2018]

17. Transport Canberra. https://www.transport.act.gov.au/getting-around/active-travel [Accessed: 24th September 2018].
18. White Paper on transport: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. Brussels, European Commission, 2011. http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2011:0144:FIN:EN:PDF. [Accessed: 21st August 2018].
19. Wikipedia. Active mobility, https://en.wikipedia.org/wiki/Active_mobility#cite_note-1 [Accessed: 25th September 2018].

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THE IMPACT OF THE PREFABRICATED INDUSTRIALIZED SYSTEM OF CONSTRUCTION ON THE SPATIAL ORGANIZATION OF COLLECTIVE HOUSING BUILT BETWEEN 1970 – 1980. IN NIS

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ABSTRACT

This paper researches the impact of prefabrication as an industrialized construction system on the spatial organization of collective housing concepts in Nis, built between the 1970's and the 1980's. The defined period has the characteristic of the socialist system of raising social standards and solving the problems of the constant lack of housing units for workers. The socialist system conditioned a specific way of solving social standard, which implies a solution to the construction of housing units through the collective housing. In that system, the mass constructions and prefabricated construction represented the most rational and quickest construction solutions, which achieved a higher living standard and formed a new culture of collective housing. The research was carried out as a case study of the analysis of the built object at the Nemanjic Boulevard in Nis, in which the influence of the prefabrication will be considered at the level of architecture of collective housing, through the relation between functional units and functional zones in the housing unit.

Keywords: prefabrication, industrialized construction, housing unit, collective housing, functional units, functional zones

1. INTRODUCTION

The period of the largest, massive housing construction in Nis, came after the Second World War. The created social and socioeconomic conditions have led to the creation of industry in the cities and under that influence, Nis has become one of the largest industrial centers in former Yugoslavia. These influences have led to large migrations from rural areas to the cities, which led to the formation of a new working class. This artificial creation of a new social class has created a need for new residential areas. On the other hand, the Socialist system of raising social standards aimed at solving the problem of lack of housing for workers. In Yugoslavia, the right to housing was a constitutional category, but the creation of massive housing was different from other socialist countries. After the adoption of the new law in 1960 self-managed companies

began to build housing for institutions that were looking for apartments for their workers. These companies were subsidized by the state, but not many apartments were state-owned, they became “social property”. In such an atmosphere, social construction was conditioned by a specific way of solving housing space in which mass constructions and prefabricated construction represented the most rational and quickest construction solutions. It was a way to achieve a higher standard of living and to form new culture of collective housing. The design of such a residential area had to satisfy numerous family needs. Numerous residential settlements were realized in that period in prefabricated industrialized systems (3). The paper deals with the research of the impact of prefabrication as an industrialized construction system on the spatial organization of multifunctional buildings in Nis, built in the period from 1970s to 1980s. The research was carried out as a case study of the analysis of the constructed object on the Nemanjic Boulevard in Nis, built in 1978 in which the influence of the prefabrication will be considered at the level of architecture of multi-family buildings through the relationship between functional units and zones in the housing unit.

2. THE CONCEPT OF BUILDING COLLECTIVE HOUSING

The reconstruction of cities after the Second World War began within the existing urban matrix, initially replacing destroyed buildings. The new urban identity of the city was formed by building new blocks with a large number of new buildings of the same design. Numerous residential urban blocks were realized in that period in prefabricated industrialized systems. Prefabricated construction technologies are created as a result of socioeconomic opportunities, cultural, academic and technical development, as well as housing policies. The construction of collective housing in our country after the Second World War (until 15-20 years ago) was characterized by rationality, economy, extremely large production of apartments and closed systems of industrialized construction. The concept of building a collective housing was the result of the overall social and economic development and the corresponding developments in the goals of housing construction. (2) Residential parts of the cities were built within the framework of the program of socially oriented construction as functionally separated units at new locations within the blocks, which was a feature for the post-war residential construction of Eastern European countries. The main goal of this type of construction was to provide elementary living conditions for a large number of people. Such housing policies offered an existential minimum, uniformity, and equality for all, resulting in the creation of unified industrial facilities with identical housing units for all users, regardless of their real-life needs and habits (4). On the other hand, in addition to all the advantages in the speed of execution of works, the prefabrication also had its drawbacks which were reflected in the absence of diversity, that is, uniform, monotonous housing within open, large urban blocks. The finished elements as well as final material processing of exterior walls repeats itself on a large number of buildings as well as the entire urban blocks.

Figure 1: Collective housing in prefabrication of the Lenjin Boulevard (today: Nemanjic Boulevard)
https://www.facebook.com/MilanovEdikt/photos/a.189529174516901/1244070985729376/?type=3&theater

3. THE CASE STUDY OF THE RESIDENTIAL OBJECT IN NIS BUILT IN THE PREFABRICATION SYSTEM

In the global climate of industry, production, in the decades after the Second World War the massive construction of new apartments for new generations settled in Nis began. Prefabrication as the most suitable system of rapid construction began to be implemented in Nis. The construction was accelerated, with the large part of the construction site being disassembled into production facilities.

The first prefabricated, multifunctional building in Nis was designed in 1970 in the IMS system according to the given urban conditions in terms of dimensions and levels and with the structure of apartments demanded by the investor and constructor "Gradjevinar" from Nis. The building was designed by the architects Vera Zivic and Zorana Lukovic within the Center for Housing, which by its successful application opened the way to further implementation of this system in Nis. The simple application of the IMS system has been achieved by simple facade elements. Unlocking the road to prefabrication led to the further realization of numerous collective buildings with many flats to solve the housing issue of many families. Thus, the construction of the whole blocks of buildings in Krive livade and Lenjin Boulevard in prefabricated construction began. (1)

In the overall atmosphere of fast and rational construction, the analysed residential building was designed and built in 1978, in Nis on Nemanjic Boulevard, in the part of Krive livade. The building was designed and implemented within the company "Gradjevinar" from Nis. The building, as well as the entire lamella, was designed by the architects Predrag Katanić and Ljiljana Davidović. The building was designed in the IMS prefabrication system with ranges of 4.20m and 3.60m. The structure of the building is a reinforced concrete construction dimension of columns 38x38cm, coated with facade, prefabricated, "sandwich" panels. For the observed period, the construction of slender skeletal structures or transverse concrete bearing walls is characteristic. The basic characteristic of the construction period, on one hand, is the adoption of the first regulations on the thermal protection of buildings and the beginning of the modest use of thermal insulation, and on the other hand the construction of statically slim, thin structures, large glass surfaces and thermally very poor facilities. All characteristics of the period in which the object was built are also reflected on the applied construction (3).

Interconnected structures, stairs, facade panels, and parapet fillings are made of precast concrete components of a relatively simple assembly. The rationalist approach was applied to concrete screens where external prefabricated facade panels also represent the face of the building. In all elements of the thermal coating, there is an insulation layer of 4 cm thick and which does not meet the current thermal regulations. Interconnected ceilings, as well as flat roofs, are prefabricated elements of the IMS system. The facade joinery is double wooden. One part of the loggias is glazed and attached to the living space.

3.1. The analysis of urban and architectural parameters of the building

The analysed object A1-2 is designed as a row of buildings in lamella A with clearly expressed typological characteristics for this period. Collective housing lamellas are one of the most abundant forms of multi-story architecture in the period of industrial construction, which would mean that multifunctional buildings are combined into a linear form. The lamella forms an architectural form, the masses break down the accompanying logic of the functional assembly. In the analysed case, the entire block is defined by a lamella formed from a multiplied object, while only the final objects are separated and withdrawn in relation to the regulation line. In the art of the lamella, only concrete vertical strips that define the plastic of the facade can appear. The ground is withdrawn in relation to the building's dimensions and treated with a facade brick; on the ground floor allowed penetrations towards the inner courtyard (3).

Due to its disintegration and "flow" and the lack of closed public spaces, residential areas built in an open type of large blocks with multi-story buildings did not have ambient quality, and despite the designed and realized spaces for shared use by all tenants, such housing blocks were characterized by social alienation.

(a) **(b)** **(c)**

Figure 2: (a) the position of the building in the block, (b)(c) today's appearance of the building

https://www.google.com/maps/place/

Almost all buildings built during this period were designed without the detailed microclimate analysis. Facades are the same, regardless of their orientation, dominant winds or conditions related to a specific location. The orientation of the building is in the east-west direction, while only the final object in the lamella is facing north or south. These residential buildings have a big number of floors which results in high density of population.

(a) (b)

Figure 3: (a) Northeast facade, and (b) Southwest facade (author's drawings)

3.2. The typological analysis of the housing units

The access to the design of prefabricated residential architecture is very specific because the construction technology dictated spatial organization solutions in a greater or different way than in the traditional building system. The prefabrication influenced the formation of the typology - in the following way (4):

- it directed the ranges and sizes of the rooms
- it directed the ways of functional room connections
- it directed the grouping of individual rooms, primarily sanitary blocks and kitchens
- it directed the number of housing units on the typical floor

In some examples, it can be concluded that prefabrication has formed types of housing units by:

- directing the day and night zone
- directing communications within a residential unit.

The constraints defined by the prefabrication can also be seen on the example of the object being analysed. The dimensions of the apartments as well as the layout of the rooms are defined by the ranges of the IMS constructive system. The analysed object has a defined range of the structural system of 4.20m and 3.60m. The structure of the building is a reinforced concrete skeleton, dimensions 38x38cm, which defined the layout and dimension of the rooms inside the assembly. The building was designed as a central assembly in which two elevators and a staircase were placed in the central part, while on the floors the flats were grouped around them. All nine floors are designed as typical floors for 36 apartments with four apartments defined on the ground floor and two in the attic, which is a total of 42 apartments. In the basement, there are residential premises whose layout and division are performed independently of the constructive system, by light

partitions. Also in the basement there are hydrofoils, heating substations, and garbage rooms. The loft is designed as a residential part and as a common laundry room.

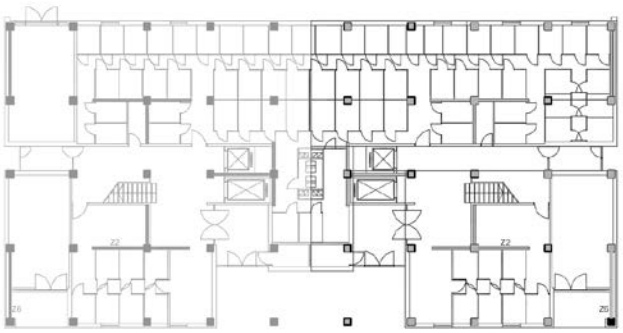


Figure 4: Ground floor (author's drawings)

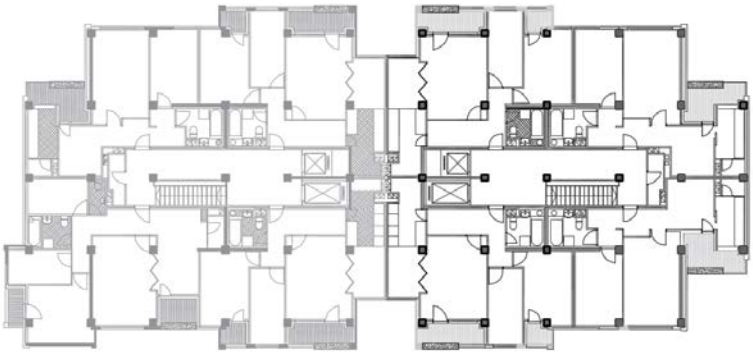


Figure 5: Typical floor 1.-9. (author's drawings)

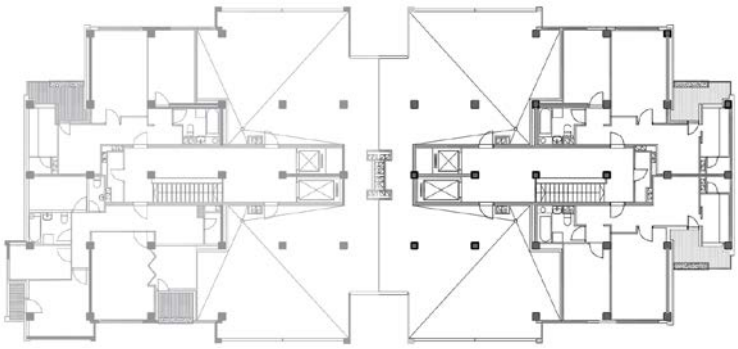
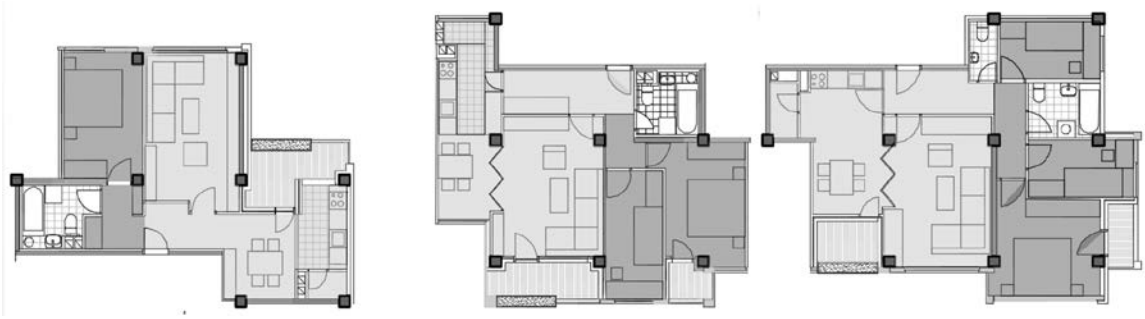


Figure 6: Attic (author's drawings)

The building was designed as nine standard floors with four apartments or three type apartments designed to meet the needs of different family structures. The starting point for the design of collective buildings was based on the expectation of the number of people who would live in the apartment, which also defined the structure of apartments (6). Apartment (a) was designed as a one bedroom apartment for a married couple without children, apartment (b) was designed as a one and a half room apartment for a family with one child and apartment (c) was designed as a two bedroom apartment for a family with two children; On the other hand, the idea of designed apartments was to satisfy various assumed family situations, which resulted in the provision of sleep in the living room (7) in each apartment. Variation of possible scenarios of using the same housing unit was investigated by analysing multi-purpose residential spaces by improving compatible content. The constructive IMS system defined the width of the living room at 3.60m, while for other rooms within this range, communication with the auxiliary rooms or sanitary facilities was designed; also in all apartments the span defined the kitchen dimension with the dining room.

The organization of all apartments is in line with the family's biological rhythm. The structure of the apartment was by a constructive system defined into the day and night zone, in which, depending on the needs of families, two centers of family gathering were defined, and they can be divided into generations (living room and dining room); also the dining room became an extended communication and at the same time the center of gravity of the family.

In accordance with the new social relations and ideology, the society was responsible for providing individuality to each person, either as an individual or a family member, and the development of an individual's life in an apartment that refers to complete isolation and at the same time common activities within the family circle (6), which as a result had that all three apartments have one half-room, resulting from the need for a person's individuality within the apartment and as such can satisfy the needs of children or the elderly as a family members.



(a) (b) (c)

Figure 7: (a), (b), (c) Typical apartments in the building (author's drawings)

4. CONCLUSION

The mid-20th century was marked by a new social development, the creation of a new working class and the solution of the issue of social equality. The demolition of cities in the Second World War has created the space for the construction and creation of new urban units. As a political and ideological goal in the general spirit of development of the new state, prefabrication appeared in response to the needs of solving the housing problems of a large number of people and the construction of as many housing units as possible. Nis as an industrial center had parallel development with other cities in Yugoslavia. Urbanized mass construction was a solution to housing for a large number of workers who represented a new social class. From the presented analysis of typical apartments, it can be concluded that the prefabrication, with its clearly defined ranges and elements, reduced the number of types of apartments. On the other hand, the designed apartments had clearly defined functional zones, defined by the dimensions, ranges and modules of the assembly system and above all they were following the needs and development of the individual as well as the entire family. The spatial quality of apartments, as well as the construction itself, has changed over different periods.

Today, the prefabricated building system in our conditions is almost totally rejected, but we can say that the prefabrication formed urban landscapes and physical forms of residential architecture that have their architectural value in Nis and other cities of the former Yugoslavia.

REFERENCES

1. Informativni Bilten Centra za stanovanje br. 18 (April 1977.) pp. 23-24.
2. Jovanović Popović, M., Ignjatović, D., Radivojević, A., Rajčić, A., Đukanović Lj, Ć.I.N. and Nedić, M., 2013. National typology of residential buildings in Serbia. Faculty of Architecture, University of Belgrade and GIZ–German Association for International Cooperation, Belgrade.)
3. Jovanović, J., Grbić, J. and Petrović, D., 2011. Prefabricated construction in former Yugoslavia. Visual and aesthetic features and technology of prefabrication. Proceedings of Post War Modern Architecture in Europe, 22nd to 24th of July.
4. Mecanov J. D., 2015. Spatial organization of residential housing realised in Belgrade, in period between 1947th and 1980th year, in precast industrial systems. University of Belgrade, Faculty of architecture, Doctoral Dissertation, Belgrade

5. Mecanov, D., 2016. The influence of prefabricated construction systems on Belgrade's architecture*. Nasleđe,* (17), pp.97-124.

6. Ristić-Trajković, J., Stojiljković, D. and Međo, V., 2015. Influence of the socialist ideology on the conception of multi-family housing: New urban landscape and the typological models of housing units. *Facta universitatis-series: Architecture and Civil Engineering*, 13(2), pp.167-179.

7. Čanak M., 2015. All my apartments. Orion art. Beograd

GREEN INFRASTRUCTURE IN BELGRADE AS (RE) GENERATIVE SPACE OF BIOPHILIA: THE CASE STUDY OF BLOCKS 45, 70 AND SAVAMALA

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ABSTRACT

The consequences of climate change have already affected European urban areas, as numerous researches show that intense urbanization leads to degradation of natural habitats and reduction of biodiversity. Scientific findings on ecology and climatology, as well as global and national policies requires a shift of the planning process towards the development of urban adaptable ecosystems. In this article, we look at possibilities to apply green infrastructure as urban planning approach that provides polyvalent space for ecosystem services and human well- being. Focus of the research presented in this article are Block 45 and 70 in New Belgrade and Savamala neighborhood in the old city center. Even though they are characterized by different ecological, urban, morphological and social characteristics, they share direct contact with Sava River. Therefore, the adaptive potential of these spatial segments will be the subject of the analysis presented in this article, and the emphasis will be on applying biophilic design within the integrated network of green infrastructure.

Keywords: green infrastructure, environmental planning and design, the ecosystem approach, biophilia, Blocks 45 and 70, Savamala

1. INTRODUCTION

New discourses of ecology bring the shift in planning paradigms and change its value base. The ecosystem approach to planning involves achieving the goals of human well-being in the context of an integrated socio-ecological system, in which built and social components can be considered as specific types of physical and biological components (Pickett and Cadenasso, 2004). This approach is based on the principles of multi-scalability, hierarchical structure of ecosystems, the relation elements-processes, connectivity and spatial continuity (Pickett and Cadenasso, 2004; Ahern, 2007). As part of discourse, the term green infrastructure (hereinafter GI) appears as a new-planning and design concept that supports a set of ecological and cultural functions, contributes to better health and well-being of people (Ahern, 2007; Irvine et al., 2010; Lafortezza et al., 2013; Zaręba 2014). The main theme of this paper are the possibilities of applying the concept of GI in the area of urban structures of Belgrade. The study will address the possibilities of implementation of its spatial elements at neighbourhood/district level and linking them with Belgrade's green core as its main component at a higher city level. Two urban areas of Belgrade were taken for case studies: Blok 45 in New Belgrade and Savamala in the old town both located right next to the Sava River, the main green-blue corridor of the city. As

representatives of two different models of urban structure, the study will determine what consequences it has for planning and implementation of elements of GI. The work will explore the capacity and compatibility of informal greening in order to be integrated with the planned network of GI and thus successfully completed. The basic assumption is that the forms of development of the urban areas establish mutually different relationships with the corresponding elements of GI. Greening spaces and autonomous adaptation by informal activities of the tenants, the local community or association could become an important part / element of GI as part of the concept of greening urban areas and future plans at local level. These spontaneously formed processes will be analysed in order to examine the possibilities for inclusion in the strategy and action plan that will be a driver of trends in higher spatial and organizational levels. Informal green spaces are an important factor of human well-being because, like GI, they have ecological, physiological and psychological importance. For the purpose of the case study we will apply three successive methods: Identification of the GI components based on patterns processed using patch-corridor-matrix model (Ahern, 2007); assessment of the problems and potentials of urban areas for application components of GI using Forman's model (Forman, 1995); identification of informal activities of greening and assessment of the potential of such space consisting of analysis, planning, site visits and documentation of the current situation. In the final part, we will compare the findings from the case studies and draw conclusions regarding the differences arising from the specific urban areas.

2. THEORETICAL FRAMEWORK FOR PLANNING AND DESIGN GREEN INFRASTRUCTURE

Planning of GI is based on scientifically-based principles for landscape planning including a multi-scaled perspective, recognition of pattern process relationships, the fundamental importance of connectivity and specific guidelines for planning the spatial configuration of landscapes. It is therefore essential that the structural elements of the GI are identified on the basis of patterns landscape. Benedict & McMahon (2002) define GI as an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations. Green infrastructure provides environmental services in urban areas, which is a prerequisite for ensuring biodiversity, social and territorial cohesion and sustainable development, and overall human well-being (Lafortezza et al., 2013; Zaręba, 2014).

Keeping in mind the topic of this work that explores the relationship between GI and certain models of urban structure, we consider GI in terms of its structure and the elementary units of which it consists of. For this purpose, we rely on the definition provided by Ortega-Álvarez & MacGregor-Fors (2009) who present GI in structural terms as components that work together to maintain a network of sites supporting ecological and social processes. In general, two main components of GI are the hubs and links (Benedict and Makmahon, 2002). Hubs can contain sub-elements such as nature reserves, parks and open spaces, forests and agricultural land. Links are connections that include green corridors and green belts that connect ecosystems, enabling the flow of ecological processes (Williamson, 2003). Although these elements are precisely defined spatial entities, in nature there are no sharp boundaries.

The method that we applied to two case studies consists of three phases: (A) identification of the components GI based on patterns of landscapes; (B) an assessment resources of the studied urban areas (case studies) for application components GI; (C) identification and assessment of potential informal green space.

(A) For the purposes for describing and understanding the spatial configuration of landscapes, as well as for identification of its fundamental elements, the two case studies in this work will refer to the patch-corridor-matrix model developed by Richard Forman (1995), a convenient and universally accepted model for structural categorisation and mapping the landscape mosaic which comes from an area of applied landscape ecology and it is universally accepted (Forman, 1995; Ahern, 2007). According to this model, there are three fundamental landscape elements- spatial components that define landscape structure: patches, corridors, and the matrix. Patches provide multiple functions including wildlife habitat, aquifer recharge areas, or sources and sinks for species or nutrients (Ahern, 2007). Corridors are linear landscape elements that can be defined on the basis of structure or function and they serve many functions within the landscape including habitat for wildlife, pathways or conduits for the movement of plants, animals, nutrients, and wind, or as barriers to such movement (Ahern, 2007). The matrix is the dominant land cover type in terms of area, a degree of connectivity and continuity, and control that is exerted over the dynamics of the landscape (Forman, 1995; Forman and Godron, 1986). Table 1 provides urban landscape elements classified in the Patch-Corridor-Matrix Model sorted by levels (Ahern, 2007; GI Guidance, 2009). As spatial information base for identification of landscape

elements, we use the map of the current situation of biotopes of Belgrade, which is part of the "Green regulation of Belgrade" and belongs to the official planning documents at the level of a city.

Table 1: Urban landscape elements classified in the Patch-Corridor-Matrix Model sorted by levels; according to Ahern (2007) and Green Infrastructure Guidance (2009).

Scale / ***Element***	***Region/ City***	***District/ Neighborhood***	***Individual sites/ Buildings***
Urban Patches/ Hubs and spots	• *Wetlands* • *Regional parks* • *River islands* • *Park forests* • *Forests*	• *Parks* • *Community gardens* • *Botanic gardens* • *Cementeries* • *Sportfields* • *Squares*	• *Vacant lots* • *Individual gardens* • *Green roofs* • *Terraces*
Urban Corridors/ Lines	• *Rivers* • *Canals* • *Riverways*	• *Drainageways* • *Roads* • *Powerlines* • *inner block lanes* • *tree alleys*	• *Green roofs* • *Individual trees* • *Vertical gardens*
Urban Matrix		• *Residental Neighborhoods* • *Industrial Districts* • *Waste disposal Areas* • *Commercial Areas* • *Mixed use Districts*	

(B) For the purposes of assessing the potential of urban areas (case studies), for application of GI components, we will use Forman's guidelines for landscape planning which recognizes the basic, so-called. 'Indispensable' patterns and their inter-relations: (1) a few large patches of natural vegetation; (2) major steam or river corridor; (3) connectivity with corridors and stepping stones between large patches; (4) heterogeneous bits of nature across the urban matrix. (Figure 1). These indispensable patterns are equally relevant in urban environments as they are in landscapes that are less dominated by human development and built infrastructure. Forman argues that these patterns are fundamental, for without them specific ecological functions will not be supported (Forman, 1995).

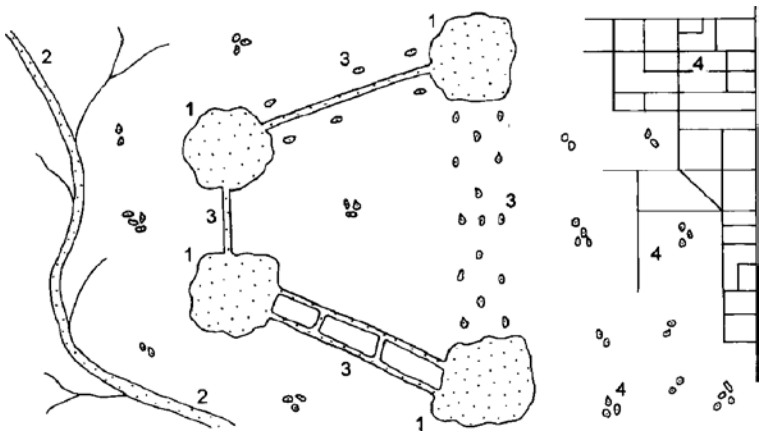

Figure 1: Top-priority ecological 'indispensables' in planning a landscape (Forman, 1995).

(C) In the analysis, we will pay particular attention to the importance and role of informal activities that produce 'bits of nature' greening elements within the urban matrix. According to Forman's guidelines 'bits of nature' are one of four essential patterns in the planning of the urban landscape. Bits of nature within the urban matrix plays a crucial role in ensuring a higher degree of connectivity of the entire urban landscape (Forman, 1995). These are a line or dot elements of GI at the local levels of neighbourhood/district and individual plots/object (Table 1).

All three listed phases involve the identification of the problem and the potential to achieve Forman principles of landscape planning concerning the presence of all the necessary components, and a spatial configuration that enables the necessary connectivity.

3. CASE STUDIES: BLOCK 45 AND SAVAMALA

Areas around the rivers Danube and Sava, with GI networks - islets, riverbank parks, foreland, lakes, ponds and wetlands that are located right next to them are called natural core areas of Belgrade (Belgrade green regulation 2003; City of Belgrade development strategy, 2011). The river Sava, as a green-blue corridor with

urban areas that are directly related thereto, is taken as a testing ground for the analyses of the possibilities for the implementation of GI. Two Belgrade urban areas dwelling on the banks of Sava River- New Belgrade's Blocks 45 and 70 and Savamala were selected for the case study. What is common for these two urban areas is their position in relation to the green core of the city and the city's main green and blue corridors - Sava River with its coastline (Figure 2). However, being related to two epochs of Belgrade's development that caused also their morphological differences, hence different problems in compatibility with functions of the city and its ecology (Sztumski, 2013).

This unique and comprehensive area of green and blue corridors is identified in the Master Plan of Belgrade (2003) as a “green core of Belgrade”, which includes the areas under the river courses of the Danube and Sava, with components of GI corresponding to spatial level of the region/city: river islands, coastal parks, forelands, lakes, ponds and marshes that are located right next to them. For now, strategies and plans at the city and local level do not recognize sufficiently the principles of GI planning, such as multi-scalability, relations structures of the processes, connectivity and ecosystem services. The importance of GI is identified/recognized the most in terms of its role in adaptation and mitigation to climate change, in the form of action plans. The city of Belgrade in early 2015 adopted the Action Plan for Climate Change Adaptation in which as a measure of the highest priority was listed the planning and implementation of GI networks throughout the territory of the city, based on the concept defined in the Green Regulation of Belgrade (2003). In this way, spatial and urban planning at the level of town and municipality gradually turns to the preferred ecosystem approach to planning. However, in order to successfully implement GI at the local level, regulations and plans must contain information on the structural and functional properties that green spaces must have in order to integrate with components of GI at higher spatial levels, in the case of Belgrade with its “green core”.

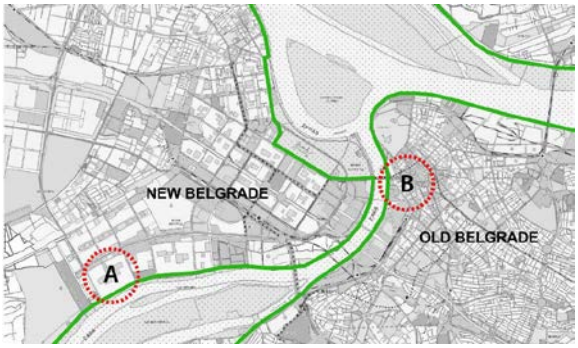

Figure 2: Position of block 45 (A) and Savamala (B) in relation to green core of Belgrade and River Sava.

3.1. Block 45

Block 45 is located in the municipality of New Belgrade, first among Belgrade municipalities across the surface of the intra-block greens (396.6 hectares). The block of 32,000 inhabitants occupies a strip of land on the left bank of the Sava River, implemented as a unique urban entity at the level of the extended local community. Despite the large projected areas dedicated to greenery (norm of 22m² of green space per inhabitant is required), it remains insufficiently defined and with no clear differences in relation to other areas for public use. Defining the public interest, i.e. public land and the area for new development, are becoming the key in urban planning of New Belgrade, as well as for reconstruction and differentiation of green spaces in the elements that make up the network of GI. The draft of a detailed regulation plan for blocks 45 and 70 in 2009. specifies new values which include, inter alia, "the preservation and improvement of the achieved high standards of living and understanding the emerging needs of the population." In terms of the development of GI, the Action Plan for Climate Change Adaptation (2015) provides for the development of a network of green corridors along the promenade Lazara Kardenasa that connects residents of the city with the Sava river.

Based on patch-corridor-matrix model and biotope map of Belgrade, we have identified the basic elements of the area in the territory (Figure 3a) on the basis of which we will identify the components of GI and their inter-relations using Forman's model. In the immediate surroundings of the block, on its west and east, there are five major patches (P1, P2, P6, P7 and P8) composed of potentially valuable biotopes extensively used and with rich structure (biotope map of Belgrade, 2007). According to their purpose, these are free public spaces covered with greenery (P1, P2, P8) or intra-block green areas (P6 and P7). Within the block, there are three patches small and medium-sized (P3, P4, P5) in potential also worthy biotopes with rich structure. Concerning the

purpose, these patches are intra-block greenery. Corridors in the area of the block (C1, C2, C3 and C4) can be divided according to their importance into broader city (C1, C2), local (C3, C4) and intra-block. Within the block, there are three intra-block corridors (C3, C4, C5) whose purpose is pedestrian communication and connecting the block with the main green-blue corridor (C1).

The block is halved into southern and northern part. There are 21 planned buildings in the southern half, lower levels from GF + 2 to GF + 4 in the form of semi-atrium houses opened and oriented towards the river. In the northern half, it was planned the construction of 45 high-storey buildings (GF+7 to GF+15). The northern and the southern parts of the block differ in the built form, primarily in the type of residential buildings – the northern part consists of freestanding skyscrapers, whereas the southern part consists of semi-atrium buildings with a smaller number of floors. This also caused the different configuration of greenery: in the northern part it appears in the form of smaller park areas, with a narrow strip of greenery around the building or smaller residual areas around playgrounds and parking lots; in the southern part, green areas are less fragmented and consist of smaller park areas and greenery surrounded by a semi-atrium form of building. The apartments on the ground floor of these buildings own a narrow strip of green area, which is private property, while the remaining majority is the public green area mainly covered with trees and bushes. Both urban matrixes of the block 45 have characteristic shapes bits of nature, which were created as a combination of the mentioned urban-morphological characteristics, as well as informal activities of greening initiated by dwellers. With informal activities, dwellers contribute to the impression that semi-atriums are a private or common space designed primarily for their needs. This informal greening transforms the semi-atrium area into very diverse and rich bits of nature (Figure 3c).

The matrix of the northern part of the block consists of 45 residential skyscrapers (GF+7 to GF+15) which are arranged in a chessboard pattern. The areas between the skyscrapers are fragmented and designed for green areas, parking lot, children's playgrounds and vehicular and pedestrian communication; the matrix of the southern part of the block, which consists of semi-atrium residential buildings oriented towards the river in north-south direction. Using Forman's criteria we are able to examine the potentials of the elements of the area to form a favourable spatial configuration of GI. The area in its immediate surrounding has several large patches of natural vegetation (Figure 3a, P1, P2, P7, P8) which, according to the structure of the biotope belong to 'complex, structurally rich fallow lands with mosaic arrangement of vegetation of different stages of succession' (biotope map of Belgrade, 2007). In the northern matrix of the block, informal greening is not as diverse as in the southern, primarily because of the high fragmentation of open areas due to dense and dispersed arrangement of skyscrapers and concrete areas, such as parking lots and playgrounds. Greenery is reduced to a narrow strip by the buildings and residual areas around parking lots and playgrounds. However, dwellers' interest in individual greening is equally high, it is mainly expressed through the cultivation of flowers and low bushy vegetation such as hedges (Figure 3b).

Above recognized bits of nature transformed by informal activities are of great importance for planning and design of future GI because it connects the levels of micro and macro, blocks with riverside areas and rivers, providing continuity of greenery. This is very important for the residents of the blocks because it provides continuous protection from high temperatures and sunlight, forming an integral space of rich biodiversity and connectivity of habitat for plant and animal species.

Figure 3a, 3b, 3c: Elements of GI (3a), bits of nature north urban matrix (3b), bits of nature south urban matrix (3c). (author: I. Simić)

3.2. Savamala

Savamala is the central urban area of Belgrade, which covers an area of the two city municipalities- Savski Venac and Stari Grad. It is located on a slope along the left bank of the Sava. Savamala is bounded in the east by street Gavrilo Princip, and in the west its natural border is the river Sava. The cutting of flux of people and greenery between the two lines - the Sava river and Karadjordjeva Street - proved to be a key issue in the development of Savamala. In recent years it became evident that there has been a resurgence of interest in this part of the city, since its degraded state is now perceived as a challenge for reactivation, especially in the civil sector, cultural and artistic circles.

Savamala is classified in plans as continuously built urban fabric, which consists of the traditional city block as the elementary unit (Master Plan of Belgrade to 2021). Along Karadjordjeva street, it is homogeneous and consists of GF+4 to GF+6 storey buildings which form a continuous street front. In the zone along the riverbanks, the urban fabric is discontinually constructed with a combination of low-rise city block and service and storage facilities. Regarding the planning treatment of green areas of Savamala at the local level, it is only partial. While it is recognized as an urban district, it extends over the territory of two municipalities. The part in the municipality of Savski venac is covered by Local environmental action plan (LEAP, 2010) which suggests "starting plans and projects related to the oldest urban part of Belgrade-Savamala" and launching "the current relocation plan of the railway station and repurpose of Sava amphitheatre." The plan is based on the projects "Belgrade green regulation" (2003) and "Mapping and evaluating biotopes of Belgrade" (2007), which established the concept of planning of green areas, which corresponds to the concept of GI, i.e. on biotope mapping, biodiversity and ecosystem functions which a network of greenery should take. LEAP defines the basic aims, among other things, the introduction of GIS (geographical information system) of green areas and "raising the modern forms of green areas such as 'pocket parks', roof and vertical greenery and others." (LEAP, 2007).

Based on patch-corridor-matrix model and map of biotopes of Belgrade, we have identified the basic elements of the area in the territory (Figure 4) on the basis of which we will identify the components of GI and their inter-relations using Forman's model. On the territory of Savamala we recognized six major patches (P1, P2, P3, P4, P5, P6), of which P2, P5 and P6 belong to the park greenery, P1 to intra-block greenery, P3 to square and P4 to greenery along the road. The structure of their biotopes is diverse: green areas under trees and shrubs less than 50 percent (P2, P6), a complex structurally rich fallow land (P4), green areas under trees and shrubs more than 50 percent (P5) and micro-complex mosaically arranged biotopes with the participation of built surface less than 50 percent (P1).

Streets have the corridor function in this densely built urban structure, and their green potential is reflected in the tree coverage percentage, water-absorbing areas and surface water drainage system. The main street corridor is Karadjordjeva Street (C1) with a wider urban character. The connection between Karadjordjeva street and the Sava banks is achieved by a network of smaller street corridors (C2-C7): Hercegovačka, Braće Krsmanović, Mostarska, Zvornička and Železnička streets. It should be noted that the railroad blocks direct contact of river corridors with the riverbanks.

Savamala urban matrix is characterized by a densely built structure of closed blocks, a high percentage of asphalt and other waterproof surfaces, which implies fragmentation and low diversity of biotopes. Bits of nature which are limited mainly to the areas within the block. However, there has been a recent trend of informal greening in the form of collective actions initiated by local organizations. Within Mikser festival "Blue-green dream" project is organized, which brings together the local community and professionals participating in the greening of public spaces, planting rows of trees, individual trees and placing of urban furniture for horticulture (Figures 4a, 4b). Public workshop on urban gardening “Zdravamala” (Figure 4d) was held within the "Spanish house" which is currently used as an informal public space (Zdravamala, 2014). The participatory workshop "My piece of Savamala" (2015), which addressed the new solution for free public space in Karadjordjeva Street, was held in the organization of "Mixer House" and "Urban Guerrilla". That public space has remained free after the relocation of the petrol station. This action has implemented a method of participatory design by involving various actors - the local people, experts in the field of urban planning, architecture, ecology and engineering, as well as city and local authorities (Figure 4e).

Figure 4a, 4b, 4c, 4d, 4e: Elements of GI (4a), "Blue-green dream" (4b, 4c), "Zdravamala" (4d), "My piece of Savamala" (4e).

(author: I. Simić)

4. CONCLUDING REMARKS

In this paper, we have investigated the possibilities of applying the concept of GI and spatial planning in the context of Belgrade and its built environment. The focus of the study was an implementation of GI at the local spatial level of neighbourhood/district and establishment of a connection to city/regional level, especially to river and riverbank as a major green-blue corridor. For the case study, we have chosen Block 45 and Savamala, two urban areas of Belgrade positioned right next to the riverbank and River Sava, as the main blue-green corridor at the regional / city level. Although in a similar position in relation to the river, these areas represent entirely different models of urban structure - Block 45 is representative of the "functionalist" model of the city, while Savamala is a typical traditional urban structure of the old city centre. These implied different conditions for the development of green spaces: Green regulation of Belgrade treated area of the block 45 as an integral part of the internal ring of greenery and green core, while Savamala is treated as a part of a continuously built urban area with the lowest percentage of green space. Because of these contrasting conditions in terms of green spaces, planning of GI at the local level requires different approaches. Therefore, the research put emphasis on the study of spatial context, the specific problems of urban structure that challenges actions of GI implementation.

Based on the ecosystem approach to planning, we have formed the theoretical framework where we defined the concept of GI, its elements and the possibilities for their application within the planning context of Belgrade. In case studies we have dealt with the identification and assessment of potential of existing green spaces to become a part of the future network of GI. Research showed that informal greening could take a very diverse spatial pattern, and it is different by the character of a private/public and individual/collective. As expected, two case studies have shown very different forms of informal greening, but it can be concluded that in both cases it plays an equally important role as bits of nature across urban matrix that increases the overall connectivity of urban matrix in relation to other elements of GI at the local level.

Block 45 is an urban structure with a high percentage of green and open spaces within the block, as well as the nature of similar patches in its immediate surroundings, which gives a great potential for the development of the necessary elements of GI. Object typology determines the type of urban matrix, as well as the type and level of informal greening. It recognizes the two types of urban matrix, south and north. North matrix, with free-standing skyscraper type of housing, has less diverse biotopes and more fragmented structure of green spaces around and between buildings. Informal green spaces are the result of individual or joint activities of tenants in the green areas related to housing. Tenants are self-organized and they modifying these areas by planting shrubs and flowers. South matrix, with greenery in the semi-atrium type of housing, brings intense informal greening of spaces that includes individual gardening on private plots, as well as planting high

vegetation in public green space. There is also an interesting phenomenon of "extension" of individual gardening to adjacent public space.

Savamala is a dense and intensively built urban area where parks are main patches, and streets are potential corridors of GI. Informal actions of greening spaces are substantially different in character than the one in block 45. The public spaces such as squares, urban pockets and surfaces along the roads have become the main available space for bits of nature. Unlike the block 45, the main initiators of informal activities in Savamala are locally based organizations. They are organizing inclusive projects and public participatory workshops involving experts, local residents and other stakeholders aiming to improve the environmental quality of public spaces. In urban matrix of Savamala, these public bits of nature are a key link in connecting all of the components of GI at the local level.

All of these processes, which are spontaneously initiated and mainly related to the informal level action, must be involved in planning strategies which would raise listed trends to a higher spatial and organizational level. Bearing in mind the necessity of immediate action which would alleviate the impact of carbon-intensive life and increase overall well-being, it can be concluded that the right initiatives targeting the local context show greater flexibility and efficiency, therefore their potential, particularly in the field of strengthening green infrastructure, have to be used intensively and coordinated with similar actions at city level.

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References

1. AHERN, J. 2007, Green infrastructure for cities: The spatial dimension, in: Novotny, V. and Brown, P. (eds.) Cities of the Future Towards Integrated Sustainable Water and Landscape Management. IWA Publishing, London, p. 267-283.
2. Action Plan for Climate Change Adaptation for City of Belgrade, 2015, http://www.beograd.rs/download.php/documents/Akcioni%20plan%20adaptacije%20na%20klimatske%20promene-srp.pdf (28 Apr 2016).
3. BENEDICT, M., MCMAHON, E. 2002, Green infrastructure: Smart conservation for the 21st Century. The Conservation Fund and Sprawl Watch Clearinghouse, Arlington, VA.
4. Blue-green dream, 2014, http://www.slideshare.net/NALED/the-story-of-mikser (28th Apr 2016).
5. City of Belgrade development strategy (CBDS) 2011-2016 [Strategija razvoja grada Beograda 2011-2016], 2011, http://www.beograd.rs/download.php/documents/SRGBpredlog.pdf (28th Apr 2016).
6. Detailed urban plan of blocks 45 and 70 [Detaljni urbanistički plan bloka 45 i 70], 1966, in: RS Official Gazette, no. 09/11.
7. EU Commission & Commission of the European Communities, 2007, Green Paper - Adapting to climate change in Europe – options for EU action, The European Parliament, Brussels.
8. EU Commission & European Environment Agency, 2006, Urban Sprawl in Europe - The ignored chalenge, EEA, Copenhagen.
9. FORMAN, R. 1995, Land Mosaics: The Ecology of Landscapes and Regions, Cambridge University Press, London.
10. GILL, S. E., HANDLEY, J. F., ENNOS, A. R., PAULIET, S. 2007, Adapting Cities for Climate Change: The Role of Green Infrastructure, in: Built Environment, vol. 33, no 1, p. 115-133.
11. Green Regulation of Belgrade [Zelena regulativa Beograda], 2003, http://www.urbel.com/documents/zelena_regulativa_beograd.pdf (28th Apr 2016).
12. Green Infrastructure Guidance, 2009, http://publications.naturalengland.org.uk/publication/35033 (10th June 2016).

13. IPCC WGII Fourth Assessment Report. 2005, Inter-Relationships between Adaptation and Mitigation, IPCC.
14. IRVINE, K. N., FULLER, R. A., DEVINE-WRIGHT, P., TRATALOS, J., PAYNE, S. R., WARREN, P. H., LOMAS, K. J., GASTON, K. J. 2010, Ecological and Psychological Value of Urban Green Space, in: Dimensions of Sustainable City, Future City 2, eds. Jenks, M. and Jones C., Springer, London, p. 215-237.
15. LAFORTEZZA, R., DAVIES, C., SANESI, G., KONIJNENDIJK, C. 2013, Green Infrastructure as a tool to support spatial planning in European urban regions, in: iForest 6, p. 102-108, http://www.sisef.it/iforest/contens/?id'ifor0723-006, [2013-03-05]
16. Local ecological action plan (LEAP) of Savski venac municpality [Lokalni ekološki akcioni plan gradske opštine Savski venac], (2009). URL: http://www.savskivenac.rs/ekoppt/2010-4.pps (28th Apr 2016).
17. Mapping and evaluating biotopes of Belgrade [Kartiranje i vrednovanje biotopa Beograda], http://www.urbel.com/documents/info20-tema.pdf (28th Apr 2016).
18. Master Plan of Belgrade to 2021 [Urbanistički zavod Beograda, Generalni Plan Beograda 2021], http://www.urbel.com/cms_images/gup1.jpg, (17th Dec 2015).
19. Millennium Ecosystem Assessment (MEA), http://www.millenniumassessment.org/en/index.html, (17th Dec 2015).
20. My piece of Savamala - City Guerilla [Moje parče Savamale - Gradska gerila], http://festival.mikser.rs/en/project/my-piece-of-savamala/ (28th Apr 2016).
21. PICKETT, STEWARD. T. A., CADENASSO, M. L., AND GROVE, J. M. 2004, Resilient cities: meaning, models, and metaphor for integrating the ecological, socioeconomic, and planning realms, in: Landscape and Urban Planning, no. 69, p. 369–384.
22. SZTUMSKI, W. 2013, Towards the Sustainability of Urban Development, in: Problemy Ekorozwoju/ Problems of Sustainable Development, vol.8, no. 2, p. 39-48.
23. TEOFILOVIĆ, A., CVEJIĆ, J. 2003, Zelena regulativa Beograda, Urbanistički Zavod, Beograd.
24. UN Habitat Global Report on Human Settlements. (2011) Cities and Climate Change: Policy Directions, Abridged Edition. London: Earthscan.
25. UNEP & UN Habitat, brochure. (2006) The Climate Change and the Role of Cities. UNEP.
26. Belgrade green regulation, http://www.urbel.com/default.aspx?ID=uzb_ZelenaReg3&LN=S (17th Dec 2015).
27. WILLIAMSON, K. S. 2003, Growing with green infrastructure. Heritage Conservancy, Doylestown, PA, USA, pp. 20. [online] http://164.156.7.76/ucmprd2/groups/public/documents/document/dcnr_002286.pdf (16th June 2016).
28. ZARĘBA, A. 2014, Multifunctional and Multiscale Aspects of Green Infrastructure in Contemporary Research, in: Problemy Ekorozwoju/ Problems of Sustainable Development, vol. 9, no. 121, p. 149-156.
29. Zdravamala, http://urbanincubator.org/portfolio_page/zdravamala/ (28th Apr 2016).Smith, J. J., 2010. Chapter title. Chapter 7 in Publication Name (Eds. A. A. Anderson, B. B. Bridgens and C. C. Conte). Wiley, Chichester. pp 139–164.

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TESTING GREENING POTENTIAL WITH GREEN ROOFTOPS OF INDUSTRIAL BUILDINGS

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ABSTRACT

Healthy and sustainable environment, both built and natural, is a paramount assignment for the professions of urban and architectural design. This paper examines the possibilities of improving the built environment through the introduction of new frameworks for designing and building industrial sites. Since the industry has been moved from the central city areas into peripheral zones, importance of distinguishing and high-quality design of the industrial facilities faded. Following the shifts in urban planning principles contemporary city is being compacted and this also has consequences on way of designing industrial complexes, making them compact too, oversimplified and banal, while reducing the building plots and increasing (maximising) occupancy index. This paper tend to examine the potential of contemporary industrial buildings for developing much greener and environmentally friendly facilities by building green rooftops. The rooftops of the industrial building, usually with flat or sight slope, are found appropriate for this kind of construction, while benefits may be found in improved thermal insulation, soundproofing and waterproofing. This paper demonstrated the possible scope of increasing greenery in urban areas by the industrial roofs built with green rooftops. We conducted the research in the urban area of Nis, analysing and discussing the size and indexes for newly built industrial zones in Nis. Numbers we have calculated for the city of Nis suggest that this kind of environmental intervention in building design and construction should be considered also at the planning level, which should consequently lead to binding codes for developers and investors.

Keywords: industrial buildings; green rooftops; city of Nis; industrial zones; occupation index, environmental awareness

1. INTRODUCTION

Industry and services are one of the main urban uses of the land in urban city areas. These category does not have high-level reputation regarding the human appreciation. Such places are not at the top-lists for the

favourite places in the city area, and rarely do they contribute the city image. For these reasons, the industry is not that much visible in the city and it is not what makes the cities distinct. However, it does not mean that industrial areas are marginal and irrelevant to the city, especially when comes to the discussion regarding the ecological matters. Still, since the industry has been moved from the central city areas into peripheral zones, importance of distinguishing and high-quality design of the industrial facilities faded. In the meantime, the shifts in urban planning principles and nearly discarded modernistic ideas of urban green belts and mono-functional zoning brought some substantial changes to the cities. (Carmona et al., 2003) This is particularly emphasized for former socialistic cities that, although densely populated, did not have a compact city form. Also, the presence of the industrial areas in the socialistic city was excessive too. For example, lands designated for industrial use comprised 44% of St. Petersburg, 32% of Moscow and 28% of Krakow; while the corresponding percentage for London and Paris was just 5 (Hirt & Stanilov, 2009). In the recent decades public green space has been shrinking, e.g. Sofia ''lost in transition'' some 30% of its public green space - it has been converted to private use. (Hirt, 2013) Contemporary city is being compacted and this also has consequences on way of designing industrial complexes, making them compact too, oversimplified and banal, while reducing the building plots and increasing (maximising) occupancy index.

Avoiding the discussion about the reasoning for the reduced quality of the working environment of the contemporary industrial complexes compered to their historical predecessors that could easily be found on in economy, this paper tend to examine the potential of contemporary industrial buildings for developing much greener and environmentally friendly facilities by building green rooftops. This kind of construction is not new or avant-garde, on a contrary, it is a traditional and originates from the folks builders, which strongly suggests that there is a substantial logic in this kind of construction. The rooftops of the industrial building are found appropriate for this kind of construction due to their usually large size and flat or shallow slope. Furthermore, beside the factual potential to build the green roof, this construction may be benefiting also due to improved thermal insulation but also soundproofing and waterproofing, which has been proved by previous researches. (Weiler&Scholz-Barth, 2009)

This paper demonstrated the possible scope of increasing greenery in urban areas if the industrial roofs are constructed with green rooftops. We conducted the research in the urban area of Nis, analysing and discussing the size and indexes for newly developed industrial sites in Nis that otherwise showed low level of environmental awareness. Additionally we compared contemporary image of industrial zones with the image of industrial zone in the country from mid-20.century as indicatory for typical modernistic era. Discussion emphasised that if we discarded modernistic concept of city as inefficient and inadequate, there must be an effort to make the city and its parts if not improved than at least at the same level of environmental and ecological awareness. We have put an effort to demonstrate that building green rooftops on the industrial buildings could be a great opportunity to contribute to the better and healthier environment, while in the same time benefits may be added to the building users and investors via reduced needs for usual thermal insulation, addition temperature regulation, reduced noise and better air quality. Although contemporary industrial buildings are usually over-simplified and above all rational, usage of green rooftops may be a mutually benefiting model for the improvement of both aesthetical and environmental qualities of the buildings and their surrounding area.

2. BENEFITING FROM GREEN ROOFS

Green roofs are considered as environmentally friendly constructions that has multi-factorial benefits for the urban environment. Over the time, green roofs are associated with both ecological but also with social significance. (Weiler&Scholz-Barth, 2009) What makes green roofs so desirable solution?

- Green roofs contribute to increment of green areas in urban areas. At urban level, green roofs means existence of the greenery on the areas already built and occupied by other uses. So, layering one use (in this case greenery) over another one (any utilitarian purpose), it is possible to accomplish both compact and densely used urban areas as well as to gain enough green areas within the city urban area which is considered important due to ecological but also aesthetical reasons. Balanced development of the urban environment that also integrates nature is a timeless need of the human society.
- Greenery contribute to the air quality and the micro-climate of the surrounding area. Due to the biological processes, the greenery effects on the oxygen presence in the air, but also, it could contribute in reducing the pollution (often toxic) and urban heat islands by reducing air temperature and inducing air masses movement.

- Green roofs are considered successful solutions for mitigation of atmospheric precipitations. Storm water runoff for the large scale roof areas could be in dangerous flood risk, but green roofs when equipped with additional retention systems could be very efficient for absorption of the excessive water. (Weiler&Scholz-Barth, 2009)
- Green roofs contribute to thermal insulation of the buildings. The composition of the layers of the green roof and their physical properties are considered as good thermal barrier. This composition contributes to lower levels of thermal energy transmission through the roof structure but also in this case the roof surface is protected of excessive heating, especially characteristic for flat and slightly sloped roofs due to exposure to the sun at all times (even in moderate climates variation in temperature of the roof surface can cover more than 70 degrees from morning till afternoon). (Weiler&Scholz-Barth, 2009)
- Green roof are also good sound absorber. This becomes relevant when it's compared to the real (economically advantageous) alternative roof solution made of lightweight roof panels made of metal sheets and expanded insulation material. This is particularly the case for industrial buildings and the workshops where lightweight metal panels are often in use.
- Greenery is the place of pleasant relaxation outdoor activities. Green roof as a form of the urban greenery, parkland, could be the place that people are happy to visit when they enjoy staying in the open space (which is a basic human need). Although green roofs could not offer a real experience of staying in nature, in the cases of the densely built urban areas, these small green oasis on the rooftops may be a fair offer first of all because of proximity to places of human basic activities – working and living.

To paint the picture of justification of the use of green roofs, many European municipalities, recently have mandated the incorporation of green roof systems as standard building practice. (Weiler&Scholz-Barth, 2009) But also, even without legislative mandate, there are numerous successfully built green roofs attesting the affinity of landscape architects, architects and their clients for this kind of structure that combines artificial and natural systems into one carefully designed and engineered building.

(a) (b)

Figure 1: (a) & (b) A photo-documentation of Ford Rouge Center near Dearborn, Michigane (source: https://www.greenroofs.com/) examples of application of green-roof systems on industrial buildings

Possible downsides of building a green roofs as former research and practice have showed are basically connected with increased levels of expenses for construction of such buildings. The cost rises due to increased loads for the roof structure but also for the construction of the green roofs structure. A side from the economy, building green roofs possibly induces higher demands for maintaining such surface as living organisms are planted on the place and it demands maintaining.

3. WHAT DEFINES THE CONTEMPORARY INDUSTRIAL BUILDINGS AND COMPLEXES TODAY?

Industry today is much different than even decades ago, but especially in comparison with its beginnings couple centuries ago. Following the technological advancement, industries evolved their built structures adjusting them to the needs that have occurred over time. The factory buildings have changed over time also influenced by the changes in paradigms of urban planning and creating and steering urban and built environment. Modern movement and modernism have made a huge impact on industrial buildings, while at the same time industry has influenced the modernistic architects. (Frampton, 1980) Hirt (2013) cited many researchers who advocated the theory that urbanization in the 20th century was dependent on two primary socio-economic trends: modernization and industrialization, so that the general model of 20th-century modern was industry-led urbanity. (Hirt, 2013) Today, modern movement is a past history and in contemporary times industries are relying on different beliefs and meanings (post-modern is term that some researchers use, but it

has a vague definition of meaning in this context). Since industrial complexes have been expired from central urban areas of the city by forming zoning rules rooted in Athens Charter, industries have been using benefits of enough unoccupied land that is available but as well a commodity of mono-functional zones. This in architectural term means, that industrial complex are mainly built as compact mega-block single-story buildings that maximally utilize available land, rationalise building costs but as well functional organisation of the industry (Everything is under one roof). Also this kind of building type, since placed in industrial zone out of frequent passers-by (roads and traffic lines are often designed as pedestrian unfriendly routes), often lacks of aesthetical quality due to lack of interest for the architectural distinction. Hence, the typical contemporary industrial building is designed as large-scale single-story building, its form is usually flat and wide while the roof surface is often the most prominent feature of the building. This is especially emphasized by the fact that industrial buildings are often seen from the distance, and usually from the higher floors of buildings in the neighbourhood or from elevated areas of the city, as industries usually take place at lower levels of the city, into the valleys. Furthermore, as post-modern period has brought the aspiration towards compacting urban areas, typical green belts around the industrial complexes that was promoted in modernistic time have been gone or maximally reduced. Higher demands for the available land, the need to expand traffic corridors, but also cleaner and advanced industrial technology all together contributed to this. In this way industrial zones and complexes become more densely built, lost surrounding greenery, while buildings are built simple and dull surrounded by 'vast sea' of asphalt and pavement needed to accept all the necessary motor-traffic.

(a) (b)

Figure 2: (a) A satellite image of the two newly built industrial sites in the industrial zone Donje Medjurovo (source: https://www.google.com/maps), and (b) Image of an industrial building in the industrial zone from human perspective (source: http://www.trimo-architecturalawards.com/en/submited-works-2012)

In the contest of the research topic of this paper, it is important to highlight a possibilities to apply a green roofs on the construction of the industrial buildings, firstly the shape, geometry and the slope of the roofs as well as the huge area of these otherwise plain industrial roofs are satisfying recommendations for applying the green roofs systems.

4. ABOUT INDUSTRY IN NIŠ

The beginning of the industry in the city of Nis may be found immediately upon the liberation of the Turks in the second half of the XIX century. However full-size of the industrial development in Nis occurred only after WWII. The development of the city has always been conditioned by the development of the industry and commerce, given the position and status of the city in a geographical and political sense. Today industry and commerce takes more than 17% of the urban and suburban areas of the city (rural settlements excluding). (data provided from GUP 2010-2025)

Table 1: Spreadsheet of the area in the city of Nis used for industry & commerce and green areas, excerpt from GUP 2010-2025

Construction area according GUP 2010-2025 (General Urban Plan)	*16 142,21 ha (100.0%)*
Business and industrial zones divided into several categories	*2462.94 ha (15.3%)*
Industry and services (building codes 'PG-22')	*167,66 ha*
Business, industry & commerce (building codes 'PG-23')	*1356,90 ha*
Business and commerce (building codes 'PG-24')	*914,57 ha*
Fair (building codes 'PG-24')	*21,81 ha*
Business centre in a sports facility (building codes 'PG-24')	*2.00 ha*
Greenery and open areas	*2536,36 ha (15.7%)*
Recreational area	*79,85ha*
Park	*318,70ha*
Park woods	*73,61ha*
Buffer zones	*2064.20 ha*
Assessment of the population in the city of Nis for 2025 according GUP 2010-2025	*253 642 inhabitants*

Over time the changes followed the world trends in building industrial facilities, so today it is possible to make a differences between industrial complexes built immediately after WWII and those one that belongs to the complexes built in last couple of decades. While earlier period is characterised by the city planning and architectural design principles that are characteristic for socialistic countries – some researchers described them with 'explicit pursue of a heavily ideologically-loaded spatial structure' (Hirt, 2013); the later one is characterised by the introduction of market economy that brought much different way of thinking into city planning but into architectural design, too. (Tosic, 2005) Actually the main differences that may be found between the industrial complex from previous periods and present one is in the way of utilising the available property and land. While the socialist development approach some researchers explained ideologically as concept ''big is beautiful'' (Andrusz, 1996), the current overall mechanisms of urban spatial production in East-Central Europe are very different from what we witnessed some decades ago and resources including land and property are distributed according to market principles. (Hirt, 2013) However, today the results from the both concepts are present in the city simultaneously, while the older one is being more-less successfully adjusted to the contemporary trends. From the point of view we discuss in this paper, it is crucial to recognize that former huge plots of industrial complexes from socialistic period allowed much greater presence of greenery on the site, but in the whole city too. In addition to this statement in the Table 2 is given an overview of the industrial complexes build in Serbia from 1945 to 1967.

Table 2: Analytical data of the industrial complexes in Serbia built 1945-1967

Industrial Complex	*Total area [m^2]*	*Area under buildings [%]*	*Area under communications [%]*	*Free area – greenery [%]*
Lightweight industries – textile industry				
Silk factory Zemun	*16 104*	*56.5*	*9.4*	*34.1*
Wool factory Paracin	*68 500*	*32.0*	*59.5*	*8.5*
Wool mill Vranje	*82 600*	*10.3*	*0.7*	*89.0*
Cotton factory Senta	*39 525*	*49.0*	*10.5*	*40.5*
Synthetic fibres factory Prizren	*108 000*	*38.0*	*7.0*	*55.0*
Spinning mill Pristina	*300 825*	*21.5*	*6.0*	*72.0*
Spinning mill Zemun	*134 600*	*45.5*	*7.9*	*46.6*
Textile factory Novi Pazar	*88 520*	*26.2*	*18.5*	*55.3*
on average:		*34.8*	*13.8*	*51.4*
Heavy industries – metal industry				
'Zmaj' Zemun	*340 000*	*29.0*	*10.0*	*61.0*
'27. mart' Novi Sad	*75 000*	*25.7*	*8.2*	*66.1*
'Potisje' Ada	*47 700*	*13.1*	*14.8*	*72.1*
'Gosa' Smedervska Palanka	*202 600*	*42.0*	*22.4*	*35.6*
Tool factory Pirot	*36 500*	*19.0*	*9.8*	*71.2*
'Pobeda' Petrovaradin	*149 250*	*16.2*	*9.2*	*74.2*
on average:		*24.2*	*12.4*	*63.4*
Source: V. Damjanovic, 1990				

An insight how in the present days industrial complexes are being regulated is given in a Table 3 that are showing building codes specified by GUP 2010-2025. As the Table 3 shows, unlike the practice from the post-WWII period (Table 2), contemporary industrial sites is possible to occupy up to 70%, while the greenery should be present at least at 10% of the site area while the green border line is obligated provided that greenery is not immediate surroundings.

Table 3: Building codes for the sites available for industry developing according to GUP 2010-2025 for Nis

Building codes	*PG 22*	*PG 23*	*PG 24*
Area under buildings	*Up to 70%*	*Up to 40-60% for industry Up to 70% for business & commerce*	*Up to 70%*
Building index	*Up to 2,1*	*0.6-1.2 for industry Up to 2,1 for business & commerce*	*Up to 2.1*
Border line	*6.0 m of greenery provided that contact zone is not greenery*	*6.0 m of greenery provided that contact zone is not greenery*	*3.0 m of greenery provided that contact zone is not greenery*
Greenery	*Min. 10%*	*Min. 10%*	*Min. 10%*

Analysing spatial distribution of the industrial area in the city of Nis, the plan (GUP 2010-2025) reveals that the industrial zones are organized around the large industrial complexes dating from previous periods (some even before WWII) showing that traditional industrial area in the city of Nis are not planned for the change of uses as it can be witnessed in some fast-developing cities all over the world. Surrounding agricultural land as a greenfield is added to these zones in order to increase the available land for industrial development. However, regardless of the origins of the industrial zones - brownfield or greenfield, the governing building codes are declared to be the same. That leaves the room for the old industrial complexes to be additionally built or rebuilt, mirroring in this way, by spatial utilization, newly built industrial zones in greenfield area. This particularly means the reduction of the extensive green area in old industrial sites that are positioned deeply (closer to the city centre) within the urban city area.

Table 4: Analytical data of the newly built industrial complexes in Nis

Industrial complex	*Total area [m^2]*	*Area under buildings [%]*	*Free area – greenery [%]*	*Additional constructions on site*
'Leoni', D.Tucovica, Nis	*80 727*	*30.3*	*37.4*	*Yes*
'Zumtobel', Suvi Do, Nis	*111 151*	*53.0*	*19.0**	*No*
'IMI', Niška Banja, Nis	*50 213*	*49.1*	*25.0*	*Yes*
'Johnson Electric', 3. Phase, Vazduhoplovaca, Nis	*26 644*	*59.0*	*10.0*	*No*
'Johnson Electric', 1.i 2. Phase, Vazduhoplovaca, Nis	*38 918*	*61.8*	*10.0*	*No*
'Yura Corporation', Donje Medjurovo, Nis	*40 840*	*43.3*	*23.4*	*No*
'Shinwon', Donje Medjurovo, Nis	*15 386*	*56.6*	*10.0**	*No*
On average:		*50.5*	*19.26*	
**** area included greened parking with turf grid***				
Sources: Officially adopted urban projects for the each site, available on https:// www.ni.rs				

In recent years in Nis has been built several industrial complexes that predominately occupied greenfield area. Table 4 presents the data regarding these complexes that are relevant for this analysis. These complexes are used to establish the general picture about contemporary industry in Nis (and Serbia as well) and their spatial production.

5. DISCUSSION

Balanced development of the city promoted in a current planning documents could be noted as the overall areas for business and industries is similar by the size as the green area in the city. These areas cover a bit more than 15% (each) of the total (buildable) city area (see Table 1) which give us the reason for the conviction that there is reasoning in the idea of making industrial sites more green via more contemporary and technologically advanced way and without compromising the area for the industrial buildings. With a bit more than 15%, Nis is in the middle group of the cities (Amsterdam 13%, Edinburgh 16%, Warsaw 17% - for more see: http://www.worldcitiesculturefo rum.com) according to the percentage of the greenery. Far less greenery have cities as Bogota (4.4%), Istanbul (2.2%), but also Paris (7.5%), Melbourne (9.0%), but at the same time London (33%), Moscow (54%) and Stockholm (40%) are more in advantageous position from this point of view.

Comparing the results from Table 2 and 4, it absolutely clear that greenery is been reduced systematically in the areas of industrial sites and zones within the city. This reduction is legitimate and it is approved by the current official planning documents (Table 3) that are following current paradigms in planning and urban theory partly discussed in chapter 3. The numbers, presented in Tables 2 and 4, show that, on average in Nis

and Serbia, the percentage of the greenery within the industrial sites are reduced for more than 30% of the whole site, while the percentage of the area under buildings on the industrial sites is increased for more than 30% of the whole site.

This reduction of greenery from 51.4% (lightweight industries in Table 2) to 19.26% (Table3) means that the greenery in current urban design plans for industrial sites is twice and a half times less represented than in former ones designed right after WWII. According to building codes (Table 3), this percentage is defined with requiring minimum of 10%, and as shown in the Table 4, this limit is very much exploited. Actually, the sites with displayed higher percentage of greenery are ones with planned additional buildings (expansions) on the site. Furthermore, there are cases where even minimal requiring percentage of greenery is designed as mixed-used – the area is both greenery and the parking lot with turf grid.

Similarly, if we compare 50.5% of the site under buildings in contemporary industrial sites (Table 4) with 34.8% (lightweight industries) or even 24.2% (heavyweight industries) in Table 2, it comes to the conclusion that the area under buildings is increased for a half or even doubled. This means that the area that was used once, today may be used for the industrial buildings twice larger than half century ago. This is also in accordance with current plans that limits the occupation of the site to 70% (Table 3). This theoretical framework is rarely exploited (Table 4), but occupation index under 50% may be seen only in the sites with already envisioned expansions.

With the greenery reduced more than twice and built area increased up to twice, the suggestion to use flat or slight slope roofs of the industrial buildings for the additional green space on the site is more than recommendable. For the purpose of the theoretical consideration Table 5 given bellow showing the percentage of possible increment of the greenery by using the green roof tops from the level of site (plot) but on the city level as well. The calculation is performed for all types of areas listed in the Table 1 since they belong to the similar building codes named PG22, PG23 & PG24 (Table 3) that are reserved for “big box” building types out of city central areas and reserved for business, production and commerce by the use. The values for the occupation index (area under buildings) and percentage of greenery is used from the Table 4 - the average values from the list, as realistic scenario, while the results would be much extreme if the calculation would be performed with theoretical values from the plan (Table 3).

Table 5: Theoretical calculation for additional greenery using green-roof construction for the city of Nis

	PG 22	*PG 23*	*PG 24*
Total area under given building codes [ha]	*167.22*	*1356.00*	*750.70*
Average area under building	*50.5% (within the all category limits)*		
Potential area under green-roof [ha] ** correction coefficient 0.9 adopted*	*76.00*	*616.30*	*341.19*
Average area under greenery	*19.26% (within the all category limits)*		
Potential area under regular greenery [ha]	*32.21*	*261.16*	*144.58*
Total area of greenery [ha]	*108.21*	*877.46*	*485.77*
Increment of greenery at the plot level [%]	*~ 336 %*		
Area under greenery at the city level (actual) [ha]	*2536,36*		
Area under greenery at city level (potential) [ha]	*4007.80*		
Percentage increase of greenery in the city	*~ 63.3%*		

This theoretical calculation, shown in Table 5, is showing that the area under roofs of industrial buildings is not minor in overall urban city area (buildable). Considering that newly built industrial sites are today in majority located on greenfield area, this means that by the realisation of the investment on available industrial sites by plan (GUP 2010-2025), all the greenery we are aware of in reality on these sites will be dramatically wiped out. In this context, building a green rooftops is a way of making continuity with the previous state is enabled and provided.

6 CONCLUSIONS

From the presented analysis we were able to draw the following conclusions:

- Today there is definitely far less green area that accompany the industrial buildings. Literally, industrial complexes is been constructed with required minimum of 10% of the total site area, also planned for additional uses (parking area) as well, which is highly not recommended for ecological reasons.
- Also, vast area of industrial rooftops in contemporary industrial complexes does not give much pleasant view for the distant (and elevated) watchers to whom they (rooftops) stay exposed due to shortage of around protective greenery (buffer green zones).

- The analysis in this paper has showed that by building green rooftops instead of conventional one, the increment of the overall greenery on the site is substantial (more than three times (336%) would be enlarged)
- Also, this analysis suggest that the overall area under greenery at the city level would be raised by more than a half (63.3%).
- Additionally, the quality and the form of the industrial structures would not be compromised by green rooftops as the majority of contemporary industrial buildings are being built blind (without zenith-light)
- Industrial rooftops are been easily recommended for green rooftops for usually flat and slight slope roof types
- Furthermore, industrial activities may be in benefit by this kind of roof structure because of the environmental and physical qualities, presented in Chapter 2, of the green rooftops
- Still, this kind of structure is definitely more expensive than conventional roofs, and this is obvious reason why there are still no evidence of its mass use.
- However, even with increased expenses for the construction (and even maintenance) the benefits may be factual and computable (increased percentage of greenery, reduced noise and thermal losses, improved air quality etc.), but also the benefits may be for the society in general with improved or just not violated city image and city ambience that is not easy to put into account, but not less important.
- For all this reasons, it may be recommended for the future planning and design considerations to put in a request to use a green rooftops when building an industrial facility.

REFERENCES

1. Andrusz, G. 1996. Structural change and boundary instability, in G. Andrusz et al. (Eds.) Cities after socialism: Urban and Regional Change and Conflict in Post-socialist societies, Malden: Blackwell. pp. 30-69
2. Camona, M., Tiesdell, S., Oc, T. & Heath, T. 2010. Public Places - Urban Spaces: The Dimensions of Urban Design, 2nd edition, (originally published in 2003) Routhledge
3. Damjanovic, V. 1990. Industrijske zgrade i kompleksi. 4. izdanje. Univerzitet u Beogradu, Gradjevinska knjiga, Beograd, Srbija
4. Frampton, K. 2007. Modern Architecture: A Critical History, 4th edition, (originally published in 1980) Thames & Hudson, London, UK
5. General Urban Plan Nis 2010-2025 (GUP 2010-2025), Institute for Urbanism, City of Nis, 2009. http://www.zurbnis.rs/ [Accessed: 1st July 2017]
6. Green Roofs, 2018. http://www.greenroof.com [Accessed: 5th September, 2018]
7. Hirt, S. & Stanilov, K. 2009. Twenty years of transition: The evolution of urban planning in Eastern Europe and the Former Soviet Union, 1989-2009. Nairobi: UN-HABITAT
8. Hirt, S., 2013. What happened to the (post)socialist city? Cities, 32(2013). pp S29-S38.
9. Tosic, I. 2005. City development in Central and Eastern Europe since 1990: The impact of the internal forces, in F. Hamilton et al. (Eds.) Transformation of Cities in Central and Eastern Europe: Towards Globalisation, New York: United Nations University Press
10. Urban Projects (adopted) of Industrial Sites, City of Nis, 2018. http://www.ni.rs/gradska-uprava/gradska-uprava-grada-nisa/sekretarijat-za-planiranje-i-izgradnju/ [Accessed 5th September 2018]
11. Weiler, S. & Scholtz-Barth, K. 2009. Green Roof Systems, Wiley, New Jersey, USA
12. World Cities Culture Forum, 2015. http://www.worldcitiesscultureforum.com [Accessed: 20th September, 2018]

THE IMPACT OF FLOATING HOUSING TO ENVIRONMENT

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ABSTRACT

The need for housing space in coastal and flooded areas is a challenge for architects to neutralize shortcomings with innovative solutions. The best solution for this problem is floating housing. In history, this type of housing had a defensive function, and today it is mostly a need or a type of luxury housing. This paper presents contemporary trends of floating housing, with an emphasis on the ecological aspect ie the influence of floating housing on the environment. Therefore, it is aimed at reducing energy consumption and applying modern methods and technologies for energy saving. The underwater drone monitoring method provided the results of a study of the impact of floating objects on water quality and the aquatic world in the environment. The aim of the paper is to highlight own interpretations related to the problem ie importance of floating housing and its impact on the environment by analyzing and studying the cases. The main contribution of this paper should be a proposal for possible solutions in the design process of floating housing.

Keywords: floating housing; environment; energy saving; technologies

1. INTRODUCTION

Considering some of the modern examples of floating houses, we will surely recall one of the first forms of organized housing, which, according to its design and organizational characteristics, has many similarities with today's forms of floating housing. These are pile-dwellings, whose accommodation, form and organization emanated from different needs than today's floating houses, but in both cases there are practical reasons that have generated this kind of housing [1]. There are many countries that have problems with building land, so they see one of the alternative options in floating housing. The research methodology involves analyzing the projects of floating settlements in the Netherlands. The reason for the selection of two examples of floating settlements in the Netherlands are the problems that this country faces due to the rise in sea levels and the growing shortage of building land. The Netherlands is a country that can be a role model in addressing this problem to other countries that are struggling with these challenges. The underwater drone tracking method provided the results of a study of the impact of floating objects on water quality and the aquatic world in the environment.

The main issue of research work relates to the principles of construction and operation of housing on the water, indicating, above all, the tendency to reduce energy consumption and the use of modern methods and technologies for energy savings [2]. It should be noted that besides ecological, floating houses have a positive impact on the psychological aspect of housing. Living near an untouched nature means being surrounded by beauty that enriches life in a way that most apartments and houses do not provide on land.

2. MODERN TRENDS IN FLOATING HOUSING

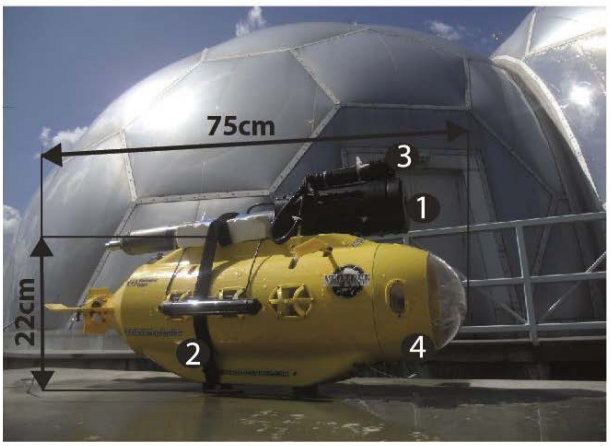
The country which is an necessary part of today's ideas about the development of floating housing for very practical reasons is the Netherlands. Considering that the sea level is constantly rising as a result of global warming, it is clear that this country will increasingly struggle with water. Instead of many years of resisting and fighting against water, ideas appear to adapt to existing conditions and try to live in harmony with water. As a result of such ideas, floating housing appears as one of the most logical solutions to the mentioned problem [3]. Recognizing the growing shortage of building land, Dutch construction companies are beginning to build floating houses. Houses are made of wood and lightweight materials floating on platforms, interconnected with trails, and can be separated from the surrounding neighborhood as a separate unit (Figure 1b). The ideas of floating housing are further developed with the goal of colonizing the sea. There are predictions that in 2050. will start establishing of building floating cities, so the world could become much different from what we know today (Figure1a).

a) b)

Figure 1. a) Forecasts of the future of floating cities, b) Floating housing, The Netherlands [11]

3. EFFECTS OF FLOATING HOUSING ON ENVIRONMENT

The monitoring of water quality under floating objects was difficult until now due to poor access to water surfaces below the objects. In this research project, the underwater dron on remote control (Thunder Tiger Neptun SB-1) equipped with water quality sensors and video camera (Figure 2), was used to perform the measurement of dissolved oxygen under and around floating buildings / platforms [2]. Dron monitors several water quality parameters, such as pressure (depth), temperature, conductivity, the presence of nitrates, ammonium, dissolved oxygen and turbidity. In addition to sensor data, the underwater dron also collects footage video of the underwater world, used to estimate ecology and underwater habitats near floating objects. Data were collected from several different locations throughout the Netherlands, from July to October 2014.



Attached Equipment:
(1) In-situ TROLL 9500 Sensors:
- Nitrate and Ammonium ISE
- Rugged Dissolved Oxygen

(2) CTD Diver :
- Temperature
- Pressure
- Conductivity

(3) Diving light
(4) HD Video Camera (GoPro 3+)

Figure 2. The underwater drone with the attached equipment (near the Floating Pavilion, Rotterdam) [8]

3.1. Monitoring the impact of floating objects using an underwater drone

During the measurement, the underwater dron was guided in accordance with floating objects, where it collected water quality data from sensors. As a control, the data are also collected from the open sea zone of the same aquatic surface. To ensure that the blockage caused by the floating object has no effect on these measurements, measurements on the open sea are taken at a distance of at least 8 m from the floating platforms. Figure 3 illustrates these procedures and measurements from locations [4]. Dron monitoring is mainly based on videos (dry and underwater) and information recorded in the logbook. The depth is recorded by the pressure sensor (CTD diver).

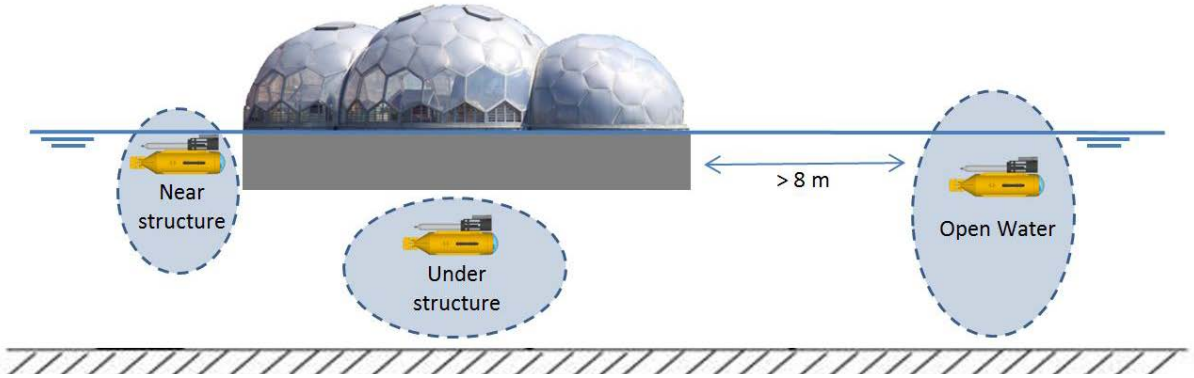


Figure 3. Schematization of the zones of collection of data (Floating Pavilion, Rotterdam) [8]

3.2. Influence of floating objects on water quality

The results obtained in this paper focus on the analysis of dissolved oxygen. This is one of the parameters most endangered by the presence of floating structures, due to covering the surface of the water, and the consequent influence on air-water interactions [5]. For the purpose of analysis, given that water quality parameters vary under floating structures, the measured data are divided into depth domains, and then the averages are calculated for each depth (Figure 4). This made it possible to evaluate and compare results from different depths and zones, and evaluate the effects that a floating object can cause. Figure 4 shows that the concentration of dissolved oxygen is always slightly below the floating structures, than on the open sea at the same depth.

An analysis of the minimum oxygen concentrations found under floating structures is also of great importance, because it allows to see if the acceptable levels of oxygen for the aquatic world are maintained at all times. Figure 5 presents these minimum values of dissolved oxygen, both in the open sea and under floating objects at different locations [6]. It can be noted that, despite achieving a lower value below the structures than on the open sea (8 m away from the structure), the concentration of dissolved oxygen remains within the range of 6 to 9 mg / L at most sites. This range is higher than the conventional concentration of reference dissolved oxygen that protects the normal aquatic world in fishponds and water bodies of about 4.5 mg / l (for example, Alaska, 1979, Ontario, 1977) [7].

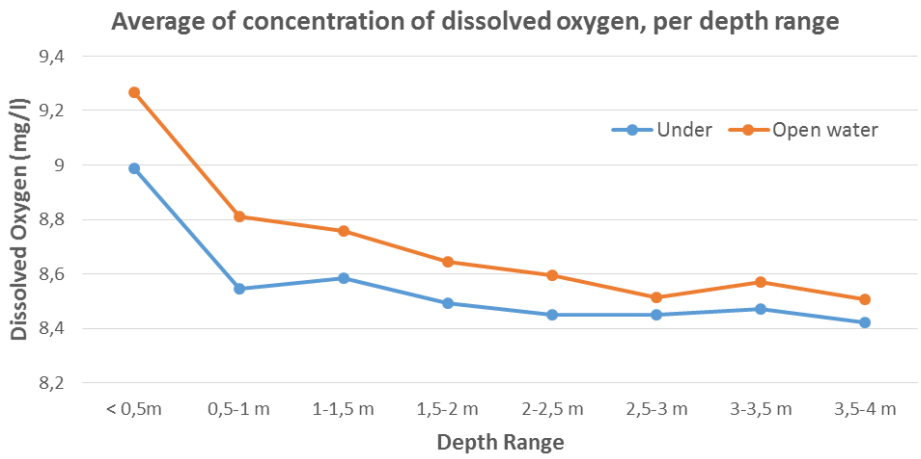


Figure 4. Comparison between the averages of the concentration of dissolved oxygen under/near floating structures and in open water, per depth range (Floating Pavilion, Rotterdam, 13 August 2014) [8]

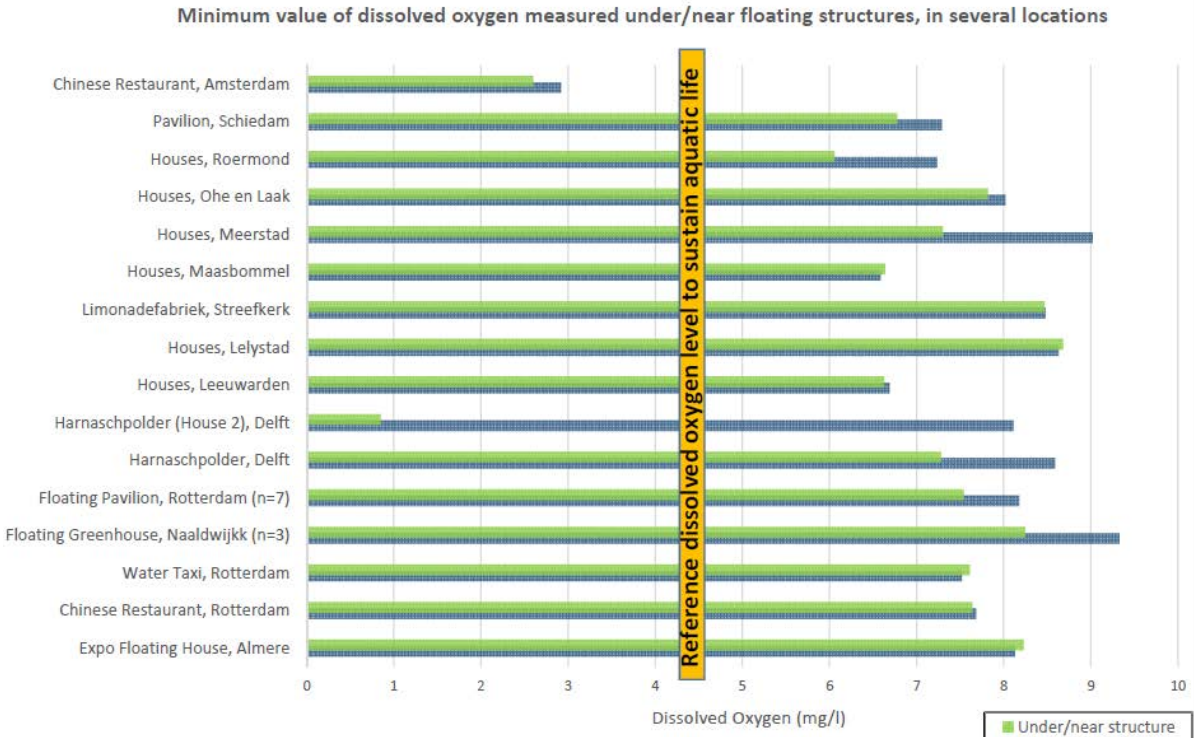


Figure 5. Comparison between the minimum concentrations of dissolved oxygen detected under/near floating structures and in open water, per location [8]

3.3. The impact of floating objects on the water world in the environment

On the basis of underwater images, it was possible to identify several types of fish that swim under and next to these floating structures, along with many other organisms adhering to structures (eg, dreissenid mussel). Floating structures are attractive for zooplankton and Misidae (Neomises spp). The presence of these fish and other aquatic species in interaction with these structures can be considered a good indicator of water quality. The underwater footage is a clear insight into what is happening under the floating structure. It was noticed that a completely new habitat was created, which was not previously present.

Figure 6. Examples of underwater footage with aquatic life under floating houses in Maasbommel and Lelystad (NL) [8]

Revealed differences in the concentration of measured water quality parameters (eg dissolved oxygen) between the open sea and below / near the structures are low, and most of the parameters remain at an acceptable level. As for ecology, the underwater video reveals a multitude of aquatic organisms associated with these structures (such as shells) and fish that swim below them (Figure 6) [8]. This shows that, if they are well-designed, floating structures can stimulate water life and biodiversity around these structures, creating new habitats and providing shelter for smaller and younger fish, so they have a positive impact on the environment. Moreover, it can be concluded that underwater drons show high potential as a water quality monitoring tool, since they can easily reach zones with a limited access for data collection, which would otherwise be expensive or even unsafe to perform (for example, divers).

3.4. Sustainable Water System for Floating Objects

An efficient water management strategy can be expanded to the area of using water occupants of floating objects. In this case, the objects use clean water as the input component and produce wastewater as the outlet. Rainwater is a resource that is often not used - instead it mostly turns into wastewater in combined sewage systems. However, rainwater can be used for many purposes. In the sea, in particular, rainwater can be an important source of fresh water. If the rainwater is not collected, fresh water should be imported or produced by the desalination of seawater. For these reasons, collecting and storing rainwater in areas in the open sea should be ensured.

In warm and humid climates, dry and rainy periods usually change. In order to ensure the use of rainwater during dry months, adequate rainwater storage should be provided. In the open sea, rainfall can be collected using roofs of buildings and floating platforms, and stored in flexible reservoirs. The rainwater can be treated and used for cooking, drinking and showering. After use, water could be collected in another reservoir for "gray" water. "Gray" water is not suitable for drinking, but if it is adequately treated, it can be used for washing machines and toilets. While water used for washing machines returns to a gray water reservoir, wastewater from the toilet can be used as a free source of nutrients for algae. When wastewater is pumped into OMEGA floating bioreactors, ejected nutrients for algae and clean water are slowly discharged into the sea (Figure 7) [9].

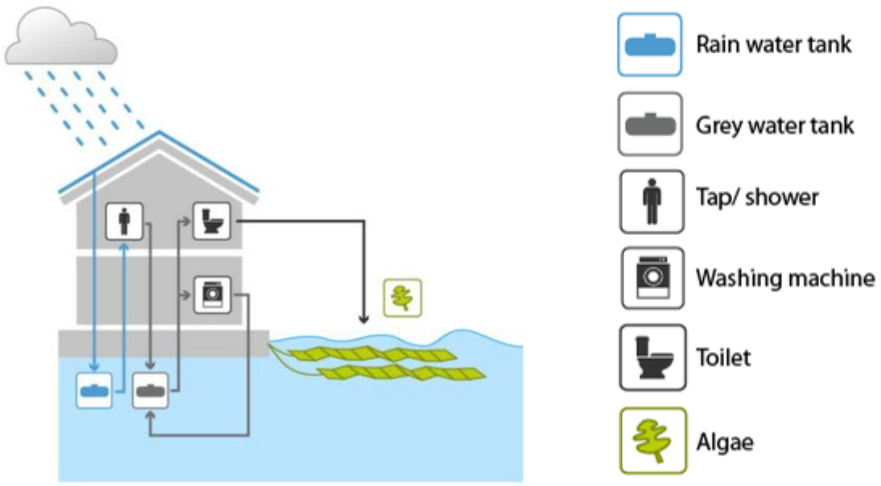


Figure 7. Sustainable water reuse system (DeltaSync, 2013) [9]

4. EXAMPLES OF MODERN FLOATING HOUSING

For the purpose of the analysis, the paper presents examples from the field of floating housing whose construction is in accordance with the environment and contribute to sustainability and energy saving.

4.1. A floating settlement on the periphery of Amsterdam

Ooms Bouwmaatschappij Company has built the first eight of the planned 500 floating houses on the periphery of Amsterdam (Figure 8). Houses are designed to withstand wind blows, and can be located up to 100 meters from the shore. Houses are built on floating platforms of wood and light materials, and are interconnected by trails. Initially, houses are divided into clusters, but there is a possibility to separate the house from the surrounding neighborhood and individually move to another place [10].

The possibility of house floating creates a sense of freedom, independence from place of residence, the possibility of shifting the whole house, which is much more interesting than moving. However, although the water calms down people and creates very nice visual effects, when one comes out of the house all around the person is water that again limits it in this way.

Figure 8. Floating estate, Amsterdam, The Netherlands [10]

4.2. Citadel - a floating complex of housing, Netherlands

This project is part of a development program called New Water, which goes a step further in the technological sense, using water for cooling of apartments, thus achieving 25% energy savings in comparison to conventional buildings on land. Designed for developer ONW/BNG GO, The Citadel is a flotilla of apartments in one modern luxury development. The project will consist of 60 units in a high density arrangement (30 units per acre of water) (Figure 9).

Part of the project means halting some flood defenses and letting the water back in. Olthuis points out that Holland has as many as 3,500 polders (patches of low-lying land that are protected by artificial dikes) which are below sea level and kept dry by pumping water out 24/7.

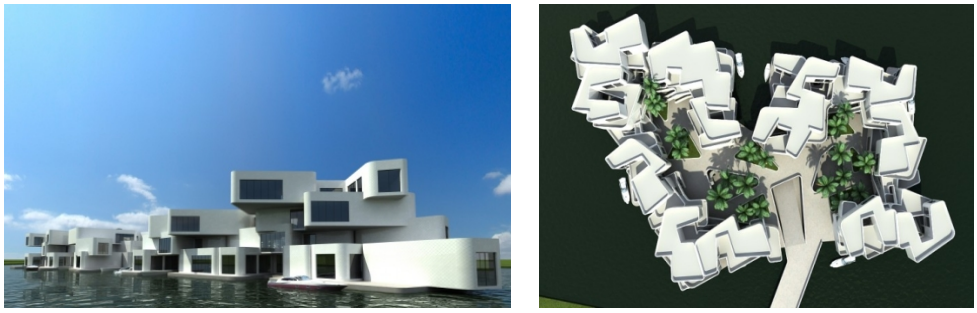


Figure 9. Project New water, floating complex; The Netherlands [11]

This new development, dubbed New Water, will essentially be re-flooded after centuries of being kept artificially dry. Lightweight construction on top of a main deck and easy connections to land are part of the program designed to deliver the same level of comfort as in a high-rise building. A large, heavy, floating concrete caisson provides the foundation, which also contains the car park, and will support the apartments. These will consist of 180 modular elements, all arranged around a central courtyard.

Construction will take place in a temporary dry dock. When construction is completed, explains Olthuis, the pumps will stop and the site will flood. Once the site has been "depolderized," the Citadel will float in 6 feet of water, which will later rise to 12 feet in depth. A floating bridge will connect the Citadel to the mainland, allowing residents and emergency vehicles access. The architects maintain that due to the large size of the overall concrete caisson base, which is 240 x 420 x 9 feet in size, residents will not be able to detect any water-related motion [11].

Sustainability is an abiding concern, though the Citadel does not seem to have yet committed to the full range of technologies. The facades will be clad in aluminum, as its longevity and low-maintenance requirements were found to outweigh its energy costs. Greenhouse units and green roofs will be part of the environment but it is not yet clear how extensive these will be. Energy saving methods and technology are estimated to make consumption for the Citadel 25 percent less than that of a conventional building on land. Not surprisingly, all of the apartments will have water views and most will have their own berth for a small boat. The Citadel is part of a larger development that will be built in this depolderized zone of New Water, which will eventually have 6 such floating apartment buildings (Figure 10).

Figure 10. Urban plan, New Water [11]

5. CONCLUSION

The example of the Netherlands illustrates how the ideas of floating housing develop simply because of the lack of ground. The development of building technology has made significant progress in this area, and today there are many examples of floating housing, as well as entire settlements, and in the near future are predicted large city floating complexes. Analyzed examples from the field of floating housing in Netherlands show that construction can be in accordance with the environment and contribute to sustainability and energy saving. Based on research results, it can be concluded that the construction in accordance with the environment does not impair its quality and biodiversity. Throughout constructing and using floating objects there is no devastation of the aquatic environment, and water quality and life of the water world is not disturbed. Also, a water management system for such objects has been successfully solved. Floating houses may be the need of tomorrow in coastal areas and flood-prone areas around the world, therefore, engineers, architects and researchers must have the capacity to design and build such houses in order to realize the future needs of the population.

ACKNOWLEDGEMENTS

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REFERENCES

1. Vasilevska, Lj., 2000. Uvod u urbanizam. Građevinsko-arhitektonski fakultet, Niš.
2. Boogaard, FC., Graaf, R. De., 2014. Kennis en marktontwikkeling drijvend bouwen-Effecten drijvende constructies op waterkwaliteit.
3. De Graaf, R., 2012. Adaptive urban development, 1st edn. Rotterdam Unversity Press, Rotterdam.
4. Liu, Y. And Sun, D., 2011. Biologically Inspired Robotics. CRC Press, Boca Raton, FL, USA. 340 pp.
5. Hartwich, H., 2014. Preliminary study for an environmental impact assesment of foating cities. Potsdam, Germany: University of Potsdam. 55 pp.
6. Howe, C., Anton, B., Philip, R., Morchain, D., 2011. Adapting Urban Water Systems.
7. Ji Z-G (2008) Hydrodynamics and water quality: modeling rivers, lakes, and estuaries. John Willey & Sons, Inc.
8. Kitazawa, D., Tabeta, S., Fujino, M., Kato, T., 2010. Assessment of environmental variations caused by a very large floating structure in a semi-closed bay. Environ Monit Assess 165:461–74. doi: 10.1007/s10661-009-0959-9.
9. Lima, R., Sazonov, V., Boogaard, FC., et al., 2015. Monitoring the impacts of floating structures on the water quality and ecology using an undewater drone. IHRA World Congress.
10. www.seasteading.org/**floating**-**city**-**project**/ [Accessed: 3st July 2018]
11. http://www.ecoboot.nl/artikelen/floating_houses.php [Accessed: 3st July 2018]
12. http://www.arhitekton.net/prosirenje-teritorije-territorial-expansion-water-studio-2/?lang=sr [Accessed: 9st July 2018]

POTENTIAL OF THE SOUTH SERBIA IN RENEWABLE ENERGY SOURCES AND THEIR EXPLOITATION

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ABSTRACT

Renewable energy sources (RES), in the developed countries of Europe and the world, are slowly but surely taking the primacy in use compared to conventional sources. Limited capacities of fossil fuels, coal, oil, natural gas and their very detrimental effect on the environment have been made to think about energy sources in a different - more alternative way. In order to meet all the human energy needs that are growing each day, more and more money is being invested in the construction of plants for the production of energy from renewable sources. The benefit is substantial: the consumption of fossil fuels decreases, the environment is protected, and the emission of harmful gases is reduced. Thus, the EU began to implement a global action to mitigate the dangers of using fossil fuels and committed itself to reducing the total CO_2 emissions to the environment by all means available. As urban areas are far more demanding consumers than rural areas, many cities in Europe have adopted measures regarding the use of RES that has been in place for years. Thus, the city of Niš in 2014 also adopted the Sustainable Energy Action Plan (SEAP) of the City of Niš. The aim of this paper is to present the potentials of southern Serbia in renewable energy sources and their exploitation with the specific focus to demonstrate how the energy produced in this way may contribute in more environmentally friendly development of the city.

Keywords: renewable energy sources, South Serbia, potential, clean energy, ecological awareness

1. INTRODUCTION

The majority of countries around the world will face serious energy shortages in the near future. The high demand for electricity and heat, as well as the increase in the number of inhabitants in the world, lead to a critical available quantities of fossil fuels. Consequently, many countries will force their economies to be orientated towards strategies of the use of renewable energy sources. Combustion of fossil fuels, especially those based on oil and coal, is the main cause of global warming and the increase in CO_2 emissions in the atmosphere. All these changes that directly affect the Earth's ecological system can affect the reduction of dependence on coal use and encourage the development and use of renewable energy technologies. Due to the large global problem (a deterioration of the Earth's eco-system and the less controlled consumption of fossil fuels), the promise and assumed responsibility of the EU to increase the share of renewable energy sources in electricity production by 20% by 2020 relative to 2010 (EU "ENERGY 2020"). Many documents have been created and adopted on this topic that invite and bind the responsibility of all EU member states. The planet Earth is the only one and we have to unite the forces to preserve it, for the benefit of all its inhabitants and future generations. As Serbia is part of the world, it have to, in accordance with its capabilities, economically, primarily contribute to environmental protection and reduced consumption of fossil fuels and to the increased use of renewable energy sources.

2. RENEWABLE ENERGY SOURCES IN THE TERRITORY OF SOUTHERN SERBIA

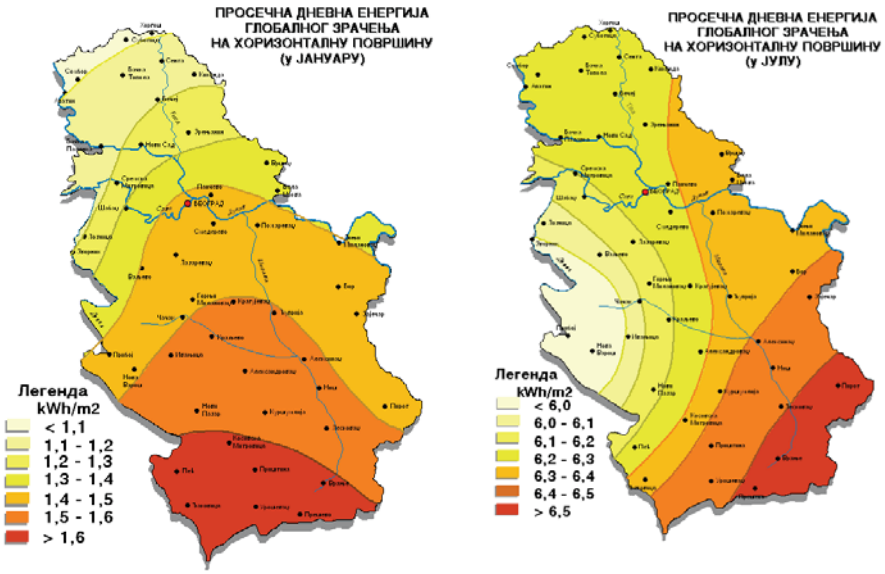
By definition, renewable energy is energy that is exploited at the same speed as it is naturally renewed. Renewable energy sources are all non-fossil origin, which are:

- Sun energy
- Wind Energy
- Biomass
- Geothermal energy
- Hydropower
- Waves and tides.

The Republic of Serbia has no access to the sea so that waves and tides, as renewable energy sources, cannot be its natural potential in generating energy from these sources.

2.1. The Energy of the Sun

The sun is a great source of energy. According to an estimate, the capacity of solar energy is about 14,000 times greater than the total energy consumed by humanity today. The use of this energy as a source of energy requires the fulfilment of many preconditions for it. The economic and technological development of the state is crucial in the choice of using this energy source as well as the geographical position of the state. In Serbia, the number of sunny days, according to the data provided by the Ministry of Energy, is higher than 2000 hours annually. However, although this is much more than in many European countries, this potential is still not fully exploited in Serbia. The reason for this is the high price of the receiver of solar radiation and accompanying equipment (Jankovic V. 2004). In Serbia, this system, so far, is used exclusively for the production of heat energy, so its application is on individual residential buildings and tourist facilities just for heating the water. In the territory of southern Serbia, Niš, Kuršumlija and Vranje have the greatest potential of this renewable energy source (Figure1).

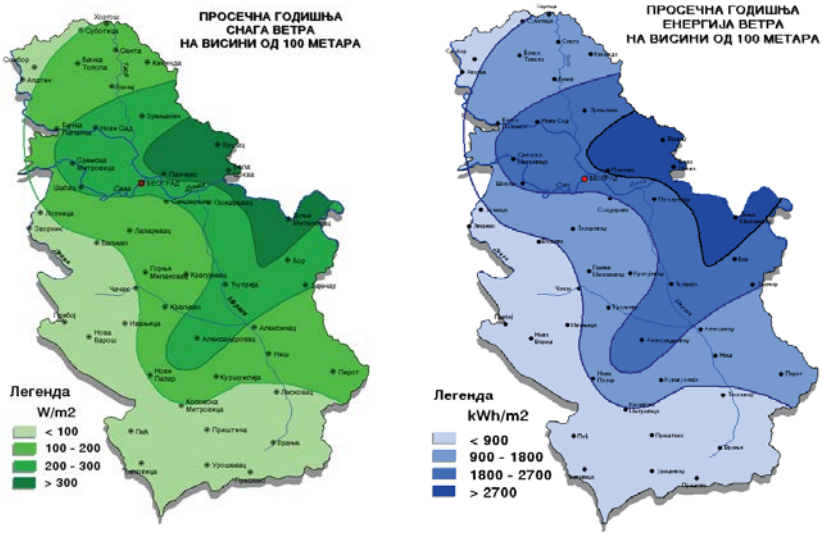


(a) (b)

Figure 1: Average Daily Energy of global solar radiation on a horizontal surface [kWh / m^2] in the territory of Serbia (a) in January (b) in July
Source: energetskiportal.rs

2.2. Wind Energy

People has served the wind power since ancient times, initially for the launch of sailboards, in the mills for the grinding of grain. The windmills also played the role as a water pump and for many other purposes. Today, the wind as a renewable energy source is used for the production of electricity (Wagner, Mathur, 2013.). The use of wind energy in Serbia is at a very low level. Extremely windy areas in Serbia are in Vojvodina, above all, mountain areas of southern and eastern Serbia (from 100 to 1500 m above sea level). However, as wind generators start to operate at a wind speed between 3.0-5.0 (m/s) and the highest average wind speed in southern Serbia is 1.4-3.10 (m / s), (Figure 2) it is concluded that this part of Serbia has no potential in this renewable energy source. Any investment in wind generators for the production of electricity in this area would not be profitable.



(a) (b)

Figure 2: Average annual values a) wind power, b) wind energy in Serbia at a height of 100 m above sea level [kWh/m^2]
Source: energetskiportal.rs

2.3. The Energy of the Biomass

The potential of the biomass energy is very large and accounts for about 80% of the total potential of renewable energy sources. Biomass is defines as a biodegradable part of the remains of biological origin (plants and animals) as well as the biodegradable part of industrial and municipal waste (Jordanović, Jevremović, Vasić, 2012). Biomass is a carbon-neutral renewable energy source that is constantly available in eco-systems. It come out from wood (timber remains) or agricultural. The timber biomass is created during the felling of forests or industrial processing, while agricultural crops leave the crop residues or liquid manure from animal farms (Henning, Mardsjo, 2010). Combustion of biomass yields heat energy that was used up until recently for heating and heating water, but today it is used for electricity generation. For energy purposes, biofuel is also used, which is caused by the transformation of biomass into the liquid state, as well as biogas which is degraded biological waste in the gaseous state. Serbia is extremely rich in arable land and forests, so its potential in biomass is significant. The available quantity of wood, which is mostly represented in central and southern Serbia, amounts to 1.53 million tons of oil equivalent. Agricultural biomass is available mostly in Vojvodina and its potential is estimated at around 1.67 million tons of oil equivalent, but the utilization rate is not more than 2%. Despite the rich biomass resources, taking into account its biodiversity and its distribution, it is not sufficiently used in Serbia for efficient energy generation. In the south and east of our country, the wood mass is primarily and uncontrolledly used as a wood for heating. Such use of wood could be much better utilized. In the specialised facilities, this biomass could be used simultaneously for the generation of heat and electricity. One of the most advanced plants for obtaining combined energy is CHP (Combined Heat And Power). While in other similar plants, the primary fuel utilization factor is from 30 to 40%, in CHP plants it reaches more than 85%. Waste thermal energy, in the form of steam or hot water, released during the electricity generation process is used for the needs of the technological process or for heating the space. This saves significant savings in the total cost of the plant. The CHP plant has a wide range of applications (wood industry, dryers, breweries, dairies, food industry, etc.).

As far as southern Serbia is concerned, on the basis of the data on the domesticated livestock and the raw materials on herbal base as resource for the production of biogas, it can be concluded that this part of Serbia does not contribute much in the total utilization of this renewable energy source (SEAP 2014). However, as the Government of the Republic of Serbia has defined as one of its strategic goals to increase the production of electricity from renewable sources, the current situation may change in the shortest possible time.

2.4. Geothermal Sources

In the Republic of Serbia, according to the Ministry of Energy, there are several hundred wells with geothermal water. The total potential of these sources is estimated up to 5 times higher than achieved. Otherwise, the potential of this resource is 185,000 t equivalent oil. Judging by potential, Serbia belongs to the richer countries of the region. The reason for the poor exploitation of geothermal resources in Serbia is unsystematic approach in exploration and preparatory works, as well as inadequate incentives for the use of this energy source. Territories in Serbia are built of hard rocks, and due to such favourable hydrogeological and geothermal characteristics in Serbia there are about 160 geothermal water sources with a temperature of more than 15°C. The warmest sources are in Vranjska Banja with a water temperature of up to 96°C, which makes it the hottest spa in whole Europe. The total yield of all natural geothermal sources is about 4000 l/s. And the total amount of heat accumulated in geothermal water reservoirs in Serbia, at a depth of 3 km, is about 2 times higher than the equivalent thermal energy that would be obtained by combustion of all types of coal from all the sites in Serbia. Unlike other renewable energy sources, geothermal energy does not depend on the season, the weather conditions and the time of the day. The biggest "drawback" of this energy source is the high cost of investment. Return of invested funds in the construction of a power plant for the production of electricity from geothermal sources are guaranteed, but with the delays from 2 even up to 20 years.

The geothermal sources on the territory of southern Serbia are present. Only in the vicinity of Nis there are several: in Niska Banja, Banja Topila, Ostrovica and Miljakovac. Still, all these sources are with relatively low water temperature (up to 60°C, in Niska Banja 35,5°C), which is still uneconomic for developing the large facilities for the production of heat and electricity. So far, these geothermal sources are used for heating smaller objects for different purposes and for the purpose of treatments. In Niska Banja, thermal pump with the power of 5MW are using thermal waste water with temperature of 25°C for heating the hotel and the rehabilitation centre.

2.5. Hydro-energy

The Republic of Serbia is extremely rich in water. Hydropower is the most important renewable energy resource in Serbia (SEAP 2014). About 10.4% of the total energy potential is found in watercourses where small hydropower plants can be built. Hydroelectric energy is obtained through two phases. In the first phase, the potential energy of the water mass drives the hydraulic turbine and turns into mechanical energy, and in the second phase this mechanical energy is driven by a generator that turns into electricity. The power generated by the electricity depends on the flow of water mass and the difference in the level between the source of the watercourse and the outflow of the accumulation – drop. (Kaschny, O) Majority of hydropower plants require the construction of a dam that allows regulation of the watercourse but also an increase in the fall. Environmental impacts of small hydropower plants are negligible in relation to the impacts of large hydro power plants. For this reason, small hydropower plants are increasingly being built around the world. The relief of southern Serbia is suitable for the construction of such plants, and it is not surprising that more and more foreign investors invest in the construction of small hydro power plants in this part of Serbia.

Investments in these capacities also depend on state incentives for building energy capacities from renewable energy sources in accordance with legal regulations that should attract the capital of private investors. Thanks to the company “Inter-energo” from Ljubljana in the Municipality of Vlasotince, the "Poštica" hydroelectric power plant (Figure 3) was put into operation, thus starting the investment cycle of electricity production from renewable energy sources in Serbia. The users of such small plants not only produce electricity for their own needs, but the surplus of energy is sold to the electricity distribution, which indicates that the investments in such plants are very much paid off.

The construction of small hydropower plants is of great strategic importance for the country. The local population would be supplied with electricity produced by non-polluting sources of energy that would not pollute the environment, imports of energy and electricity would be reduced, and the growth of employment of domestic capacities for production of equipment and the execution of works would be accelerated. It should be noted that, regardless of size, the hydroelectric power plant replaces coal consumption by about 1.4kg per kWh of electricity produced.

Figure 3: Small hydropower plant in the municipality of Vlasotince “Poštica”

Source: http: //www.pcpress.info

2.6. Summary of the renewable energy resources in Southern Serbia

The geographical disposition and climate characteristics of the Republic of Serbia are as rarely as any country in Europe. Rich natural resources (rivers, forests, geothermal springs, arable land, etc.) in Serbia are not

sufficiently used in the process of generating electricity and thermal energy (for heating) from these renewable energy sources. Economic development of Serbia and its readiness to invest in energy producers from alternative sources is still not on the EU countries level.

The region of Southern Serbia has potential in renewable sources of energy. First of all, there are hydropower (Figure 4) and geothermal energy. Biomass energy does exists as a great potential but its utilization is only 2%. Wind energy potential, in this part of Serbia, is limited due to climate characteristics and because of it is not used. On the other hand, the sun's energy is a great potential but at this moment is underused and exploited only for individual needs.

Figure 4. Hidroelektrana " Sićevo"

Source: http: //www.pcpress.info

3. CONCLUSION

The common characteristic of all renewable and alternative technologies for the production of heat and electricity is relatively high level of initial investment, but also their later low operating price. The extent to what extent a country will use renewable resources depends exclusively on its economic power. One thing is certain, the use of alternative energy sources will be inevitable. The increase in the number of inhabitants on the planet Earth and the increasing needs for the energy of modern society influence slowly to change the ecological awareness of all on this issue. Responsible behaviour in all spheres of society is necessary in order to preserve the environment. Before investing in such technologies it is necessary to carry out a detailed analysis of price and potential. Not all sources have the same potential in a certain part of the world as in Serbia. Renewable energy sources are the main backbone of Serbia's energy independence in the future. The total potential of energy from renewable sources can satisfy 1/4 of the annual needs of Serbia for electricity. According to the Ministry of Energy, in 2004, Serbia spent energy equivalent to burning 40 million tons of oil. From renewed energy sources, 0.96 million equivalent t were obtained during the same year, and the potential of the utilization is several times higher (around 3 million t). Solar energy in Serbia is still unprofitable for the production of electricity on a larger scale, but it is used for the purpose of heating individual objects for different purposes. Geothermal sources are insufficiently warm (used for the heating of facilities and for the purpose of treatment), wind energy is not sufficiently tested (no wind generator in Serbia still gives electricity), while biomass is more and more present. The most successful projects are in the construction of small hydropower plants. The use of renewable energy sources promotes the economic growth of one country and

the extent to which the utilization of natural resources will depend on the implementation of the National Renewable Energy Program. The Government Regulation also provides for the status of a privileged producer of electricity from renewable sources.

REFERENCES

1. Marina Jordanović-Vasić (2009) Upotreba biomase iz poljoprivrednog otpada kao obnovljivog izvora energije, Nauka+Praksa (ISSN 1451-8341), Vol. 12.1, str. 60-63, Građevinsko-arhitektonski fakultet, Niš
2. Marina Jordanović, Ljiljana Jevremović, Milanka Vasić: Sustainalble Design: Processing of Solid Waste as a Source of Energy, IV International Symposium for Students of Doctoral Studies in the Fields of Civil Engineering, Architecture And Environmental Protection – PHIDAC, Faculty of Civil Engineering and Architecture, Nis, Serbia, 27-28 September 2012, Proceedings (ed. Z. Grdiç, G. Toplicic-Curcic), ISBN 978-86-88601-05-4, p.p. 88-92
3. Akcioni plan održivog razvoja grada Niša, 2014. (SEAP) Sustainable Energy Action Plan of the City of Niš
4. Janković, V., Knjiga o obnovljivim izvorima energije u Srbiji i Crnoj Gori, ISBN 86-903283-8-6, OEBS-misija u Srbiji i Crnoj Gori, 2004.
5. Dag Henning, Olle Mardsjo (2010). " Heat analysis for the City of Nis", Serbia, Swedish Ministry for Foreing Affairs, Sweden, (Final Report 101217)
6. Wagner H.-J. and Mathur J.,Introduction to Wind Energy Systems – Basics, Technology and Operation, second edition (Springer-Verlag, Berlin) 2013, ISBN 978-3-642-32975-3.
7. *U.S.Department of Energy:* http://www.eia.doe.gov/kids/renewable/geothermal.html, 2010
8. https://www.hidroevent.com
9. Biomass-The Growing Energy Source, (www.science. org.au/ nova)
10. Kaschny, O., Small hydro power plant automation, Schneider Electric Brazil, CDI Power

(http://www2.schneider-electric.com/documents/solutions/solution/280-small_hydro_power_plant_v1.pdf)

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INTERCONNECTION BETWEEN URBAN-BASED FACTORS AND FLEXIBLE HOUSING POTENTIALS

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ABSTRACT

Realization of flexible housing designs, which in the physical sense could accept the complex and unpredictable changes occurring in the contemporary world, while at the same time could respond to the specific and changing needs of the inhabitants, represents a strategic measure of sustainable city development. Reducing the increasingly frequent occurrence of abandonment and devastation of buildings and prolonging the exploitation period is of particular importance for the successful sustainable strategy. The problem of building dysfunctionality can come from within, as a consequence of the characteristics of the building, but also from the outside, of the conditions that prevail in the wider built environment. The mechanism of dependence and influence on different levels of the spatial system must have a reversible character, since it is the only way to maintain openness in a system based on the principles of sustainability. In this paper, the interdependence of wider urban factors and the flexible housing potentials is investigated, using the example of the central city zone of Nis. The aim is to provide general recommendations for improving the quality of housing, considering the wider urban environment.

Keywords: urban planning; flexible housing; apartment; sustainable development

1. INTRODUCTION

In the existing urban environments, rigid constellations composed of outdated and abandoned structures seriously undermine further development of the urban system. Recognizing the uncertainty of the future development of the city is a basic starting point for sustainable urban planning. Modern urban approach moves from a closed and static system to a strategically open development plan. Urban planning, therefore, should strive for complete system openness, stemming from the new integrative methodological paradigm which is not dogmatic and which does not overestimate the role of the moment.

Flexible planning is one of the strategic measures of urban sustainability that, at a certain time continuum, diminishes the risk of 'functional outbursts' caused by changing social and ecological circumstances. Ephemerality, rather than finality, is the basic tendency of flexible planning strategy, which defines the urban structure as a living organism in a dynamic relationship with its environment. Planning strategies that make the spatial system environmentally, functionally, socially or technologically adaptable are essential for the further sustainable development of the cities and the quality of city life.

The sustainability of the environment in terms of continuous physical variability and adaptability is of particular importance for the area of housing, in which the relationship of users and space is based on complex processes and activities. Housing improvement in the context of sustainable development implies harmonization of the methodology of planning, design and construction of residential buildings with the standards and requirements of modern life. In addition, beside the architectural ones, wider urban planning parameters that can affect the flexibility of housing should also be taken into account. Further work explores the reversible relationship of urban conditions and housing flexibility in the system of sustainable city development.

2. PROGRAM DIVERSITY AND POTENTIALS OF ARCHITECTURAL HERITAGE

The conventional approach to urban planning, with a spatial plan of a certain finality, does not treat the complexity and variability characterized by modern society. One of its basic characteristics is the aspiration to final and unchangeable structures where '... the burden of adjustment is shifted as much as possible to the content of the space, i.e. to the users of the space, reducing in advance the adjustment by its inelasticity at the root of the approach'[1].

The problem of obsolescence of architectural heritage is often caused by the inability of existing physical structures to adapt to current social circumstances and development trends. Awareness of the values and potentials of the existing architectural fund, as well as the possibilities of building conversion, often does not exist. Consequently, losing a part of the urban heritage before it is valorized, the urban environment faces an irreversible loss of the spirit of the city (figure 1). Thereby the problems can arise from inside, caused by the application of inadequate architectural approach, but also by the consequence of wider urban factors that are negatively affecting the potentials of flexibility from a higher level.

(a) (b)

Figure 1: Pekeliling flats in Kuala Lumpur (Malaysia) in 1968 (a) and now, waiting to be demolished (b)

The realization and affirmation of '... sustainable housing solutions, which in a physical sense would be sufficiently adaptive to handle complex and unpredictable changes in a natural and created environment, while responding to the specific and changing needs of the users'[2], must represent the imperative of a sustainable and socially conscious architecture. Flexibility, therefore, is an essential part of the sustainable construction system, the basic and fundamental premise of the long-term and continuous exploitation of the building.

The attractiveness of the city depends to a great extent on the achieved level of urbanity, the diversity of the content and program that it offers, the potential for compactization and upgrading of the urban structure, and especially to the degree of flexibility of the elementary building unit of urban tissue – the apartment (figure 2). Flexible housing program extends the offers and housing functions and attracts a wide range of tenants like students, single persons, families, people with special needs, old people, etc. The diversity of programs and functions leads to the extension and renewal of the life cycle of the basic urban cell (i.e. the apartment), which, like in biological processes, prolongs the aging of the entire urban system. Modern sustainable strategies that involve increasing urban development by expanding content and extending the life span of buildings result in a multifunctional urban constellation which is always in a state of dynamism.

[1] Knežević, G., 1980. Apsolutna i relativna fleksibilnost u organizaciji stana, doktorska disertacija, Arhitektonski fakultet Sveučilišta u Zagrebu, p. 72

[2] Bajić, T. and Pantović, K., 2011. Mogućnosti primene modularnih sistema u projektovanju održivog i klimatski svesnog socijalnog stanovanja. Arhitektura i urbanizam, 33, p. 58

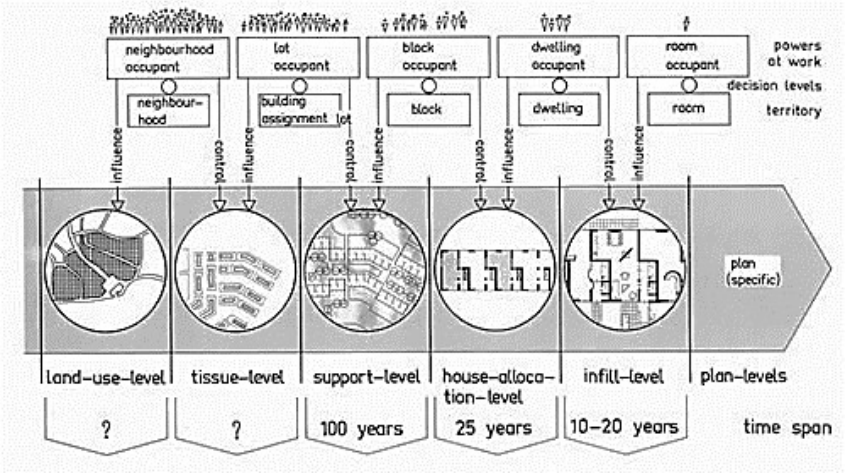
Figure 2: Program diversity arises from the flexibility of the apartment

The unobstructed and continuous functioning of urban processes in the physical environment is an essential aspect of the sustainable city development. On the other hand, the measure of maintaining the quality of life is directly related to the volume, quality and diversity of housing supply. Flexible housing must be supported by a dynamic planning concept and urban system whose characteristics change over time, in accordance with the social interests and freedom of society within it:

'The essence of sustainability is in understanding human needs and aspirations and designing in accordance with them, instead the efforts to pack human needs and aspirations into suitable boxes and settlements for the joy of planners and economists, but which don't resemble the places where they would like to live, or in which they would really choose to stay in'[3].

3. 'OPEN BULDING' CONCEPT

The term 'open building' describes a number of studies that consider architecture and the environment as a series of processes and activities that take place at different levels of the system, under the general precondition that the built environment is in constant transformation and change.[4] Within the concept, three spatial decision levels are identified: the level of urban tissue, the level of structure and the level of infill. These levels are mutually coordinated by the system of control and impact (figure 3).



[3] Bajić, T. and Pantović, K., 2011. Mogućnosti primene modularnih sistema u projektovanju održivog i klimatski svesnog socijalnog stanovanja. Arhitektura i urbanizam, 33, p. 43

[4] Kendall, S. and Teicher, J., 2000. Residential open building. E & FN Spon, London, p. 3

Figure 3: Levels of decision making in the spatial system and the lifetime of individual levels[5]

Persistence of the urban fabric is at a higher level compared to the buildings that are positioned within the tissue and which can be transformed or replaced by other buildings. The buildings are further decomposed to the elements of structure and infill, wherein the level of higher order (structure) controls the changes within the level of a lower order (infill). On the other hand, the lower level sets certain requirements in relation to the higher level. At each level, the controlling actor is defined: the occupant at the level of infill, the contractor at the level of the structure and communities at the level of urban tissue.

Considering the hierarchy of control and influence is of particular importance for understanding the spatial-functional relations and enhancing features within the urban system.

4. URBAN HOUSING POLICY AND QUALITY OF RESIDENTIAL SPACE

As noted earlier, the characteristics of a higher level in the hierarchy based spatial system directly affect the characteristics of lower order levels. In spite of the fact that it expresses a certain degree of individuality, the apartment represents an inseparable entity with other housing units within the assembly, and further, with the wider environment in which it is located. Since the spatial organization of an apartment is conditioned by the definition of a building block, which is further conditioned by the definition of the urban structure, it is necessary to carry out an analysis of wider urban factors that affect the quality and use value of the residential space.

The apartment is physically and functionally connected to the building plot on which it is located, so the quality of the plan is conditioned by the relevant urban parameters and locational conditions. The population density, for example, greatly affects the applied urban concept of the settlement, which further affects the quality of residential space. In order to understand this interdependence, a part of the central core of the city of Nis dominated by high-density housing is given as an example (figure 4).

The Municipality of Medijana (central part of the city) is registered as one of the municipalities with the highest population density in the Republic of Serbia (8534 residents per km^2). The Municipality comprises of three characteristic urban zones - the old town core of Nis, rich in cultural and historical heritage, a settlement built mainly in the seventies and eighties in the area Kriva livada and the suburban settlement Brzi Brod, formed on the remains of prehistoric and ancient settlements. High population density, high degree of urbanization, as well as frequent migration movements at daily and annual level impose the unconditional functional sustainability of this local urban community.

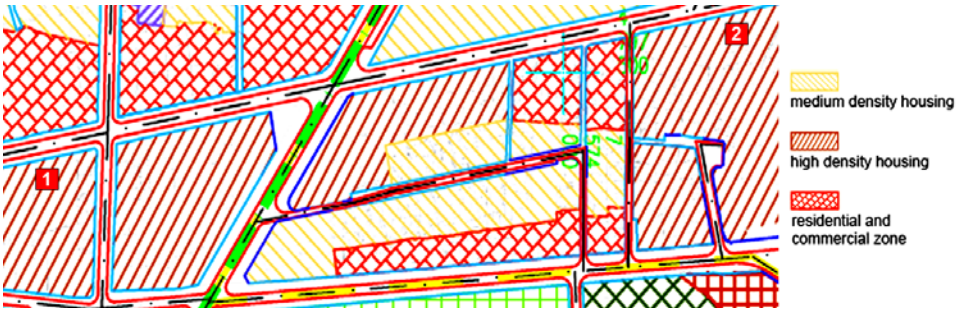


Figure 4: Central city core of Nis (Cara Dusana Street), General Regulation Plan of Municipality of Mediana (Nis)

The construction site in high-density settlements represents increasingly rare resource, which makes urban land more expensive. The need for rational land use conditions the construction in height, with a hugely reduced size of the apartments and free area on the plot. Due to the lack of available land, in the central city zone, buildings are mostly planned on smaller plots, and the urban conditions for the distance between two buildings are often ignored. In these circumstances, the ability of physical structure to accommodate to program dynamics is extremely limited.

The city matrix of the central zone of Niš is regulated by a system of regular building blocks, in which the buildings were constructed on the most expensive land for housing during the pre-war period. During the transition period, massive upgrades of residential buildings with flat roofs were carried out, which were in

[5] Cuperus, Y., 2001. An Introduction to Open Building. Proceedings of the Ninth Conference of the International Group for Lean Construction, Singapore, p. 3

many cases statically defective, without any esthetic qualities and with problems of insufficient parking space. In the current market conditions characterized by the construction of buildings on the plots with previously located individual housing, there is a tendency of reduction of architectural standards with large number of apartments planned within the typical floor plan. Concentration of a large number of apartments, as the dominant tendency of investors, reduces the organizational and functional quality of the space, and therefore the potentials of flexibility (figure 5).

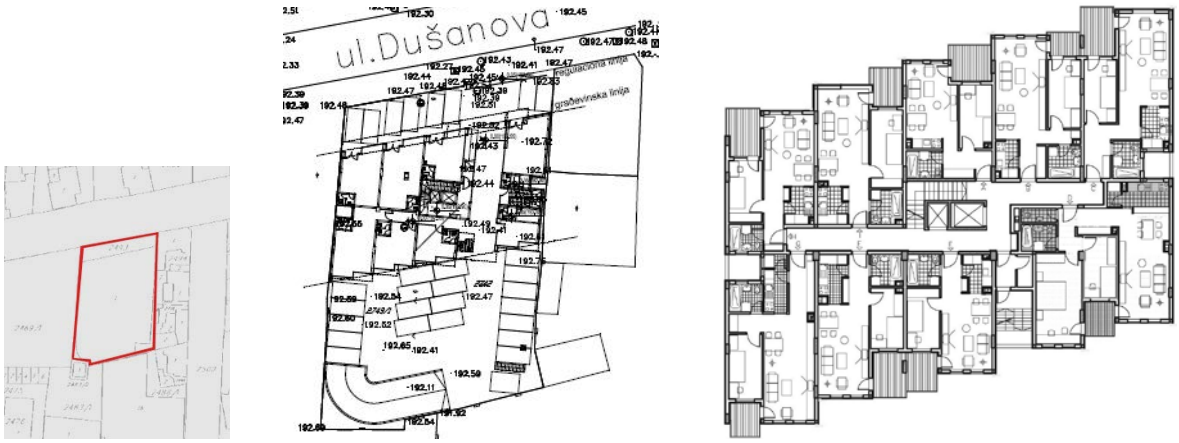


Figure 5: Concentration of a large number of apartments within the typical floor (location 1 marked on figure 4)

The geometry and the degree of incorporation of the assembly are also important criteria of flexibility. The geometry of the plan is determined by the design of housing units within the assembly, but also by the conditions found on location. Due to the property law issues and partial conversion of privately-owned plots, construction is sometimes realized on irregular plots that give an unclear form of the assembly (figure 6). Breaking the geometry of the assembly can have a favorable effect on the quality of the orientation of the space, but, on the other hand, it can limit the possibility of alternative redistribution of space within the assembly. As far as the geometry of the assembly is concerned, the deeper tracts condition the necessary division of the contents within the apartment to the auxiliary zone, which is located at the depth of the assembly, and the main zone (with residential rooms) located next to the facade because of the need for natural lighting. Less depth of the assembly represents a more favorable solution, because variations in the plan are to a lesser extent conditioned by the need for natural lighting and ventilation. The geometry of the assembly is in direct relation to the geometry of the plot. On narrow plots in the central city zone construction from plot border to border conditions an elongated form and generally only two-sidedly oriented assembly.

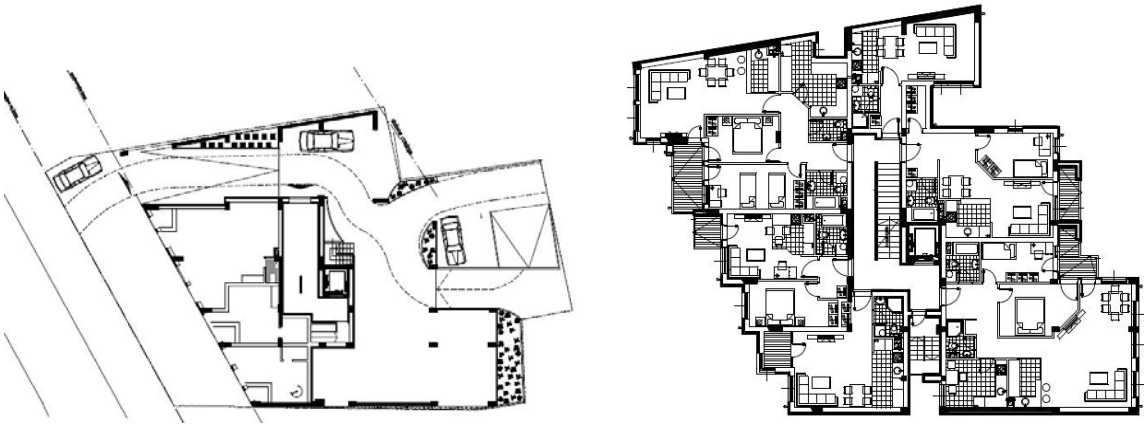


Figure 6: Broken geometry of the assembly emerged from the broken geometry of the plot (location 2 marked on figure 4)

Based on the previous, it can be concluded that the degree of incorporation of the assembly directly influences the number of output facades. The convincing representation of flats with one-sided orientation stems from a ubiquitous restrictive policy of planning and construction. Overcrowding and the need for urban sustainability in the urban centers and the immediate surroundings condition the strategic measure of compacting housing through block construction. With a greater degree of assembly incorporation, the possibilities of multifaceted housing units are initially reduced. With the decrease in the number of output facades, the potentials of flexible space organization are also reduced.

Priority of quantitative over qualitative resulted in construction based exclusively on the elementary needs of housing, whereby the program diversity largely has not been the subject of design considerations. Univalence in expression contributed to the rapid depreciation of the housing fund, which due to poor adaptability to changes provides very narrow possibilities for exploitation. On the other hand, the problem of a lack of space for construction, vulnerability of natural resources, but also the growing needs for new housing environment in already defined and densely populated urban zones, make the implementation of the global program of sustainability more difficult. The rigidity of the built structures, in most cases, require their demolition, which permanently and irretrievably loses the invested material resources.

5. CONCLUSIONS

The diversity of housing programs, which represents an important quality of modern cities, requires a global approach to the problem of housing, where individual buildings cannot be perceived as independent entities isolated from their surroundings, but as part of a wider urban organism where the structures together contribute to the undisturbed functioning of the system. The possibility of upgrading the existing built environment in order to realize the defined criteria of sustainability is an imperative demand of the future. Also, construction of new housing environment in an existing urban matrix must be supported by a planning policy and regulations that is based on the principles of flexibility and sustainability. On the other hand, the inadequate 'inside' action of architecture which disables the regeneration of the basic physical cell of inhabitants' accommodation leads to the global 'dying' of the urban system.

The analysis of contemporary construction in Nis points to the absence of initiative and positive reflection on the topic of sustainable and socially responsible activities in the domain of architecture and urban planning. In the ubiquitous conventional planning concept, the higher level of the system dominates the lower level, with the interdependence being one-way and irreversible. The variability in the basis of the system requires a comprehensive planning and construction strategy that will create a favorable platform and support to the growing diversity of housing needs. Flexibility in the organization of an apartment can therefore be realized only under the condition that it grows out of a comprehensive urban and architectural ideology, which is based on system openness and development of the physical environment.

ACKNOWLEDGEMENTS

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REFERENCES

1. Acharya, L., 2013. Flexible architecture for the dynamic societies: Reflection on a journey from the 20th Century into the future. Master thesis in Art History, Faculty of Humanities, Social Sciences and Education, University of Tromsø

2. Bajić, T. and Pantović, K., 2011. Mogućnosti primene modularnih sistema u projektovanju održivog i klimatski svesnog socijalnog stanovanja. *Arhitektura i urbanizam*, 33, pp 42-59

3. Brand, S., 1994. How Buildings Learn: What Happens after they're built. Penguin Books, London

4. Cuperus, Y., 2001. An Introduction to Open Building. Proceedings of the Ninth Conference of the International Group for Lean Construction, Singapore, pp

5. Habraken, N. J., 2008. Design for flexibility, *Building Research & Information*, 36 (3), pp 290-296

6. Kendall, S. and Teicher, J., 2000. Residential open building. E & FN Spon, London

7. Kronenburg, R., 2007. Flexible: Architecture that Responds to Change. Larence King Publishing Ltd, London

8. Knežević, G., 1980. Apsolutna i relativna fleksibilnost u organizaciji stana, doktorska disertacija, Arhitektonski fakultet Sveučilišta u Zagrebu

9. Maas, W., 2003. Five Minutes City: Architecture and (im) mobility: Forum & Workshop Rotterdam 2002. Episode publishers, Rotterdam

10. Marcuse, P. and Kempen, R., V., 2000. Globalizing Cities: A New Spatial Order?. Blackwell Publishing, Oxford

11. Ratcliffe, J. et al, 1996. Urban planning and real estate development. UCL Press, London

12. Wikström, A., 2013. The Challenge of Change: Planning for social urban resilience. An analysis of contemporary planning aims and practices. Master's Thesis, Department of Human Geography, Stockholm University

13. Živković, M., Jovanović, G., Kondić, S., 2014. Flexible planning strategies of sustainable city development. *Facta Universitatis: Series Architecture and Civil Engineering*, University of Niš, 12 (3), pp. 273-286

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BRINGING NATURE INTO URBAN AREAS THROUGH IMPLEMENTATION OF MODERN STORMWATER MANAGEMENT APPROACHES: EXAMPLES FROM VIENNA'S NEIGHBOURHOODS

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ABSTRACT

Most modern stormwater approaches, such as Water Sensitive Urban Design, Sustainable Drainage System, Low Impact Development etc., are based on mimicking the natural environment in urban conditions, which makes them environmentally friendly and, among others, allow a greater presence of nature in urban areas. Elements of nature, as well as the modes and spatial-functional levels of their implementation vary and mostly depend on the following groups of factors: 1) applied measures and technical elements, 2) site conditions, and 3) relationship between modern stormwater approaches and urban planning and design in certain institutional, organizational and planning frameworks. The focus in this paper is on the first and second group of factors. We analyze the relationship between the type of measures/technical elements and the corresponding elements of nature that brings their application, in order to determine the significance and influence of the recognized elements of nature on the ecological comfort, biodiversity, utilization and design potential, amenity and character of social interactions in the observed urban areas. Research platform are Vienna's neighbourhoods, which represent different site conditions as well as technical elements such us ponds, swales, rain gardens, green roofs etc.

Keywords: nature; modern stormwater management approaches; urban planning and design; environmentally friendly; neighbourhood; Vienna

1. INTRODUCTION

As a result of the need to find and apply adequate solutions for the adaptation of urban areas to problems arising from climate changes and rapid urbanization at the global and local level, several modern stormwater management approaches have been developed in the last few decades. The best known are Water Sensitive Urban Design (WSUD) in Australia, Sustainable Drainage System (SuDS) and Sustainable Urban Drainage System (SUDS) in Great Britain and Scotland, Best Management Practices (BMPs) and Low Impact Development (LID) in the United States, Alternative techniques (ATs) in French speaking countries and Source Control in Canada (Roy et al., 2008; Fletcher et al., 2015). Although their origin and purpose were motivated by the specific characteristics and initial problems of each country, in the meantime most of them evolved into integrated approaches which are conceptually based in a completely different way compared to traditional stormwater management systems. Namely, in addition to solving the problems of flooding and the problems of quantity and quality of rainwater, the third basic goal of modern stormwater management approaches is to replace and/or increase the capacity of the existing drainage system in urban catchments by mimicking nature environment (Cooper, 2011). This shift also led to synergy with current urban theoretical concepts and urban approaches such as Smart Growth, Green Urbanism, Green-Blue Infrastructure concept, Ecological Urbanism or Sustainable Urbanism: Design with Nature, enabling simultaneous service to the primary goal of contemporary urban planning and design - improving quality of life and quality of built environment.

Since modern approaches are based on mimicking the natural environment in urban conditions, that makes them environmentally friendly and, among others, allows a greater presence of nature in urban areas. Forms of its manifestation, as well as the modes and spatial-functional levels of implementation vary and mostly depend on the following groups of factors: 1) applied measures and technical elements of modern stormwater management approaches, 2) site conditions, and 3) relationship between modern stormwater management approaches and urban planning and design in certain institutional, organizational and planning frameworks. The focus of investigation in this paper is on the first and second group of factors.

Accordingly, the main research goals are the following: 1) to analyse the relationship between the type of measures/technical elements and the corresponding elements of the natural environment that their application carries with them, and 2) to determine the significance and influence of the recognized elements of nature environment on the ecological comfort, biodiversity, usable and morphological potential, amenity and character of social interactions in the observed urban areas.

2. METHODOLOGY

In analysing the connection and relationship between the applied types of technical elements of modern stormwater management approaches and the elements of nature environment, as well as in exploring the significance and influence of the recognized elements of nature on the built environment characteristics, the methodological framework is based on an analytical approach which relies on description, observation and analysis. Vienna's neighbourhoods are chosen for the research platform which represent various site conditions (1), different type of technical elements (2) and different element of natural environment (3).

3. BRINGING NATURE IN URBAN AREAS THROUGH IMPLEMENTATION OF MODERN STORMWATER MANAGEMENT APPROACHES - SETTING THE CONTEXT

Preconditions for the origin and later evolution of modern stormwater management approaches appeared under the paradigm "living with water" in the early 1980s, when there was a shift from the concept of water as “urban and city life enemy” and “hidden element behind pipes” towards water as an “element that contributes to the quality of life” (Vasilevska et al., 2018). In addition to creating opportunities for integrating modern approaches into the urban planning and design process, these circumstances have also led to radical changes of the urban planning and design paradigm (Brown et al., 2009), primarily in terms of the evolution of the role of urban stormwater management in planning process, their conceptual and methodological framework and cumulative socio-economic effects.

The basic intention of the new conceptual framework is to establish a greater harmony between water as a key resource and the community in a sustainable, socially rational and responsible way (Vasilevska et al., 2018). Close connection with nature and its involvement into the urban environment are at the core of this paradigm shift. In line with this, modern stormwater management approaches offer a set of different technologies and treatment modes, which also represent evolution and innovation in relation to the traditional approach (Vasilevska et al., 2014). There are four basic modes of runoff treatment, which can be applied separately or in combination: 1) infiltration; 2) disposal; 3) storage; and/or 4) re-use (Gordon-Walker et al., 2007). Each of them implies implementation of different technical elements. Although the typology and significance of a particular elements varies depending on the approaches, in general, in each of them, technical elements are similar and serve the same purpose.

The most known technical elements are: 1) swales (dry or wet); 2) bioretetions; 3) trenches; 4) sand filters; 5) ponds and lakes; 6) porous paving; 7) wetlands; 8) rainwater tanks; 9) elements of landscape architecture (green walls, for example) etc. Green roofs are not a mandatory technical element, but their application has proved to be very useful in the treatment of rainfall, so they became an unavoidable technical element of all modern stormwater approaches in many urban situations - the third most widely used technical element after bioretentions and porous paving.

Conceiving of modern approaches on the application of measures that imply or support the natural environment allows greater presence and involvement of nature in urban areas. In order to establish the connection and relationship between different types of technical elements and the expected elements of natural environment that their application carries, we conducted a research based on analysis of theoretical background and best practice examples (Lloyd et al., 2002; Cettner et al., 2013; Vasilevska et al., 2018). The

selection of technical elements and division of natural environment into four elements - greenery, water body, biodiversity (vegetation and animals) and landscape, was also carried out for the purpose of this research.

The results of the analysis, shown in Table 1, indicate the following:

1) strong relationship between most of technical elements and the elements of nature environment;
2) application of one technical element often involves several elements of nature; and
3) beside the main characteristic of each technical element and its role in stormwater management approach, the intensity of connections between technical element and certain elements of nature depends primarily on the design approach, climate conditions and spatial-functional capacity of a particular location.

Table 1: Connection between technical elements and elements of natural environment

	Technical element	Element of natural environment											
		Greenery			Waterbody			Biodiversity			Landscape		
1.	Bioretention												
2.	Swale/dry												
3.	Swale/wet												
4.	Pond and lake												
5.	Wetland												
6.	Sand filter												
7.	Porous paving												
8.	Trench												
9.	Green roof												
Connection			low			medium			strong				

Consequently, each of the mentioned technical elements and accompanying elements of natural environment are actively involved in creation of usable and morphological potential of a particular location or urban area. As most approaches support environmentally friendly lifestyle, the synergy between technical elements and accompanying natural elements directly affects the quality of life as well as the quality of the built environment. It can be best achieved through the process of urban planning and design, i.e. through an integrated planning approach in which decisions and actions are based on the achievement of a better quality of urban living as a ''umbrella'' goal. In current urban concepts as well as in urban planning practice there are several principles and characteristics of quality urban environment which also implies the quality of life on various spatial-functional levels of the city. The key characteristics, which includes the issues considered in this paper, are the following:

1) ecological comfort / healthy and pleasant environment;
2) diversification of contents and forms of the built environment, especially open spaces;
3) level of safety and privacy; and
4) social sustainability.

Each of the characteristics is accompanied by a set of measurable indicators. For example, from the stormwater management and urban planning and design point of view, ecological comfort can be evaluated through indicators such as:

a) physical isolation from streets and other sources of noise and pollution,
b) increase amount of greenery,
c) disposition, form and type of greenery,
d) increase percentage of biodiversity, etc.

Safety and privacy, which are of great importance especially in residential areas, can be evaluated through indicators such as:

a) applied materials for outdoor surfaces and communications,
b) presence and forms of visual and physical protection and barriers,
c) distance and size of the area that is isolated from access to the motor traffic,
d) distance and size of the area that is isolated from access and views from the primary pedestrian communication, etc.

A brief overview of the possibilities and benefits of synergy of technical elements and accompanying elements of natural environment and its significance for the different aspects of the quality of urban life is shown in Table 2.

Table 2: Synergy of technical elements and accompanying elements of natural environment - possibilities and benefits

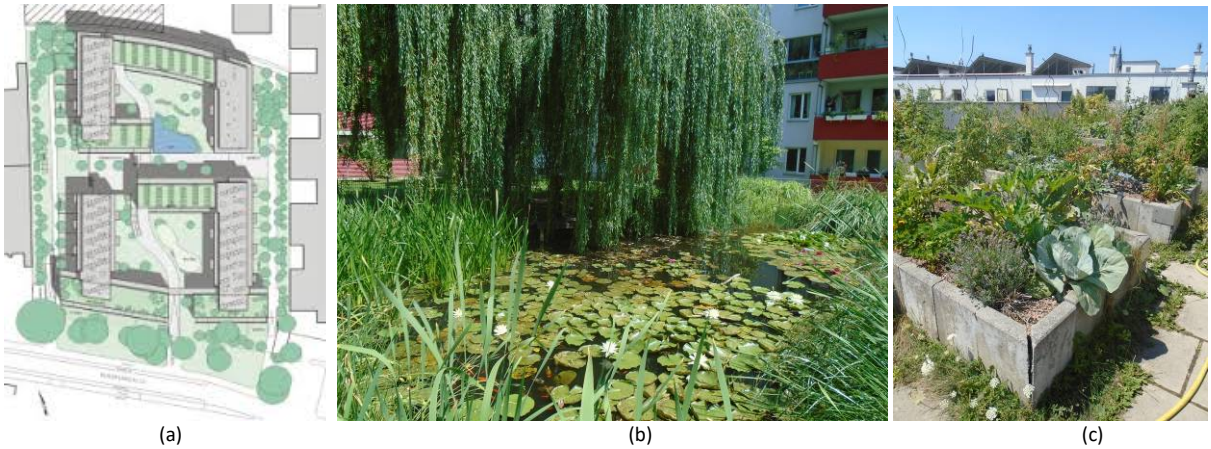
Technical element with accompanying element(s) of the natural environment in urban areas		
Technical element	Basic role of technical element in stormwater management approach	Additional role of technical element important for the quality of urban life
Green roof		
	Retain the runoff for a longer period of time Delay runoff Reduce peak runoff and total runoff Allows evapotranspiration	Create healthy and pleasant environment Provide close connection with nature Improve biodiversity Improve the air quality Mitigates urban heat island Improve the site usability in a limited urban space conditions Provide diversification of use - recreation, leisure, education, urban agriculture Create possibilities for social interaction
Trench		
	Provide temporary subsurface storage for runoff infiltration or filtration	Increase safety and privacy Provide visual and physical protection/physical barrier Improve biodiversity
Pond		
	Permanent pool of water which provide runoff attenuation and treatment	Create healthy and pleasant environment Provide close connection with nature Improve biodiversity Mitigates urban heat island Provide diversification of use - recreation, leisure, education Create possibilities for social interaction
Raingarden (type of bioretention)		
	Reduce runoff by allowing stormwater to soak into the ground	Create healthy and pleasant environment Provide connection with nature Improve biodiversity Improve the air quality (in some cases) Mitigates urban heat island
Swale		
	Increase rainwater infiltration Stored or conveyed runoff Filter pollutants	Create healthy and pleasant environment Provide close connection with nature Improve biodiversity Improve the air quality Mitigates urban heat island Improve the site usability in a limited urban space conditions (in some cases) Provide diversification of use - recreation, leisure (in some cases) Create possibilities for social interaction (in some cases)
Photos: Examples from Vienna. Sources: Authors		

4. BRINGING NATURE IN URBAN AREAS THROUGH IMPLEMENTATION OF MODERN STORMWATER MANAGEMENT APPROACHES - EXAMPLES FROM VIENNA'S NEIGHBOURHOODS

Vienna is a model of good practice by many other cities that applies a modern stormwater approach in a systematic and institutionally supported way, in order to achieve sustainable and efficient urban development that leads to a better quality of life. In a broader sense, the approach is targeted as part of The Smart City Wien framework strategy, adopted in 2014, which defines goals for the development of city that assigns priority to, and interlinks, the issues of energy, mobility, buildings and infrastructure. The framework strategy defines one meta goal for 2050: *"The best quality of life for all inhabitants of Vienna, while minimizing the consumption of resources. This will be realized through comprehensive innovation."* The stormwater management is also targeted within several strategies, documents and guidelines adopted by the city of Vienna, such as Urban Heat Islands (UHI) - Strategieplan Wien (2015), Regenwassermanagement: Rechtliche Grundlagen (2011), Integratives Regenwassermanagement–Motivenbericht, Beispielsammmlung (2010), Regenwassermanagement. Nachhaltiger Umgang mit wertvollem Regenwasser (2013), etc.

Modern stormwater approach is applied at different spatial-functional levels of the city, both in newly built areas and in those that are undergoing urban regeneration. The selected examples below represent both cases. They have a common presence of different elements of nature, which is the result of applied technical measures and design approach.

Experimental building, often in form of 'theme-oriented' estates with topics pre-determined by the city, has a major share in the qualitative development of Vienna social housing in the 1990-es. For example, the Autofreie Mustersiedlung (car-free model estate), planned since 1994 by architects Schindler, Szedenik, Lautner and Scheifinger, completed in 1999/2000, the largest of its kind in Europe with building lot size approx. 11.400m^2 (Figure 1a), transferred the means needed normally for the construction of car parks into an environmentally friendly infrastructure: greened roof-gardens, parking lots for bicycles, internet-cafe, meeting rooms, children's day-care centre, etc. A comprehensive ecological concept was realized: low energy consumption level, use of solar energy, a loading station for electric cars, heat recovery from waste water, a grey water system, runoff treatment, green areas with humid biotopes and intensive planting, including green walls and pond. The main technical element for stormwater treatment is green roof. Three roofs are intensively planted for the general use, two roofs are with raised beds and intensively landscaped, while two roofs with attached solar panels are designed as gravel roofs (Figure 1c). At the same time, greened roof-gardens provide additional, multiple benefits - possibilities for urban agriculture (Figure 1c), children education, social interactions, they improve ecological comfort/microclimate and create healthy and pleasant urban environment. The decorative pond is in a focus point in one of two courtyards within the housing area (Figure 1a and 1b). The feeding of the decorative pond as well as the irrigation takes place via water well, while the water is cleaned by UV irradiation. The pond has a seepage pit for the excess water bellow (Figure 1b).



(a) (b) (c)

Figure 1: Autofreie Mustersiedlung. (a) Plan, (b) Pond and (c) Greened roof-gardens, possibilities for urban agriculture
Sources: (a) http://www.gewog-wohnen.at/media/1044/af_broschure.pdf, (b) and (c) Authors

So far the most radical experiment within the framework of subsidized housing is Sargfabrik (former coffin factory), in the densely built-up fourteenth district of Vienna (Figure 2a). Designed by Baukünstlerkollektiv 2, built in the period from 1992 to 1994, Sargfabrik was planned by a group of residents; it organizes living by providing strongly variable 'housing boxes', and offers a wide choice of communal leisure facilities, including a restaurant, a sauna, meeting rooms, a kindergarten, and extensive green roof, all of which can also be used by

neighbourhood residents. Green roof serves also to retain and delay a runoff, but in the same time provide a close connection with nature in densely built-up urban area, diversification of use - possibilities for urban agriculture, recreation or leisure, then improve biodiversity and air quality, as well as microclimate conditions (Figure 2b and 2c).

(a) (b) (c)

Figure 2: Sargfabrik. (a) Plan, (b) Extensive green roof - close connection with nature, and (c) Extensive green roof - urban agriculture
Sources: (a) https://commons.wikimedia.org/wiki/File:Grundriss_Sargfabrik_Wien-Penzing.png, (b) and (c) Authors

Hagedornweg is as social housing area built-up in twenty-second district, designed by Göth and Guttmann (DonauConsult KT), completed in 1996, with building lot size approx. 26.000m^2 (Figure 3a). The greenery and biotope pond, with total size approx. 2600m^2, are in focus of urban composition as well as central courtyard (Figure 3a and 3b). The feeding of the biotope pond as well as the irrigation takes place via a water well, while the water is cleaned by UV irradiation. The pond has a seepage pit for the excess water bellow (with circulation pumping system).

The original intention to discharge of roof rainwater into the biotope pond was not realized due to the long-term of planning and relatively dense building accumulating amounts of water, which led to large water level fluctuations in the pond. Extreme rainfall and excess water infiltration take place in a swale adjacent to the pond. However, the pond, as the most important element that mimick the natural environment, provides additional benefits such as healthy and pleasant environment, close connection with nature, improve biodiversity, mitigates urban heat island, provide diversification of use (recreation, leisure) and provides a powerful aesthetic experience (Figure 3b).

(a) (b) (c)

Figure 3: Hagedornweg. (a) Plan, (b) Pond/Biotope, and c) Pond/Biotope - close connection with nature
Sources: (a) Stadt Wien – Vienna GIS. www.wien.gv.at/viennagis/, (b) and (c) Authors

Spar Supermarket in Engerthstrasse was built in 2010 within existing park in densely built-up housing and mix-use area in the second district. It is an example of good practice that applies green roof as a technical element of stormwater management in order to compensate for greenery in limited spatial conditions, as well as to maintain the existing relationship between built and green areas within the residential area (Figure 4a). Building lot size is approx. 2.526m^2, while plant size is approx. 1500m^2, where the surface of the green roof participates with 921m^2, and the area under slopes with 629 m^2. The supermarket is most built under a gently rising hill. The green roof surface has a construction height of at least 50cm from the waterproofing. The roof area and the slopes were planted with waves form of lavender and grass leaking into the adjacent green area (Figure 4b and 4c). Multiple use and ecological benefits are the following: more public open space, landscape design element, improvement of the microclimate, improvement of biodiversity, and reduction the energy demand.

(a) (b) (c)

Figure 4: Spar Supermarket in Engerthstrasse. (a) Plan, (b) Extensive green roof - close connection with nature, and (c) Extensive green roof - public open space. Sources: (a) K. Grimm, (b) and (c) Authors

In addition to the selected examples, there are many other examples in Vienna that demonstrate the multiple benefits of implementing technical measures and their importance for involving nature in the urban environment. For illustration purposes, some of them are shown in Figure 5.

(a) (b) (c)

Figure 5: (a) Rain garden in Quartier Vert housing area (build 2011), (b) Extensive green roof "Lavendeldach" and green wall in Boutiquehotel Stadthalle (build 2009), and (c) Swale in Friedrich-Engels hosing area (project of urban regeneration, realized 2001) Sources: (a), (b) and (c) Authors

5. CONCLUSION

In relation to the first research goal - *to analyse the relationship between the type of measures/technical elements and the corresponding elements of the natural environment that their application carries with them*, conducted research indicates the following: 1) there is a strong relationship between the most technical elements and the elements of nature environment - most of technical elements provide close connection with the nature, especially if they are applied in combination and on a larger spatial scale; 2) application of one technical element often involves a several elements of nature, mostly through the implementation of man-made forms that mimick and support elements of natural environment; and 3) the intensity of connections between technical element and certain elements of natural environment primarily depends on the design approach, climate conditions and spatial-functional capacity of a particular site or urban area.

In relation to the second research goal - to determine the significance and influence of the recognized elements of nature environment on the ecological comfort, biodiversity, usable and morphological potential, amenity and character of social interactions in the observed urban areas, research conducted through the analysis and observation of selected examples from inherited and newly developed Vienna's neighbourhoods points the following: 1) there is a strong influence of the recognized elements of nature environment on all considered aspects; 2) the greatest influence of technical elements and accompanying elements of the natural environment is achieved through improvement of biodiversity, mitigating urban heat island, microclimate and quality of landscapes (Hagedornweg, Autofreie Mustersiedlung, Sargfabrik, Spar Supermarket; Boutiquehotel Stadthalle, and 3) significant influence of technical elements and accompanying elements of the natural environment is achieved through additional benefits such as improving usable and morphologic potential of site or area, in terms of additional open space and greenery (Spar Supermarket), possibilities for social interaction (Hagedornweg), diversification of use (Autofreie Mustersiedlung, Sargfabrik) etc.

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REFERENCES

1. Brown, P., Keath, H. and Wong, T., 2009. Urban water management in cities: Historical, current and future regimes, Water Science and Technology, 59(5). pp 847–855.
2. Cettner, A., Ashley, R., Viklander, M. and Nilsson, K., 2013. Stormwater management and urban planning: Lessons from 40 years of innovation. Journal of Environmental Planning and Management, 56(6). pp 786 - 801.
3. Cooper, A., 2011. Stormwater Management Opportunities with Urban Re-development. https://www.waternz.org.nz/Attachment?Action=Download&Attachment_id=139 [Accessed: 10st June 2014].
4. Fletcher, T., Shuster, W., Hunt, W., Ashley, R., Butler, D., Arthur, S., Trowsdale, S., Barraud, S., Semadeni-Davies, A., Bertrand-Krajewski, J., Steen Mikkelsen, P., Rivard, G., Uhl, M., Dagenais, D. and Viklander, M., 2015. SUDS, LID, BMPs, WSUD and more – The evolution and application of terminology surrounding urban drainage. *Urban Water Journal* 12 (7). pp 525–542.
5. Gordon-Walker, S., Harle, T. and Naismith, I., 2007. Using science to create a better place. Cost-benefit of SUDS retrofit in urban areas. Science Report – SC060024. Bristol: Environmental Agency.
6. Integratives Regenwassermanagement – Motivenbericht, Beispielsammmlung, 2010, (K. Grimm). Magistrat der Stadt Wien, Wiener Umweltschutzabteilung – MA 22. https://www.wien.gv.at/umweltschutz/raum/pdf/motivenbericht-beispielsammlung.pdf [Accessed: 15st June 2013].
7. Lloyd, S., Wong, T. and Chesterfield, C., 2002. Water sensitive urban design - a stormwater management perspective. Cooperative Research Centre for Catchment Hydrology and Melbourne Water Corporation. https://ewater.org.au/archive/crcch/archive/pubs/pdfs/industry200210.pdf [Accessed: 21st September 2018].
8. Regenwassermanagement. Nachhaltiger Umgang mit wertvollem Regenwasser. 2013. Magistrat der Stadt Wien. https://www.wien.gv.at/umweltschutz/raum/pdf/regenwassermanagement.pdf [Accessed: 30st September 2018].
9. Roy, A., Wenger, S., Fletcher, T., Walsh, C., Ladson, A., Shuster, W., Thurston, H. and Brown, A., 2008. Impediments and Solutions to Sustainable, Watershed-Scale Urban Stormwater Management: Lessons from Australia and the United States. *Environmental Management,* 42. pp 344–359.
10. Smart City Wien framework strategy. https://smartcity.wien.gv.at/site/files/2016/12/SC_LF_Kern_ENG_2016_WEB_Einzel.pdf [Accessed: 21st September 2018].
11. Urban Heat Islands (UHI) - Strategieplan Wien.2015. Magistrat der Stadt Wien, Wiener Umweltschutzabteilung – Magistratsabteilung 22 https://www.wien.gv.at/umweltschutz/raum/pdf/uhi-strategieplan.pdf Accessed: 21st September 2018].
12. Vasilevska, Lj. and Blagojević, B, 2014. Morphologic effects of stormwater management application in the urban design process. Proceedings of International conference *Instalacije i arhitektura 2014*, Arhitektonski fakultet Univerziteta u Beogradu, Beograd, Srbija. pp. 71-77.
13. Vasilevska, M. and Vasilevska, Lj., 2018. Modern stormwater management approaches in urban regeneration. Conference proceedings 6th International conference Contemporary achievements in civil engineering, Subotica, Serbia. pp. 525 -534.

CITIES ADAPTATION TO THE CLIMATE CHANGE BY USING GREEN BUILDING PRINCIPLES

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ABSTRACT

The paper will analyse some of the concepts and principles of green building in the context of cities adaptation to climate change, which could be applied more in Serbia in the future. Having in mind the problem and their impact on the adaptation, mitigation and resilience of cities to the new changes two different approaches have being considered.

The first approach considers the city area as an environment defined through plans on a different level that integrates defining rules and tools for adapting to climate change. The second direction is focused on the impact of independent projects, which can be the initiators of adaptation to climate change on a wider scale.

The paper will present two case studies from Belgrade, Serbia. The first one is the "Study of the possibility of installing solar photovoltaic panels on a flat roof of the market in Blok 44 in New Belgrade", whose investor is "JKP Gradske pijace" (PE City markets), The second study analyses the competition entry for the former Beobanka building in Zeleni venac, Belgrade. The project's aim was to determine the possible ways of integrating the principles of green building in the processes of adaptation of existing buildings to new uses.

Keywords: urban planning; climate change; green building, individual building practices, Belgrade, Serbia

1. INTRODUCTION

When it comes to adapting cities to climate change, the principles of green building have become one of the most important premises in both urban planning and building design. Different methodologies, set by cities or states, which are primarily focused on the reduction of carbon dioxide consumption, considering its impact

on climate change, have achieved ambitious goals in the contemporary practice[1]. Such goals are stimulated by significant financial resources, which help encourage the "green programmes".

Green Cities Programme Methodology, based on the work of OECD and ICLEI, offers the following definition of a Green City: “Green City is a city which shows high environmental performance relative to established benchmarks in terms of i) quality of environmental assets (air, water, land/soil and biodiversity), ii) efficient use of resources (water, energy, land and materials) and iii) mitigating and adapting to risks deriving from climate change, while maximizing the economic and social co-benefits and considering its context (population size, socio-economic structure and geographical and climate characteristics)” [2].

All these issues are particularly relevant to Serbia, considering that the energy efficiency of buildings in the public and private sector in urban areas is poor. Serbian cities produce communal solid waste that, without treatment, ends on non-sanitary landfills, waste recycling in urban areas is negligible (up to 5%) in comparison with the EU’s today’s average of 39% and the EU's goal of recycling 50% of municipal waste from total generated waste by 2020 [3].

For the sustainable development of green cities, it is critical to recognize the relationship between environmental aspects and economic and social issues. This thinking is also very much in line with the UN’s 2030 Agenda for Sustainable Development and the Sustainable Development Goals (UN 2015) and particularly the Goal 11, calling for governments to make cities and human settlements inclusive, safe, resilient and sustainable.

The City of Belgrade is one of the cities that has expressed a desire to take a systematic approach to addressing urban environmental challenges. It is about to sign the Covenant of Mayors (CoM) for Climate and Energy and thereby commits to reduce its CO_2 emissions (and possibly other greenhouse gases) by at least 40%, increase its resilience to the impacts of climate change and provide secured access to sustainable and affordable energy by 2030. In order to achieve this, it is necessary to adopt, at the national level, the Law on Climate Change and the Carbon Dioxide Emission Reduction Strategy, which have a key impact on the development of policy and practice in this field.

2. GREEN BUILDING PRINCIPLES - STATUS AND PERSPECTIVES IN SERBIA

A building’s environmental performance can be improved through the following strategies:

- through the application of adequate expert solutions in the urban planning process;
- by maximizing the positive characteristics of the building’s location, and minimizing the negative ones (egg: proper orientation of the building in relation to the dominant winds, sunshine, appropriate building massing, glazing ratio, applications of green roofs and walls, etc.)
- through the application of technical and technological solutions and materials that reduce the energy needs of a building;
- through the use of materials and equipment with recycled content, which can be reused or recycled at the end of the building’s lifecycle;
- by generating renewable energy, and offsetting a percentage of a building’s energy demand;
- by applying sustainable water strategies, including the collection and reuse of rainwater, treatment and reuse of grey water and black water;
- by properly managing waste during construction and throughout the use of the building;
- by applying measures to ensure adequate thermal, visual and acoustic comfort of building occupants;
- by encouraging occupants to, when necessary adapt their behaviour and use a building in the most energy efficient way.

The Serbian Green Building Council (a member of the World Green Building Council) is a local body which promotes the benefits of green design and construction, and their contribution to the mitigation of climate change effects [4]. It highlights the areas where reducing carbon dioxide emission reductions can be achieved,

[1] Intergovernmental Panel on Climate Change’s (IPCC) report indicated that cities consume somewhere to 70% of total global energy and generate 80% percent of global carbon emissions [1]

and where the investments should be focused. These include: energy (electricity and heating), construction, industry, traffic (road traffic, railway, air traffic), municipal waste management, land and forest use, agriculture, etc. When it comes to cities, the building sector is of primary importance. The planning addresses the reconstruction of existing and the construction of new settlements and individual buildings, by relating these to carbon dioxide emissions. The emissions can be reduced through the design, construction, use and maintenance of buildings.

2.1. Situation in Serbia: science and practice

A significant number of scientists and researchers in Serbia is working in the fields directly or indirectly related to climate change, through projects of the Ministry of Education, Science and Technological Development of the Republic of Serbia and through international scientific projects. A large body of research has been published in international and domestic journals and monographs, and presented at conferences dedicated to this topic. It would be highly beneficial if the aforementioned Ministry, together with the Serbian Chamber of Commerce, addresses the practical application of the theoretical and experimental research, available knowledge and experience.

Regarding the issues of climate change in the field of urban planning and design, it seems that, in Serbia, the biggest progress could be achieved through legislative mechanisms. However, the effects of the actual implementation of these mechanisms in practice (the real contribution to mitigating the climate change effects) is difficult to estimate.

Energy efficiency and the application of renewable energy sources are the main priorities for reducing carbon dioxide emissions and mitigating the effects of climate change. The significance of energy efficiency is still not sufficiently recognized in Serbia, by the state, local self-governments, investors, citizens, or the media, which should play a very important role in this matter. The energy consumption in Serbia is twice as high as the average consumption in the 35 OECD countries. Since the buildings consume 60% of the final delivered energy, energy efficiency measures can have the greatest effect on reducing the country's emissions. Despite of this, the residential owners consider energy efficiency measures solely as an additional expenditure, and only 10% of domestic investors recognize them as a comparative advantage over the competition. On the other hand, so far 1766 engineers in Serbia, from various professions within the Serbian Chamber of Engineers, have been trained and licensed by responsible engineers for the energy efficiency licence [5].

Regarding the application of renewable energy sources in cities, the biggest progress has been made in the domain of solar photovoltaic systems.

More frequent extreme events such as floods, droughts, strong winds and very cold periods with increased snowfall require an examination of the vulnerability of settlements and the existing building stock in Serbia. Additionally, new adaptation models should be proposed for existing and newly constructed buildings, in order to withstand such challenges. A multidisciplinary approach is necessary for such proposals. Planners and architects are expected to expand their knowledge of the topic, as well as collaborate closer at the local and regional level.

The responsibility of the profession is to actively participate in the identification and forecasting of possible consequences of climate change and to propose effective and economical adaptation measures.

3. TWO EXAMPLES OF USING GREEN BUILDING PRINCIPLES

The research paper presents two examples of using the green building principles in Belgrade, Serbia. The first case study shows for possibilities of using photovoltaic panels and solar thermal collectors on a roof of a building of a local market in Belgrade, and the second case study presents a competition entry for the adaptation of the former Beobanka headquarters in central Belgrade. Both examples show the application of green building strategies in the city of Belgrade.

3.1. Study of the possibility of installing solar photovoltaic panels on a flat roof of the market in Blok 44 in New Belgrade

This research study has been carried out in the Institute of Architecture and Spatial & Urban Planning of Serbia and it was focused on the possibilities of installing photovoltaic panels and solar thermal collectors on roofs and facades of public buildings [6]. The main objective of this study was the use of solar energy for the substitution of electricity consumption in urban environments. The market building in Block 44 in New Belgrade

was conceived as a pilot project within which the methodology would be established, as well as the criteria that would indicate all advantages and disadvantages of using the green building principles on an existing building in the city.

The building of the market is situated in the zone of New Belgrade at N 44°48'2" latitude and E 20°22'58" longitude, at the corner of Jurija Gagarina and Nehruova streets. The building is in the urban environment with medium lot coverage. There are no tall buildings in the immediate vicinity which would cast shadows on the roof of the market building (Fig. 1). The territory of New Belgrade belongs to the area rich in solar resources and potential of solar energy is high and suitable for the use of both active and passive solar systems. The annual average daily solar radiation received on a surface ranges between 3.76 and 3.86 kWh/m^2 [6], [7].

The study shows ways of using existing surface of the building's roof for renewable energy generation. The masonry building shaped like Cyrillic "П" is closing the market on three sides (eastern, southern and western sides) [6]. Its roof structure is stable, and has the following dimensions: 55.72 x 16.49 m, 98.50 x 10.49 m and 47.72 x 16.49 m (Fig.2). The roof planes on which the solar systems are to be installed are at an angle of 17° to the south (Fig.1).

The lowest sun angles on 21st December are considered when positioning the panels. The applicable angles are those from the southeast direction (at 9 am) and southwest direction (at 3 pm), which are at our latitude about 12°, while from the south direction (at noon) about 22°. In the periods before 9 am and after 3 pm the solar energy can be used only to a limited extent. Shadow analysis were used to prove that after the adequate spacing of the panels, only a small number of solar devices are in shadow between 10 am and 2 pm on 21st December, while on 21st March, 21st September and 21st June, the solar devices are not in shade at any point during the day (Fig.3, Fig.4).

After the adequate placement of the panels, the research considered three different design option. The first included only photovoltaic panels, the second and the third were a combination of photovoltaic panels and solar collectors. The initial calculations were conducted using the standard photovoltaic panels of the following dimensions: 148x67 cm, an area of 1 m^2, and a capacity of 160W [7]. The assumption is that the panels are to be installed at the optimum angle of 35° for the purpose of generating maximum electricity each year[2].

In the Option 1 (Fig. 3,4), the photovoltaic panels in the eastern and western wing are arranged in rows of 16 panels (dimension of panels: 148x67 cm). The photovoltaic panels in the southern wing are arranged in three rows, where a double row of panels is formed in the last, third row. In the Option 2 solar thermal collectors are to be installed on the eastern and western wings in two rows with 12 panels in each row instead of the 2 last rows of photovoltaic panels. In addition to using the solar energy for generating electricity, this option is heating the water for the needs of the market building and its internal zones, used mainly for the sales of dairy products. The Option 3 has all elements as the Option 2, but it also envisages the installation of additional photovoltaic panels in the central part of the building. The central zone's dimensions are 8 by 24 meters, and photovoltaic panels are positioned in 7 rows with 11 panels in each row. Depending on the selected option, it is proposed to install between 954 and 1031 square meters of solar panels on the roof of the market in the Block 44. The panels could generate 196.6 MWh in the Option 1, 184 MWh in the Option 2, and approximately 200 MWh in the Option 3. The generated energy could offset the energy needs of the market for 3.5 to 4 months a year [7]. The estimated return of investment is between 9.3 and 9.5 years, while the expected lifespan of the system is 25 years [7].

Figure 1: Position of the building in relation to the context

Figure 2: Model of the building with new (central) roof

[2] When the panels are oriented at an angle of 17° towards the southeast in relation to the strict southern orientation the overall annual electricity consumption should be reduced by 3% relative to the maximum (southern) one

in relation to the south (17 degrees rotated)

source: Google Earth

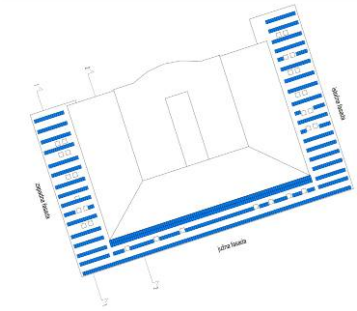

Figure 3: PV panels disposition in Variant 1

source: Study of Possibilities of Installing the Solar Photovoltaic Panels on the Flat Roof of the Market in the Block 44 in New Belgrade

source: www.gradjevinarstvo.rs

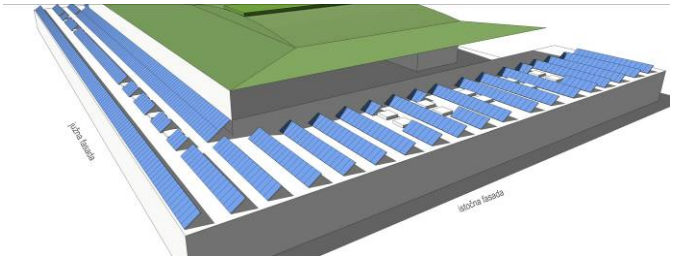

Figure 4: model of PV panels with shadows 21st of March,

source: Study of Possibilities of Installing the Solar Photovoltaic Panels on the Flat Roof of the Market in the Block 44 in New Belgrade

3.2. Competition entry for design of the Balkan eco-center at the Zeleni venac in Belgrade

3.2.1. Competition Requirements

In October 2018 Stattwerk Belgrade conducted an architectural competition for the design of the Balkan eco-centre in the former Beobanka HQ building[3] in central Belgrade. The competition was asking for a new approach to green building design in Belgrade. The main emphasis was on the environmentally sustainable adaptation of the existing building. The architectural proposal was supposed to, as far as possible, retain the structural system of the existing building. The breakdown of new functions includes office areas (20 percent of total area), rental apartments (10 percent of total area), educational eco centre (5 percent of total area), a restaurant, a sky garden, a lounge, and a car park (incl. spaces for bicycles and electrical car charging).

The design proposal had to be energy efficient, in order to allow the building to be independent from the conventional infrastructure (electricity grid). Another important aspect of the proposed design was supposed to be the integration of renewable energy technologies, which would ensure the project's energy independence. The competition requirements gave examples of renewable energy technologies including wind turbines, solar panels, kinetic energy generated in floors of common areas with high frequency of visitors or the car park, geothermal energy, etc. The application of new technologies was encouraged, even if these are not available in the Republic of Serbia, as long as the technologies had been tested and are proven to be efficient. The design was supposed to consider vertical gardens and green roofs. The car park should have been designed to promote ecological means of transportation, especially cycling and electrical vehicles [8].

3.2.2. Design Proposal

The presented competition entry (authors: Brankov B. & Stojković M.) is aiming to show the assessment of the competition requirements, exposing whether these could be met through the application of adequate green building principles, while identifying the challenges to achieving the building's energy independence.

The proposed design is offering an adequate visual representation of the existing building's massing and its clear structural solution (Fig. 5). The existing structural grid was used as the starting module for the formation of the new building's functional zones and shading elements [9]. The complex comprises of three buildings: Building A, a 6 storey south facing building on Zeleni Venac Street, Building B - a 14 storey tower, and Building C, a 7 storey building on Carice Milice Street (Fig. 6).

The competition requirement for the provision of 500 parking places was met by providing a new four levels parking structure (one underground and three over ground), inside the building C's courtyard. The car park structure has the appearance of a green hill, and is used as a garden for the office employees which can access it directly from the first floor of the building C.

[3] Building was designed by architect Milica Šterić in 1956-60. as the main headquarters of project house "Energoprojekt", but became the HQ of "Beobanka"

Shading Design

The external overhangs on the building A (Fig. 6, Fig. 7), which predominantly houses the eco centre and office areas are designed to the vertical shadow angle of 50 degrees, providing shading during summer and most of midseason, while allowing passive solar heating in winter. In addition to their solar performance, the overhangs are sized and positioned to maximise the views out. The tower (building B) has vertical greenery which is designed following similar principles as the fixed overhangs on the building A. The hanging greenery helps provide shade during summer and midseason, while allowing the low-angle winter sun in the apartments and offices (Fig. 7). The façade of the building C has a saw tooth shape, with west and south facing glazing (Fig. 7). The west facing glazing is overshadowed by the surrounding buildings and receives little radiation, and therefore does not require external shading. The south facing glazing has glass integrated photovoltaic cells, which also provide shading [9].

It is recommended that all spaces have internal blinds for glare protection.

Energy Independence

In order to offer the possibility of becoming an 'off the grid' building as per the competition requirements, the proposal was designed to be powered solely by electricity. A range of strategies has been assessed, with the initial aim of improving the performance over and above the current regulations, and then meeting the resultant, reduced energy demand through renewable energy.

The building model was produced using IES-VE 2017, which is an advanced dynamic thermal simulation software approved by USGBC and many other organisations and an approved software for code-compliance modelling. The building has been modelled with its surroundings, and the simulation used a climate file for Belgrade. The simulations have shown that by relying on the passive design strategies (relaxed temperature set-points, natural ventilation, the envelope performance as per the Passivhaus requirements), the building's energy demand can be reduced by up to 20% over a code-compliant building. Further savings can be achieved through the application of active strategies. A highly efficient lighting design is likely to reduce the total energy demand for another 9%. A combination of improved lighting design, efficient equipment and systems can result in up to 40% of total energy demand reduction. The application of photovoltaic cells on the roofs and the facades can help reduce the total energy demand down to 50% of what a code compliant building would require. The rest of the energy would have to be provided by off-site renewables.

Due to the building's shape – significant height with limited roof area, it is not feasible to achieve energy independence with currently available renewable technologies in an economically sustainable manner. However, due to constant advancements of green technology this might become possible in the future. For now, the key focus should be on the passive strategies and the responsible use of energy in buildings operation [9].

Renewable Energy

The average wind speeds in Belgrade range from 2.7 m/s to 4.0 m/s, which is not sufficient for the application of most small-scale wind turbines. The lowest speed at which a wind turbine is able to generate any power is around 3 or 4 m/s. As a result, any installed turbines would operate for a small percentage of hours and would have a long pay-off period. Additionally, the application of wind turbines in residential or mixed-use towers proved to be challenging due to noise and vibration issues (example: Strata Tower in Elephant and Castle, London). For all these reasons, the study did not consider the integration of wind turbines.

Kinetic energy plates are supposed to harvest energy from cars passing over a compressible ramp which drives a generator. This technology is essentially not harvesting free energy, since the cars need to burn more fuel in order to drive over the ramp.

The energy benefit of the application of similar kinetic energy plates in high frequency areas like corridors is expected to be very low due to the building's function and expected number of visitors. While this technology might be appealing to showcase in the eco-centre, it would not generate a substantial amount of energy to help the building achieve its energy independence goal.

Belgrade has a good potential for solar energy generation. By assessing the radiation levels on the building's façade (Fig. 7), the proposal is offering the best location for the installation of photovoltaic panels. Photovoltaic panels are primarily positioned on the building's roofs, for maximum energy generation. The roof of building B (the tower) is covered with high efficiency monocrystalline photovoltaic panels (PV area: 430 m^2,

PV efficiency: 21%). The building A has a roof-top bar covered with a photovoltaic canopy (total canopy area: 674 m^2, PV area: 472 m^2, PV efficiency: 12%). Finally, the roof of the building C (office building) is expected to be used only during lunch breaks, and, for this reason, has a photovoltaic floor instead of a canopy, as this technology allows for improved panel efficiency (PV area: 336 m^2, PV efficiency: 18%). In addition to these areas, there is a potential for glass integrated amorphous silicon cells in south facing glazing of the saw-tooth façade of the building C. This technology is less efficient, but can help provide shading, while generating energy. The total energy generated from the roof areas and south-facing glazing represents around 7% of the code compliant building's total energy demand, and around 16% of the proposed building, with highly efficient envelope and systems.

Sustainability and Wellbeing Benchmarking Systems

In addition to saving energy, the design proposal is addressing the visual, thermal and acoustic comfort of the building occupants. A meaningful integration of public art, food growing facilities, outdoor terraces, canteen, fitness centre and communal areas, all help address occupants' wellbeing. The design has a potential to achieve both WELL Building Standard and LEED BD+C Platinum ratings.

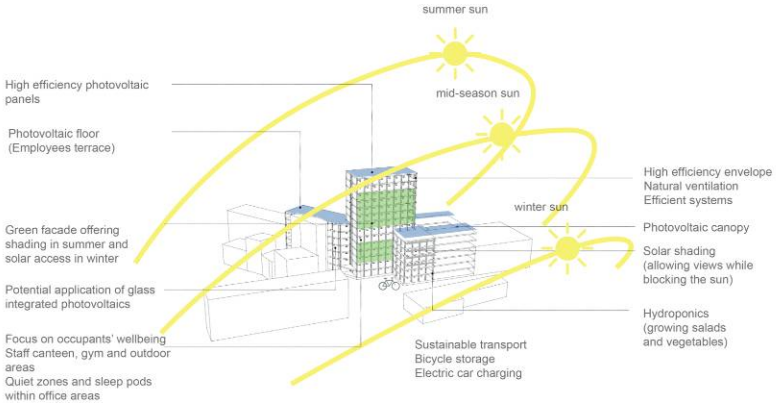

Figure 5: Key environmental design strategies

source: design proposal for Balkan-eco center (Brankov&Stojković)

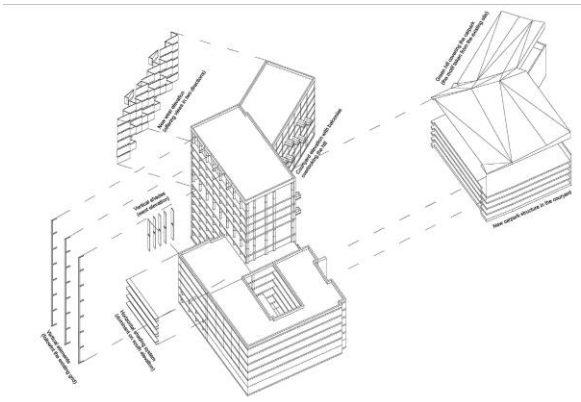

Figure 6: Model of the building with shading elements, vertical vegetation and covered car park

source: design proposal for Balkan-eco center (Brankov&Stojković)

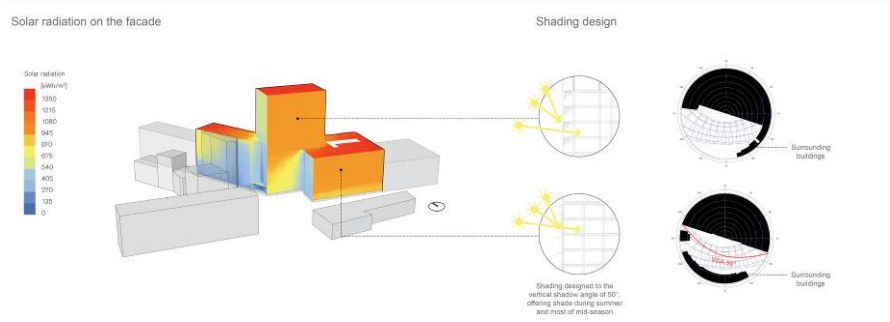

Figure 7: Solar radiation on the facade of the building and shading design

source: design proposal for Balkan-eco center (Brankov&Stojković)

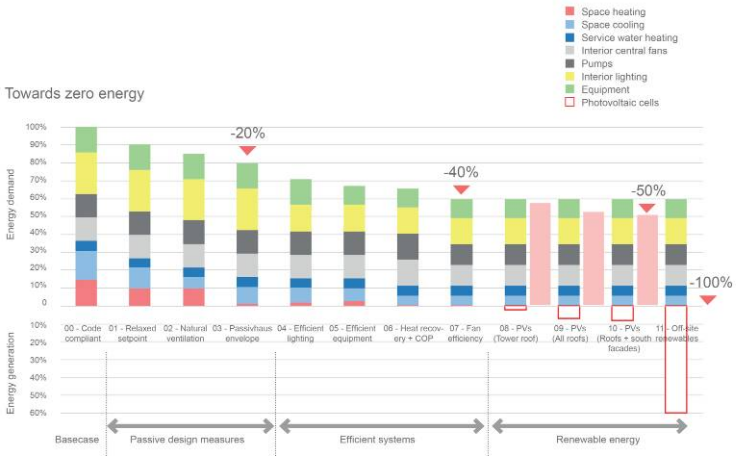

Figure 8: Energy reduction strategies

source: design proposal for Balkan-eco center (Brankov&Stojković)

4. DISCUSSION

Both presented case studies show the application of green building principles. The study of the photovoltaic panels and solar thermal collectors on the roof of the Market in the Blok 44 in New Belgrade is focused primarily on the application of renewable energy systems. It offers simple improvement options for an existing building, highlighting the potential benefits of such proposal in the analysed climate. The study's methodology can be easily adjusted to other building types and locations.

The design proposal for Balkan-eco centre is showing a holistic approach to green building. It is aiming to maximise the positive characteristics of the building's location and context, create suitable solutions for the building facades, addresses occupants comfort and wellbeing, and apply advanced technical and technological solutions that help reduce the building's energy demand. It shows how green technologies should be an integral part of any landmark building. At the same time, the simulation results show that, with the currently available technologies, it is still difficult to design a net zero energy mixed use tower. Nevertheless, the project's façade design and the energy performance optimisation methodology, especially its roadmap to a zero energy building, can be applied to other buildings.

Green principles can bring multiple benefits at the building and city level. More studies should showcase green building features in a coherent way, assessing their visual, economic and environmental impact. This would help improve the understanding of available technologies and their potential applications, and help accelerate their integration in Serbia's construction industry.

5. CONCLUSION

Resilience of cities and their adaptation to climate change are based on the basic principles of green building, which include a series of measures and actions that must be continually developed, adapted and applied in different fields. These fields, among others, include legislative, social, economic and technical, and require adequate managing due to numerous overlaps.

As a way of creating the right environment for future green construction in Serbia, it is necessary to pass a law on climate change, a national strategy to reduce emissions of carbon dioxide and other harmful gases into the atmosphere, and to develop a unique methodology for developing action plans for adapting local communities to climate change. All these documents must comply with the highest EU standards. The focus of a city's action plan on climate change must be on informing and educating its citizens, managing energy consumption and sustainable energy production, water resources, transport, sustainable procurement, managing natural resources, natural and cultural heritage, etc. Creating a set of regulations and by-laws will mobilize the right experts, and stimulate the investment in transformation and new technological solutions.

The study for the market in the Block 44 and the design proposal for Balkan-eco centre show two paths of use of green building principles in a contemporary practice. The principles of green building in Serbia are momentarily in their infancy, especially when it comes to built projects. It is, therefore, of utmost importance that the most successful examples of good practice are promoted and rewarded. Initiatives that go towards achieving the principles of green building need to be recognized by local authorities, experts and citizens. The transformation to a greener future is a slow process which requires both major financial investments and time. It is therefore important that at the outset, the cooperation between the public, private and academic sectors is combined with the expertise in the use of state-of-the-art technologies [10]. The formation of pilot projects is of exceptional importance in this field. One of the measures could be the establishment of demonstration zones and pilot projects focused on climate change adaptation and mitigation that help stimulate initiatives in the market, similar to urban and regional development zones established in Western countries.

The green building practices could be further encouraged by an energy price policy, information campaigns, favourable tax structures, tax incentives, donations and government favourable loans, international technical assistance and development programs [11]. The ultimate goal is to get the successful practices, tested in pilot projects, implemented on a national scale.

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REFERENCES

1. Mitigation of Climate Change (IPCC), 2014. http://www.ipcc.ch/report/ar5/wg3/ [Accessed: 31st July 2018].

2. Green cities methodology, European Bank for Reconstruction and Development (EBRD), 2016. https://www.ebrd.com [Accessed: 15th July 2018].

3. Municipal waste management across European countries, 2015. https://www.eea.europa.eu/themes/waste/municipal-waste [Accessed: 01st September 2018].

4. How to make building green, Serbia Green Building Council, 2017. https://serbiagbc.rs/o-zelenoj-gradnji2-2/?lang=en, [Accessed: 10th Avgust 2018]

5. Energy efficiency, Energetski portal, 2018. https://www.energetskiportal.rs/en/energy-efficiency/ [Accessed: 10th Avgust 2018]

6. Pucar. M. and Brankov, B., 2017. Possibility of using the solar energy by installing the PV panels on flat roofs of public buildings. Case study: Market in block 44 in New Belgrade - model-based approach -. PROCEEDINGS 5th International Conference on Renewable Electrical Power Sources, Belgrade, Serbia, pp. 163-168

7. Study of Possibilities of Installing the Solar Photovoltaic Panels on the Flat Roof of the Market in the Block 44 in New Belgrade, 2017. the Study led by: Pucar, M., Associate: Brankov, B., IAUS, Belgrade, Serbia.

8. Architectural Competition for Balkan Eco-Centre in Zeleni Venac, Belgrade, Stattwerk d.o.o., 2017. https://stattwerkbeograd.com/arhitektonski-konkursi/ [Accessed: 10th November 2017]

9. Competition entry for design of the Balkan eco-center at the Zeleni venac in Belgrade (former Beobanka building), 2017. Authors: Brankov, B. And Stojković, M.

10. Pucar, M., Nenković-Riznić, M, Petrović, S, Brankov, B., 2016. THE ROLE OF ARCHITECTS AND URBAN PLANNERS IN THE FORMATION OF THE CONCEPT AND FUNCTIONING OF SMART CITY. Conference proceedings from International Conference On Urban Planning ICUP2016, Niš, Serbia,p.p. 269-279

11. Pucar, M., Nenković-Riznić, M., Josimović, B., 2009. ENVIRONMENTAL PROTECTION IN THE FUNCTION OD REGIONAL DEVELOPMENT IN SERBIA, Keynote paper, INTERNATIONAL SCIENTIFIC CONFERENCE, Thematic conference proceedings Vol.1, Belgrade, Serbia, p.p. 287-319

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HOME BETWEEN THE HOUSE AND THE CITY – ARCHITECTURAL CONCEPT THAT USES URBAN PATTERN FOR HOUSING DESIGN

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ABSTRACT

When talking about the relationship between the residential architecture and urbanism, one can find a huge range of design concepts and ideas that deal with this ever-actual issue. Interior – exterior connection, i.e. the connection between the inside and the outside space, as well as the house and its surrounding, is in almost every architectural task must-appear demand. In modern Japanese architecture, among many interesting and original approaches in architectural design of single-family houses that tend to unify open and closed spaces, it is possible to find one particularly unique, where the living takes place in the space that cannot be considered as a house, at least not as a house described by conventional definition, but somewhere between the house and the city. This design approach observes the house not as one unique and compact building, but rather as a set of a group of structures unified in a fluid composition, allowing inside and outside space to overlap and integrate, with the main idea that the room takes over the role of the building and the building is organized in a form of a city. Such a concept, which is the subject of the paper, can be considered as a potential tool in connection of the urban planning and the architecture. It uses urban pattern as matrix for housing design. In order to find out its characteristics, potentials of use and other important elements which would contribute to better understanding of the conceptual idea, the concept will be researched through four case studies (Moriyama House by Ryue Nishizawa, House in Buzen by Suppose Design Office, Light Walls House by mA-style Architects and House before House by Sou Fujimoto).

Keywords: home, house, city

1. INTRODUCTION

Talking about design, i.e. shaping the space, architecture and urbanism cannot be separated. Although they are, in theory, two different activities, in practice they are never mutually exclusive, although the operation area of each can be clearly defined. Just as an example, to design a house would be a task mainly for an architect, while to design a residential block in city area is considered to be urban planning. But what

happens when the house and its surroundings could be found on the narrow border, i.e. when the home is located between the house and the city?

1.1. The subject, the goal of the paper and methods applied

In this paper is examined the architectural approach to the organization of residential buildings which is based on the scheme of city organization, i.e. organization of the part of the city. In this approach, residential unit is not observed as a whole split into rooms by walls, but as a group of different spaces in a specific place – smaller constructive units, volumetrically independent, but functionally conjoined into a construction. Urbanistic elements such as building, street, park or square are metaphorically translated into architectural elements of a room, hallway, garden (according to the principle: building=room, street=hallway, park=garden, square=living room). Architectural assembly of the building, observed from the point of form, is based on the loose structure made out of smaller elements scattered in space, randomly or by a specific scheme, whereby instead of composition, decomposition comes to the fore. Mentioned design approach, beside original, unique solutions which are in a constant interweaving of residential and urban, offers numerous possibilities that in architectural sense, primarily, could have a great influence on the residential comfort and improvement of life qualities of occupants, such as more pleasant microclimate and positive psychological influence due to penetration of greenery into the building, encouraged by the connection between open and closed areas. This paper's goal is to examine those possibilities and through analysis of the characteristics, determine the degree of applicability of given design approach in the organization of residential buildings, as much as to test potential limitations. In regard to that, in this research are done individual analysis of referential architectural designs which are taken as representative examples of the concept - four short case studies, which are, later, through comparative analysis, with modelling as an auxiliary method and observing method, used to determine some synthesized solutions.

1.2. Main principles and conceptual ideas

Principles on which the theory analysed in this paper is based on, are shown through forms adopted from urban structures by the architecture, in order to create matrix for spatial-functional organization of a building. In that manner is created a space that lies on the connection of opposites, in the domain of interweaving of inner and external, private and public, residential and urban, i.e. the house and the city (Figure 1). Commonly known case, in which the house if formed inside of a city, now is turned upside down, so the city is formed inside of a house. Individual rooms are taking the role of the buildings, free spaces between them are transformed into common areas, and communications are equal to city streets. With a variation on the topic, a large number of diverse solutions was obtained, and the main idea could be observed through the example of the architectural competition solution of a German architect Oswald Mathias Ungers, for the residential settlement *Neue Stadt* from 1963, through typology known as The house in towers, in which the layout of the building in the district is mapped into the floor layout of the apartments, and further, into the room layout in that apartment [5], through which the scheme of the organization is following the same template through three levels of spatial structures, from complex (urban) to simple (apartment) ones. The architect is perceiving the structure of a house equal to the structure of a city, just in a different scale [6], which is a proof that this idea has a wider use and it is not limited only to small individual residential buildings.

Figure 1: Main principles of conception (Illustrations by authors)

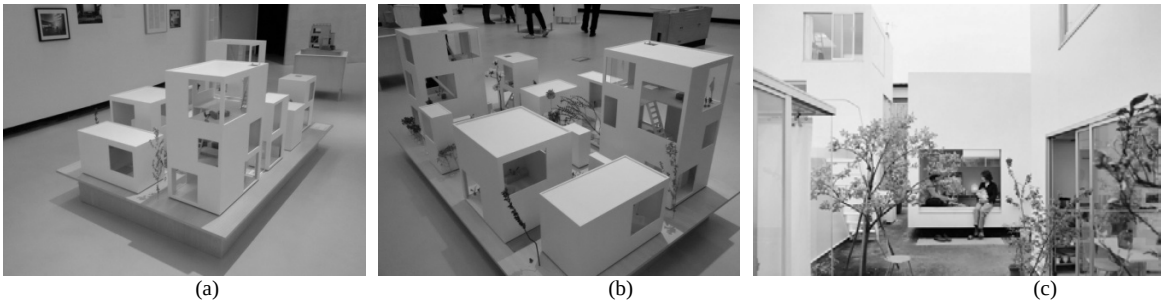
2. CASE STUDY REVIEW

For the purpose of this research case studies were analysed on the following projects: Moriyama House by Ryue Nishizawa, House in Buzen by Suppose Design Office, Light Walls House by mA-style Architects and House before House by Sou Fujimoto. In this paper are not presented detailed analysis which are done, but only the particularities which are of significance for the researched concept. Eligibility criteria is oriented

towards the connection with the original idea of conception and is based on the similarity of the organization schemes, with the limit to family residential architecture.

2.1. Brief description of projects

Moriyama House (Ryue Nishizawa, Ohta-ku, Tokyo, Japan, 2005) is a project of a residential building for a client with an unique decision – to quit his job [4], which led to a design solution in which the accent was on a building that can make profit, so the architect instead of a common approach, had the idea to divide the house into fragments which would carry specific content units, interconnected, but separated by garden spaces, which can be combined into independent functional parts, adaptable to different users – landlords and current tenants. In that manner, the potential compact building is divided into ten smaller units, scattered without any strict order, inside of the rectangular area. Each of the units is conceived as an orthogonal cube and contains certain contents. The high of cubes is various, from ground-floored to ones with three floors. Cubes are spatially independent, but functionally they are complementing each other and are combined in order to make a residential unit whole. The unique thing about these cubes is the way of their connection, which, in the lack of hallways, is not clearly defined, but left to users. In a relation to that, open green spaces between units are taking the function of horizontal communications (Figure 2.).



(a) (b) (c)

Figure 2: Moriyama House, Ryue Nishizawa, Tokyo, 2005 – (a),(b) model, (c) house

Sources of illustrations:

a, b – photos from private collection;

c – http://architecturenow.co.nz/articles/not-really-of-this-world-moriyama-house/, Accessed 17 Sep 2018.

House in Buzen project (Suppose Design Office, Buzen, Fukuoka, Japan, 2009) is developed by the idea 'to make equal the relationship between inside- and out by using courtyard as a part of everyday life and bringing inside activities outside' [2], i.e. ' to make a house with a courtyard that would become a playground naturally' [2]. In order to make this possible, architects are changing the conventional perception of a residential space and perceiving a house not as 'collection of rooms' [2], but as 'collection of constructions' [2] – six independent volumes connected with the glazed corridor of dual function (which is at the same time horizontal communication and playground, space for a break and a garden), creating in that way 'an interior space that feels exterior, a private space that feels public, a hall that feels like an avenue' [2], e.g. the space in which 'the children can run around' [2], the space in which 'you can enjoy a breeze while you eat' [2], 'read under the sun' [2] or 'fall asleep watching the stars' [2]. Formally, the building is of a simple form, where free-standing cubes scattered around the space play the role of rooms, unified by the transparent communication which represents the metaphor of a street – the place of connection, meeting, the space for play and relaxation (Figure 3).

Figure 3: House in Buzen**,** Suppose Design Office, Buzen, **2009** – photographs

Source of illustrations:

https://www.archdaily.com/50701/house-in-buzen-suppose-design-office, Accessed 17 Sep 2018.

Light Walls House (mA-style Architects, Toyokawa, Aichi Prefecture, *Japan*, 2013) is, initially, response to unfavourable location conditions with a lot of shadows, conditioned by narrow distances between opposite buildings [3], which further influenced the closure of the building to their surroundings and their opening to inner worlds. Introvert object with its side cover dissociates itself from the immediate surroundings, and makes connection with external world, e.g. lightning, through roof, and symbolically through spatial-functional organization, which copies the scheme of a city block. Conceptually, the object is formed by the principle space within a space, where inside of one cube (a larger space) are located smaller cubes which form the residential areas made of a sequence of 'opened' – 'public' and 'closed' – 'private' areas (Figure 4.). The larger cube is creating the general area of a house (the city) with, conditionally speaking, opened spaces (squares, plazas, streets) designed in a purpose of common family activities (living room, kitchen, dining room) and closed spaces (buildings) in which are located private (sleeping, bathroom) and utility functions (storage rooms), featuring in that way the idea of the architects which is preserved in their report on the building compared with the city bathed in light: 'Considering each box as a house, the empty spaces in between can be seen as paths or plazas, and remind us of a small town enclosed in light' [3].

Figure 4: Light Walls House mA-style Architects, Toyokawa, Japan, 2013 – photographs of the exterior and interior
Source of illustrations:
https://www.archdaily.com/433260/light-walls-house-ma-style-architects, Accessed 17 Sep 2018.

House before House (Sou Fujimoto, Utsunomiya, Japan, 2008) is experimental residential project with design based on the idea that people live not only in the inner, but also in the external spaces, so the house is not considered as a confined area, and it is developed as a structure which unifies individual objects, opened spaces and communications (stairs) [1]. Composition of the object is developed in the small rectangular area where the mentioned elements are intertwined. Inner spaces, i.e. rooms, are defined by the ten prefabricated metal boxes scattered horizontally and vertically, stacked one on another to the chaotic pile, from which the greenery grows, creating in that way a compact frame of opened and closed spaces. The connection between the rooms (the boxes) is enabled through stairs and ladders, and inner paths are mostly continued in the exterior. The user is offered a wide spatial diversity made by combination of spatial categories, which are in constant permeation (Figure 5).

Figure 5: House before House, Sou Fujimoto, Utsunomiya, Japan, 2008 – photographs

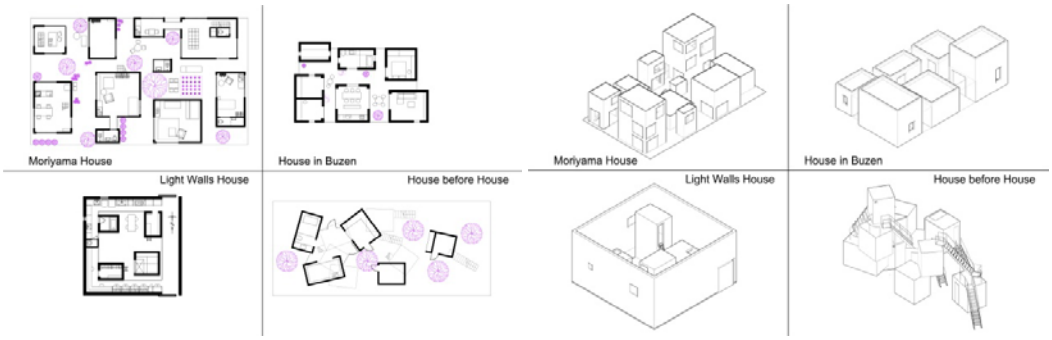
Source of illustrations:

https://inspiration.detail.de/house-before-house-in-utsunomiya-103440.html?lang=en, Accessed 17 Sep 2018.

2.2. Comparative analysis

By the comparison of the case study results determined in the projects of *Moriyama House*, *House in Buzen*, *Light Walls House* and *House before House*, the mutual similarity was established in a matter of spatial

organization of architectural compositions of these projects, which is schematically pointing on the connection with city area (Figure 6). However, the fact is that they have almost identical architectural approach, despite the initial similarity, indicates to indisputable originality and uniqueness of every single solution, to which also refers the diversity of design tendencies and final goals to which the architecture is tending to. Since the basic purpose of all analysed buildings is the same (they are family residential houses), functional contents are similar, so the analysis criteria is orientated mainly towards the spatial frame, spatial-functional organization and modelling.

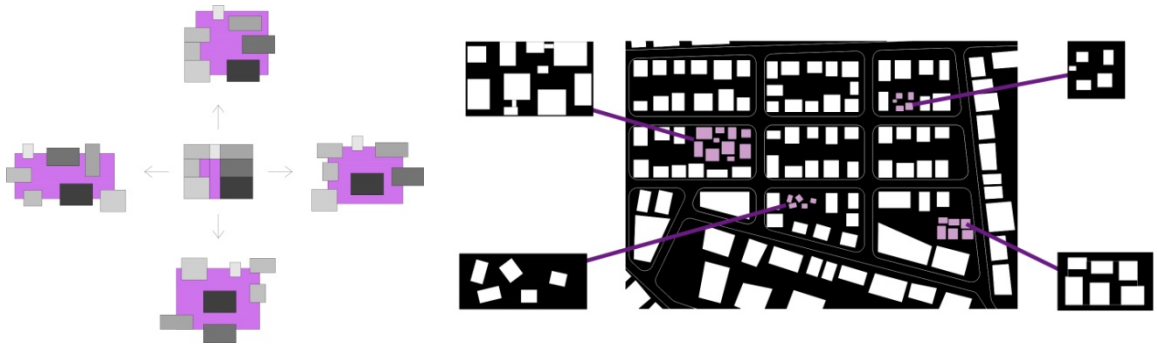


(a) (b)

Figure 6: (a) Floor plans of the analysed objects; (b) axonometric views of 3D models

(drawings are authors' interpretations of the drawings of the architects)

In object's spatial organization the decomposition is noticeable, which is the first important element characteristic for the analysed design approach. Instead of compact unity, the object is divided into a bigger number of units, freely positioned within the boundaries of space purposed for housing (Figure 7b.). Unified functions are divided in spatial frame of the composition, which is from the compact whole divided into fragments (Figure 7a.). These smaller spatial units are closed areas that in their interior combine certain contents. The number of contents varies, but qualitatively and quantitatively points to the fact that these partial units are non-existent by themselves, i.e. that they cannot support all needs user has, but that their functioning is complemented by the combination with other units. Usually, the one, smaller unit is functional equivalent to a single room, and spatially and formally to one object. The connection of the areas is not strictly determined, but rather defined by opened spaces created by its position in space and it is in a larger amount left to users.



(a) (b)

Figure 7: (a) The example of decomposition of compact object, displayed through various schemes,

(b) Decomposition of the architectural composition by the scheme which defines the similarities in the organization of the objects with a city – illustration (Illustrations by authors)

Therefore, the disposition of smaller units defines interconnections and relations, and relative to that the connections through and inside of architectural composition, which are more free, chaotic and frequent than in conventional residential structures (Figure 8.). The lack of borders, i.e. any kind of a wall or fence towards the neighbours, in projects of *Moriyama House* and *House before House* leads to the question of dividing private form public domain, which could create a conflict, because the paths through the object are often not just ones by tenants that lead from one space to another inside the house, but also the ones by neighbours and random passers-by. In case of projects *House in Buzen* and *Light Walls House* that problem does not exist, because the smaller units are located into a larger closed area, which defines the borders of the objects, or at least it is not evident in the same context, since here there can also be discussed about the conflict of the public and the private. Transparent cover in case of object *House in Buzen* creates the closed area which is visually opened and available to the surroundings, so the level of its privacy is significantly dropping. Similar to that, the space

designed for daily activities in the case of *Light Walls House* could be literally considered public, in the transmitted meaning of this term, when are observed its location and purpose in entire composition.

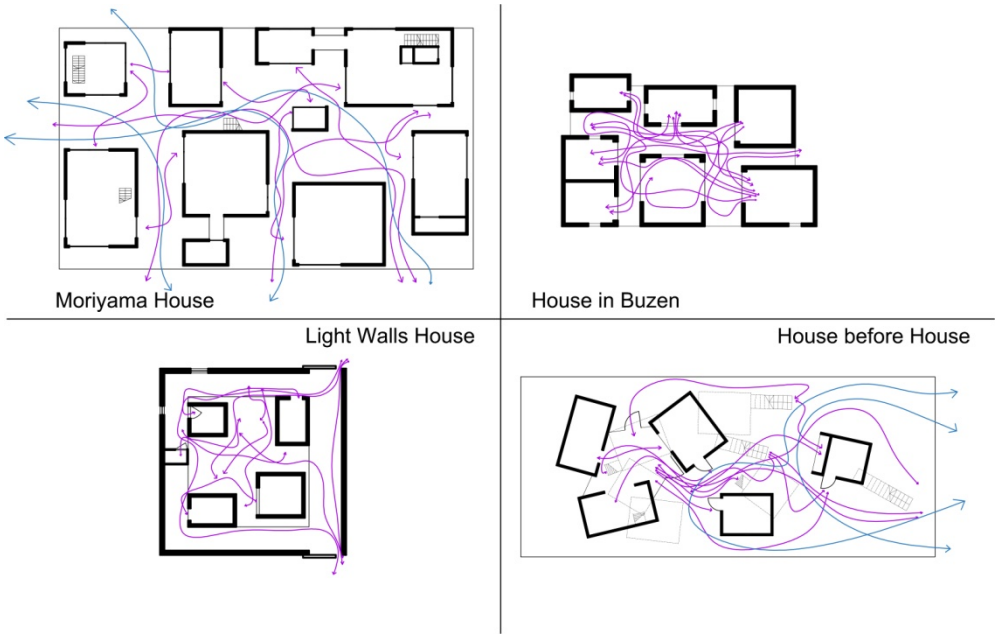
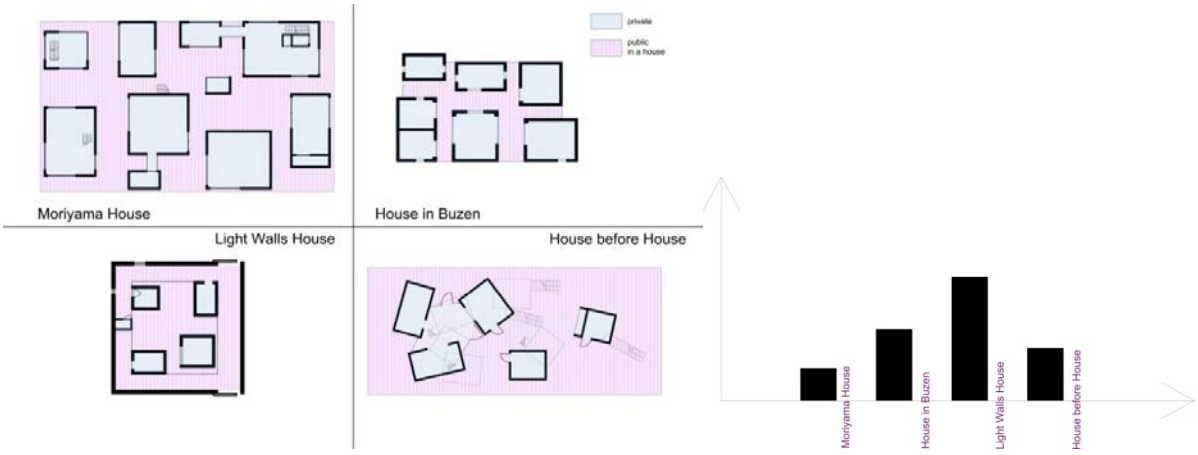


Figure 8: Schemes of the circulation through objects

(drawings are authors' interpretations of the drawings of the architects)

Accordingly, as one more feature of the analysed concept, stands out the presence of constant interweaving of the private and public. The level of pleasantness of the projects varies, and depends on the type of the border which separates the closed and the opened areas, i.e. the object from its surroundings. The highest degree of privacy is reached in the project of *Light Walls House* by introvert design of solid external cover, by which the object is completely closed to its immediate surroundings, while the lowest degree of privacy is in case of *Moriyama House*, due to the lack of any borders towards neighbour objects and streets or physical indications of private propriety, which is also noticeable in the case of *House before House*, although in smaller amount, regarding the context of its micro-location (Figure 9.).



(a) (b)

Figure 9: (a) The private and public domains in projects; (b) The degree of privacy in regards to surrounding

(a – drawings are authors' interpretations of the drawings of the architects, b – Illustration by authors)

In the sense of free spaces inside of a structure, a conclusion could be made in which they are not without purpose. They are actually the most significant elements of architectural composition, because their function is multiple. The primary and basic one is of horizontal communication, and the second, but not less significant, are green areas, garden, playground, space for rest and relaxation. In the project of *Light Walls House*, the free area is the most important, central area, in which are located the activities of eating in the dining room and

socializing in living room. Multiple purpose of these areas and imprecise defining in the sense of belonging to the interior and exterior (especially in the projects of *Moriyama House* and *House before House*, then in the project of *House in Buzen*) are indication to richness of spatial domains and transient forms of spatial categories recognized as interspaces or *in between spaces*– areas that cannot be defined as inner nor external, but as a combination of each and depending on the angle of observation can be the part of both the interior and exterior [7], which is the next important element, characteristic for this concept (Figure 10).

Figure 10: (a) Free areas as in between categories; (b) Free areas as focuses of the gathering and random contacts of users, which are metaphorically compared to squares (drawings are authors' interpretations of the drawings of the architects)

3. ADVANTAGES AND DEFICIENCIES OF THE CONCEPTUAL IDEA

By the comparison of the analysed projects, the advantages and deficiencies of analysed design concept could be established.

As advantages, the following characteristics stand out:

- Good connection between people and nature / good connection between exterior and interior (examples: *Moriyama House*, *House in Buzen*, *House before House*);
- Stronger social connections – people are meeting in the common areas, i.e. 'public rooms' (examples: *Moriyama House*, *House in Buzen*, *Light Walls House*, *House before House*);
- Dynamic life / dynamic residential area – the house is following natural courses and is in constant modification with them (examples: *Moriyama House*, *House in Buzen*, *House before House*);
- Convenience of sharing the space with other tenants in the case of renting the part of object.

The connection between the man and the nature is an expressed problem in the modern world. Large number of habitants and high population density, high level of construction are reversely proportional to the level on greenery, which leads to reduction of percentage of green areas in cities, thus to an increase of pollution and bad consequences on the life and health of habitants. The architecture is constantly trying to, through its activity, give contribution to this problem's solution. The design concept in the approach of organization of residential spaces analysed in this paper is potential aspect of participation in the campaign that fights for a healthier environment, in a way of bringing the part of nature inside of a construction and by starting from the smaller unit of urban space – the house, i.e. the room. Through the creation of spatial continuum of residential area and greenery (house + garden= inner + outer space= living area) the strong integration of inner and outer area is created, where the man is closer to the nature, and this unity reduces the negative influences on life in big city. According to the survey done for the purpose of the research (short survey conducted on a group of 41 people different in age and nationality – 20 to 72 years old, from Brazil, Croatia, Greece, India, Indonesia, Japan, Lebanon, Macedonia, Serbia and Turkey), where around 88% of the respondent said that would prefer to live in a house more open to the nature and the same percentage claimed that the garden is very important part of the house, it turns out that nature plays significant role in living.

When it comes to social relations inside of objects of this conception, spatial-functional organization itself accelerates the social contacts between the residents, or family members. Large and collapsed corridors, i.e. free spaces between the structures inside of objects are meeting points, as much as places for gathering and socializing. Also, individual units are visually more opened, because of their free position in space, and by that they are more expressed and exposed in the structure of the object and available to visual connections of tenants, whose sights are in constant intersection what is keeping the on close relations.

The dynamics of the objects is a characteristic that is mainly the quality of conception, in a case of interweaving of opened and closed areas, as in the projects of *Moriyama House*, *House in Buzen* and *House before House*, where it is manifested by constant outer influences and changes that happen outer natural and constructed environment. The life of object follows the cycle of natural changes, so it is in a constant flow of activities. The snow, the rain, the sun or the wind are not kept outside, but they are part of residential space. Their influence on happenings inside of the object depends on a structure itself, i.e. on level of exposition the object has towards the exterior, so it can be limited to only visual (the transparent cover in the case of the *House in Buzen*) or complete (*Moriyama House*, *House before House*).

The new trend in modern society is profit from the real estate. Renting objects for a short or a long period turned out to be a good investment (proof: the large number of internet portals where the users are offering their apartment or the part of an apartment with financial compensation, which are usually the cheaper, and often more comfortable option than the hotel). That would lead to a conclusion that the cost-effective house – the objects that is itself a way of profit, is current topic, and the researched concept could, in architectural sense, be considered as an option of finding the most acceptable model in this domain. Fragmental frame of the object is convenient because it offers greater freedom to its users, freedom that is achieved through the creation of various zones inside of the objects, which are, due to their disjunction and larger distances than in compact structure, more intimate and personalized to domestic and new users. Practically, everyone has its own part of the object and there is no interweaving of divided areas. Results of the conducted survey, mentioned above, also gave the data that 42% of the respondent find their house not so convenient for sharing with others in regard to renting it and 46% think that the houses based on this concept could maybe be more appropriate for that purpose.

As deficiencies the following characteristics stand out:

- Sustainability of the concept is based on lifestyles of users, i.e. their subjective attitudes – not every person can accept living in this kind of object;
- Wider use of the concept depends on natural conditions of the area – it is not convenient for every climate zones (This refers to the case that concept is based on radical matrix as in objects *Moriyama House* and *House before House*. *Light Walls House* and *House in Buzen*, on the other hand, are offering variants of potential overcoming the problem);
- Disjunction of space's structure can be critical in the sense of energy efficiency.

The biggest deficiency of this concept is its obvious dependence on subjective attitudes, on which also depends the fact if the concept is going to be accepted in the practice or not. Generally speaking, every architectural conception, which is primary the decision of an architect, is subjected to the judgment of the ones in a role of users. More conventional approach in the residential architecture is always safer alternative, when it comes to satisfaction of personal needs of users, because it is, as a verified solution, already adopted as a type of a standard. Nevertheless, the development of the architecture does not stop, and searching for new technologies spreads the horizons in residential architecture and is achieved through new ideas and concepts, in order to outdo common principles and habits. That is the reason why this concept could be observed as an aspect of prediction of futuristic residential models, which, in current time, appear radical to a large number of people. It is interesting that only nearly 10% of the people that participated in the above–mentioned survey, between different types of houses, that were offered in the question, choose to live in those similar to one from case studies. Most of them decided for conventional and more traditional (36%) or contemporary (54%) houses. Analysed projects are coming from the area of Japan and could be connected with often tendencies of contemporary architecture towards Japanese traditional architecture which strives to make a harmony between natural and built environment, and which is in direct relation with lifestyle conditioned by religion and culture of this nation. Approval or rejection of the concepts in other cultures cannot be precisely determined, but it can be predicted that the concept would be accepted in a smaller amount in Arabic countries, which can also be predicted in case of all western cultures that are used to a common house model. Social structure and willingness towards accepting new ideas is crucial moment for the successfulness of this concept. Generalization is not possible, but it is important to keep in mind the fact that the conception is depending on social context.

Inconvenience in a case of energy efficiency could appear due to increased area of the building's envelope. Disjunction of the structure is increasing the surface which should be isolated, so in that sense the investment is potentially larger. Nevertheless, this deficiency is not the final feature in the concept, because it does not

refer to all cases and methods of application (the example is *Light Walls House*, where exists only one unique envelope which is in contact to the environment and with rectangular shape, and of favourable shape factor).

4. FINAL CONCLUSIONS

Emblematic connection between the city and the house, displayed through the organizational scheme, presents itself as an interesting design approach which is evaluated as a search for new solutions, conceptions, lifestyles, forms of housing and spatial connections. People do not only live in their homes, but also in the streets, parks, squares, promenades, where they are spending a part of their time. Researched conception is trying to unify all of these areas and to limit them to a basic level in the hierarchical scale of the space, to transfer and modify something that originally belongs to a city, as a larger spatial society, to a home, a smaller spatial unity, basic cell in the final mechanism of urban organism. The urban public life is through architecture, transferred to a family life, and the habits which exist after the leaving a house are no longer abandoned on the entrance.

The research based on the comparative studies of projects, gave the results which defined the principles for the architectural concept of a subject. The common feature is expressed through minimalistic modelling which results the complex functional relations in the organization of residential objects. Basic characteristics are displayed primary through decomposition – fragmental unities, consolidation of open and closed parts and spatial multiplicity. External borders in the composition are indication on the possible classification in design approach to the closed, partially closed and opened structures. In the case of partially closed and opened structures, the equal importance is given to the inner and outer areas and the mix of green and built spaces is created, which leads to overlapping of the spatial domains of opened and closed area, while in the case of closed structures the whole city scenario is happening in the closed area.

The lack of clear border in the design of a space is creating a home located somewhere in a range of house and the city. There is no strict definition of a domain. In the boundary of residential architecture and urbanism, a place where people live is formed.

REFERENCES

1. ‘House before House in Utsunomiya’, DETAIL (Germany), 12/2009, pp. 1356-1359

2. ‘House in Buzen / Suppose Design Office’ 26 Feb 2010. ArchDaily. Accessed 17 Sep 2018. <https://www.archdaily.com/50701/house-in-buzen-suppose-design-office/> ISSN 0719-8884

3. ‘Light Walls House / mA-style Architects’ 05 Oct 2013. ArchDaily. Accessed 17 Sep 2018. <https://www.archdaily.com/433260/light-walls-house-ma-style-architects/> ISSN 0719-8884

4. ‘The Japanese House. Architettura e vita dal 1945 a oggi’, Exhibition, Museo Nazionale delle arti del XXI secolo - MAXXI, Rome, 09 Nov 2016 - 26 Feb 2017

5. Biscogli L., Germania di oggi: O.M.Ungers, Casabella-continuità, No. 305, 1965, pp. 36-59

6. Klotz H. (Deutsches Architekturmuseum Frankfurt am Mein), O.M. Ungers, 1951-1984: Bauten und Projekte, Friedr. Vieweg&Sohn, Braunschweig/Wiesbaden, 1985

7. Krstić H., Trentin A., Jovanović G., Interior – exterior connection in architectural design based on the incorporation of spatial in between layers, SPATIUM, No.36, 2016., pp. 84–91

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URBAN-ARCHITECTURAL ANALYSIS OF STUDENT DORMITORIES IN NIŠ

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ABSTRACT

With its University, Niš is known as a student city. For the accommodation of students, there are four pavilions that are placed in various locations. Since there is no campus, the dormitories are scattered all around the city`s territory, in the near of Faculties. They were built during 60s and 70s of the last century, and since then, except for two important architectural reconstructions, not so much has been changed in the sense of urb-architectural redesign. In the framework of the project Development of student dormitories in Serbia at the beginning of the 21st century, the paper considers characteristics of these dormitories from urban and architectural point of view. It tends to investigate the current conditions and check whether they are able to satisfy all the needs of modern living and student obligations. The special emphasize is given to the analysis of greenery and open-spaces capacities.

Keywords: student dormitory, urban-architectural analysis, student lifestyle

1. INTRODUCTION

University of Niš has 14 Faculties in its structure. 11 Faculties are located in the City of Niš, while other 3 are in Leskovac (Faculty of Technology), Vranje (Faculty of Pedagogy) and Kruševac (Faculty of Agriculture). According to data available on official web site of the University [5], number of students in the past school year 2017/2018 was 24625, counting all levels of studies, that include basic academic, basic professional, diploma academic, specialized professional, specialized academic and doctoral academic. The total number of dormitory beds in Niš is 1120, which presents only 4.55% of the whole amount of students of the University per year.

Student dormitories in the City of Niš are under the leadership of Student center, which is the company governed by the state. They are comprised of four buildings, that are not territorially unified, but are located in different parts of the city. Named after Pavilions I to IV, the buildings are divided into 3 groups: Pavilion I and II in the near of the Aleksandar the King`s Square, Pavilion III near City`s hospital and Pavilion IV on the open field behind the Fortress of Niš. They all were built in the beginning/middle of the second part of 20th century, according to design standards that were in use at that time. Period of their construction is known for serial and prefabricated construction, which means that similar solutions were applied in many different architectural projects of the same type (for example the Student dormitories '23. oktobar' / '23rd October' and 'Sajmište' in Novi Sad have the same ground floor plan as the Pavilion III in Niš; Pavilions I and II are conceptually 'very similar to the II pavilion of the Patris Lumumba students` dormitory of Belgrade' [3], where 'the solution for pavilion II is identical to the proposed feasibility study for students` dormitory near Pančevački most in Belgrade, the building of which has never been constructed' [3]). Those solutions were good for the time they were built, but the needs and habits of the students in the 3rd milenium have been significantly changed, espetially with the rapid progress of the technology and technics. Having in mind the fact that Serbia is a country of not very developed economy, which affects every brunch of its activity, including student housing, that in a great menner has a degree of public living, the aim of the paper is to investigate what is the current

condition of student dormitories in Niš, which are the subject of this research, from the architectural and urban point of view, and are they adequate to satisfied modern student`s life. The aspects that will be considered in the investigation are focused on functionality, appearance and available content, with the accent on open green spaces and possibilities of additional activities.

2. DORMITORY BUILDINGS – ANALYSIS

Pavilions I and II are located in the near of the Faculty of Economics and the Faculty of Law (Topličina street No.2). They were built in 1966 and 1969 and contain two-bed and three-bed rooms, which are characterized as the second category type of rooms. Pavilion I has 63 rooms and can facilitate 185 students, while in Pavilion II there are 54 rooms that can facilitate up to 162 students. Both buildings have computer and TV room intended for the common use of the students, as well as a spacious room for learning. [4]

Pavilion III is located in the near of the Faculty of Medicine (Velikotrnavska street No.2). It was built in 1963 and reconstructed in 1997. In 2012 was made a complete facade reconstruction, according to the highest standards of Energy efficiency. Building has 110 rooms, mostly two- and three-bed rooms, and has the capacity of 238 places. As additional content, can be found internet hall with computers and a room for learning. [4]

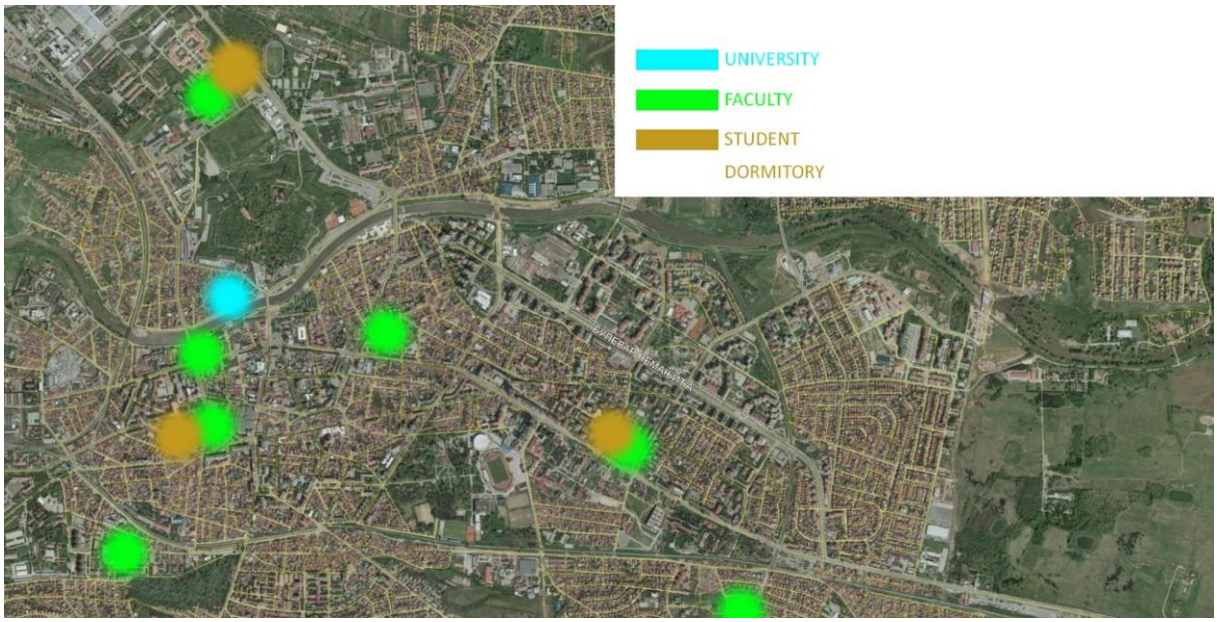

Figure 1: Location of Dormitories around territory of the city and its position towards the Faculties and the main University building

Source: gis.ni.rs, Accessed 24 Sept 2018 / authors

Pavilion IV is located in the near of the Technical Faculties. It was built in 1977, and due to destructions suffered during NATO aggression in 1999, has been completely reconstructed and adopted to modern standards. The number of students that can live in the building is 353. They are placed in 184 one- or two-bed room types of the first category, which are organized in groups – units of two to three rooms that contain common kitchen and living room. [4]

Table 1: Dormitory pavilions

Student dormitory	Address	Year of construction	Year of reconstruction	Number of rooms	Capacity	Number of floors above the ground	Type of rooms	Organization of rooms	Additional content
Pavilion I	**Topličina street No.2**	**1966**		**63**	**185**	**6**	**2/3 bedroom**	**Single units**	**Computer room, TV room, Reading room**
Pavilion II	**Topličinastreet No.2**	**1969**		**54**	**162**	**6**	**2/3 bedroom**	**Single units**	**Computer room, TV room, Reading room**
Pavilion III	**Velikotrnavska street No.2**	**1963**	**1997, 2012**	**110**	**238**	**5**	**2/3 bedroom**	**Single units**	**Internet / Computer hall, Reading room**
Pavilion IV	**Bulevard of Nikola Tesla**	**1977**	**2001**	**184**	**535**	**12**	**1/2 bedroom**	**Grouped units**	**Reading / Drawing room**
Total number of rooms / places for students				**411**	**1120**				

Locations of Pavilions are presented on the map in Figure 1, where can be seen their relation to the existed Faculties and main building of the University. It can be noticed their dispersion across the whole city`s territory. Table 1 shows short review of main information on each dormitory building.

2.1. Functional analysis

Initial design of dormitories in the sense of functional organisation of student units is based on the satisfaction of minimal student needs and does not offer any greater comfort. Observing typical floors in each of the architectural projects (Figure 2), it can be seen that the rooms are lined up around or along the horizontal communication (hall). The bathrooms, showers and toilets, are shared between the students. In Pavilions I, II and III, there is one sanitary block per floor, which means that 11, 7 or 24 rooms use the same bathroom, while in Pavilion IV the situation is in a way better – a group of four rooms has its own bathroom, as well as small kitchen. Rooms are mostly intended to accommodate two or three persons and are of minimal size.

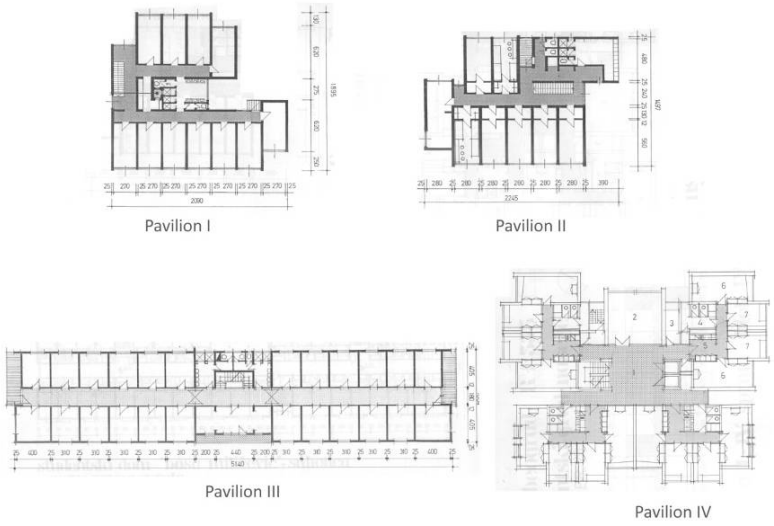

Figure 2: Typical floor plans of Pavilions (original designs)

Source: Cekić N. Vasilevska Lj., *The students of Niš residential capacities analysis from the points of views of urbanism and architecture*, On ecourbarchitecture students homes, monograph, Faculty of Civil Engineering and Architecture University of Niš, Niš, 2017, pp. 7–14

On typical floors, can also be noticed the lack of open spaces in rooms, such are balconies or loggias. Pavilion III contains few loggias with the access through the hall or common room. Although their area is not big, they represent important part of the space, giving the students possibility to take a fresh air or serving as a meeting point where residents can meet each other in a more relaxed atmosphere.

Figure 3: Typical floor plan of Pavilion IV after reconstruction

Source: Project of reconstruction by Dušan Ilić

When analysing functional content and its spatial organisation and dimensional aspect, one should have in mind the period when the dormitories were built, with the special attention paid to the political and economic framework of the time. Social occasions that ruled 60s and 70s in the last century in SFRY were strongly dedicated to the communism, which shaped almost all the domains of human life, especially the construction and architecture. Living in community was feature characteristic for the communist era, but since then, a lot has been changed. Today`s Serbia and global modern tendencies require different demands. The life today is more oriented to individualism than to unity, which is also reflected to residential architecture and therefore to student habitation. That does not mean that the student should be isolated, but that he needs more privacy in a collective housing, which leads to the conclusion that dormitories in Niš need to be adopted to contemporary requirements and lifestyle. During few reconstructions made in the buildings of Student dormitories, some changes have already been made, but are definitely not enough, since they were not applied in all of the four

structures. The best improvement can be noticed in the functional reorganisation of Pavilion IV, where private bathrooms were added to each of the rooms and common spaces inside of the grouped units were converted into gathering places composed of common living room and mini kitchen (Figure 3). It is obvious that the interventions were made at the expense of the rooms` areas, but despite this, the rooms haven`t lost much of the comfort, while increasing the level of privacy.

2.2. Aesthetic analysis

In the sense of form and aesthetics, dormitories are characterised by regular and orthogonal shapes, with dominance of straight lines, clear geometry and elements that repeat themselves. The outside appearance is in a great way reflection of the inside functional organization and the buildings` structure. Openings follow the spatial layout of the rooms. Materialisation and colorize in Pavilions I, II and III are very similar, where facades are done in conventional demit style, which is, due to its low price, very typical and frequent in the architecture of Niš, but quite unatractive and very ordinary. On the other hand, Pavilion IV to a full extent reflects the spirit od socialism and stands in its original design form. Despite the reconstructions and rennovations that were done, it can be concluded, that from the aestetics point of view, in all the Pavilions no changes have been made. In that sence, the buildings take a risk to be monotone, boring and uninteresting not only to users, but to the whole city and its image. Most of the pavilions are in the very central core of the city and therefore their role is even more important and demanding, cause they should contribute to a better apperience and the city`s representation.

(a) (b) (c)

Figure 4: Entrances to the Pavilions (a) I and II, (b) III and (c) IV
Source: authors` photos

The architectonic value of the dormitories is quite questionable. Here it is more about the pure purpose and less about the design. The focus of the architecture is more on the basic needs and the other aspects are pushed in the second plan or are not placed in the consideration at all. In order to become attractive and dynamic, it is required to pay better attention to the aesthetic aspect and the recommendation is that this should be taken into account if the future reconstructions will be planned. Suggestions are directed towards the possible buildings` facades remodelling, especially their main and most exposed parts, establishment of better segregation with the surroundings and giving attention to the role of the structures, knowing that they are important landmarks of the city, even they are basically nothing but the residential buildings. The fact is that their form is strongly linked to the place. The Figure 4 shows the current state of the main entrances to the buildings. Reconstructions could make them look more accentuated.

2.3. Green space analysis

As architectural designs of dormitories doesn`t offer enough open areas inside the buildings, which was the conclusion of the chapter 2.1., it would be desirable to compensate their absence with green areas around the building. However, green areas are in the case of Pavilion I, II and III strongly conditioned by the location, which is quite densely constructed. There is not enough space to create any bigger green space or space for recreation and relaxation, except for small park. Small green areas already exist in front of those buildings. The problem is the condition in which they are: no mobilier or old and worn out mobilier that is dysfunctional (primary benches, lamps, plant pots), greenery that needs to be better kept and maintained, as well as poor paving.

(a) (b) (c)

Figure 5: Green areas in front of the Pavilions (a) I and II, (b) III and (c) IV
Source: authors` photos

The situation in Pavilion IV is a little bit better, since the location is out of the central territory and the area around dormitory is due to greater spaciousness more comfortable and suitable for other contents, but the problems recorded in previous paragraph are the same, which can be seen from the photos shown in Figure 5.

(a) (b) (c)

Figure 6: Green areas on micro–location of: (a) Pavilion I/II, (b) III and (c) IV
Source: https://www.bing.com/maps, Accessed 27 Sept 2018 / authors

The lack of open spaces in Pavilions directs users to nearby parks, which are considered as replacement for dormitories` green areas. Figure 6 shows relations between dormitories and local parks, while Figure 7 gives the overlook of directions to the green areas on macro plan of the city. Distances vary in the range of 160 m to 1.7 km.

Figure 7: Gravity fields of dormitories in a search for green areas around the city
Source: https://www.bing.com/maps, Accessed 27 Sept 2018 / authors

After the analysis of open space and green capacities made in each of the Pavilions, it can be concluded that they are pretty limited. First of all, arises the problem of restricted area which could be used for that purpose, which does not allow creation of additional open facilities for sport and recreation or any bigger intervention (Figure 8). Since extensions are not possible, only left solution is regeneration of existing greenery and renewal of its mobilier, in order to make it fully useful and alive.

Non-existence of the facilities for sport and recreation directly affects the quality of students` life. Leisure activities should be equal part of student routine, as are academic activities or studying. Since the offer of them is quite modest, or, to be more exact, improvised, students are left to themselves and are oriented to search other options in the city which they can afford themselves according to their personal and economical possibilities. It is obvious that improvement of the facilities and variety of functions is necessary. Unfavourable situation is that that the Pavilions are not grouped in one place, but are allocated around the city. That gives no

possibility to create one unique area in the near of the Pavilions which would unify content of that kind (for example park, walking promenade, water surface, open/closed playground, open amphitheatre and so on) and would be at disposal to all the buildings of student dormitory. It can be the solution to have one joint 'green center' located independently in the part of the city on reasonable and approximately equal distances from each of the Pavilion, which is more economical option than construction of four separate smaller areas, which due to the lack of the free surfaces, are also not acceptable potentiality.

(a) (b) (c)

Figure 8: Green areas around the (a) Pavilions I/II, (b) Pavilion III and (c) Pavilion IV
Source: authors` illustration

3. DISSCUSION AND CONCLUSION

Short research that was made through this paper aimed to give overlook of the current condition of student housing in the City of Niš, 3rd biggest city in the Republic of Serbia and an important University center of the country. Analysis of the current architectonic and urban state of the student dormitory buildings are first level to the further achievements that are necessary to be done in order to increase the quality of student life, having in mind that educational system in Serbia has been significantly changed, which reflects on the employees and students and generally on the whole institution dedicated to education: 'Conditions for creating increased professors` and students` mobility and raising the quality of education on higher level, have actualized conceptual changes in organization and mode of students` living, in a way of perceiving their real, everyday needs' [1]. Case studies of four Pavilions gave the result that buildings of student dormitories require bigger changes in a sense of, most of all, their functional organization. Units of three people, with shared bathroom facilities are overcome long ago and are not suitable for modern learning system and contemporary lifestyle. Student`s need to have higher level of privacy and the possibility to live without interruptions, but to, at the same time, have possibility to gather with other students, forms the structure. Here, the biggest problem also appears in the size of the units, which is set to minimum or even under the minimum required for the certain number of users. For example, in Pavilion I, the size of three-bed unit is around 15 m^2 (2.70 m x 5.70 m), which is approximately 5 m^2 per tenant [3]. 'Worldwide experiences show that the most contemporary student apartment units are architectonically organized on the area of 18 m^2 to 40 m^2 and that in more than 90% of cases, they are of one-bedroom type. Two-bed room residential student apartments can be seen in a smaller number of student dormitories. The content of student apartment unit obligatory contains toilet, with the access from the entrance area, with living room that can have small open area: loggia or terrace. Student apartments are highly comfortable and except for bed, they are also furnished with kitchenette, wardrobes and learning zone.' [2] Reorganization of residential units could potentially decrease the capacity – the number of students in dormitories, but the intervention would significantly increase the quality of facilities and directly affect the living conditions of students. That means that new buildings are required, in order to host larger number of students. In this regard, should be mentioned a new structure that is under construction in the near of Pavilion IV, which is positive step that lead to the partial solution of the identified problem.

Apart from functional reorganization, the conclusion is that the changes are required also in the scope of aesthetic and greenery remodeling, which was considered in the 2.2. and 2.3. chapters. Both of these parts are crucial, the first maybe not for student life, but for the city, while the second directly affects the living comfort of the residents. It is necessary to reconsider the integration of the structures and environment, which puts in the foreground importance of architectural and urban planning interrelation. The lack of the green areas should be solved through reconstruction of the free spaces around the buildings which exist on sites or by considering the possibility to use the roof as an open green terrace.

Final conclusion of the research is that despite the unfavorable condition of the dormitories in Niš, there are plenty of possibilities to overcome the problems or at least to moderate negative effects that are present in today`s everyday life of their residents and are caused by urb-architectural effects on them. Clear and regular structure allows for simply retouch without any complicated processes, making the reconstruction easily to be made. Additional recommendations are to take a look into wider range of architectural projects of the type, mainly those contemporary ones which proved to be successful in practice, and try to learn from their experiences and adopt new and good approaches to design applicable also in our society.

REFERENCES

1. Cekić N., Vasov M., *Urbarhitektonska analiza razvoja stambenih jedinica u studentskim domovima Srbije početkom 21. veka sa preporukama za budućnost*, Izgradnja studentskih domova u Srbiji početkom 21. veka, Građevinsko – arhitektonski fakultet Univerziteta u Nišu, Niš, 2017, pp. 7–71
2. Cekić N., *O arhitekturi studentskih domova*, Građevinsko – arhitektonski fakultet u Nišu, Niš, 2017
3. Cekić N. Vasilevska Lj., *The students of Niš residential capacities analysis from the points of views of urbanism and architecture*, On ecourbarchitecture students homes, monograph, Faculty of Civil Engineering and Architecture University of Niš, Niš, 2017, pp. 7–14
4. http://www.scnis.rs/, Accessed 25 Sept 2018
5. https://www.ni.ac.rs/en/faculties, Accessed 27 Sep 2018

NEW URBAN FORMS AS A RESPONSE TO CLIMATE CHANGE – THE CASE OF WATER SQUARE BENTHEMPLEIN IN ROTTERDAM

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ABSTRACT

In response to climate change in urban areas in developed countries several modern stormwater approaches have been integrated in the process of urban planning and design. As opposed to the traditional, these approaches offer opportunities to reduce the amount of surface water and the level of flooding and also increase design potential of the physical environment. Their goal is to create a functional, attractive and environmentally-friendly urban environment, which would be adapted, with its structure, to the current challenges. While solving the problem of flooding, increasing the capacity of the existing drainage system in urban basins and supporting the natural hydrological cycle, modern approaches have also adopted some additional goals, such as: 1) improving the quality of life; 2) reducing the negative impacts of stormwater and managing risks; 3) improving the quality of water resources, and 4) the preservation and improvement of urban ecosystems. The implementation of stormwater management led, among others, to origin of completely new urban forms such as water squares. The research focus is on the first large scale water square located in the high flood risk zone - the Benthemplein in Rotterdam. This example indicates the basic intention of modern approaches - establishing a greater harmony between water as a key resource and the social community.

Keywords: modern stormwater approaches; urban design; environmentally friendly; water square; Benthemplein

1. INTRODUCTION

As a result of the need to find answers to the climate changes, one of the growing global problem that human society is facing for the last decades, among others, modern stormwater management approaches have been created in several developed countries (Fletcher et al., 2015). Although there are certain differences between approaches, in general, their goal is to create a functional, attractive and environmentally-friendly urban environment, which would be adapted, with its structure, to climate changes such as increasing the frequency and intensity of storm events. The concept of all approaches is based on replacing the existing drainage system in urban basins or creating new ones using measures and elements that imitate or support the natural environment. (Gordon-Walker et al., 2007). While solving the problem of flooding and increasing the capacity of the existing drainage system in urban basins, by supporting the natural hydrological cycle, modern approaches have also adopted some additional goals, such as: 1) improving the quality of life; 2) reducing the negative impacts of stormwater and managing risks; 3) improving the quality of water resources, and 4) the preservation and improvement of urban ecosystems. In line with this, quite opposite to the traditional approaches, the modern ones offer the possibility to form or increase design and usable potential of the urban environment, existing or newly planned, as well as to establish a greater harmony between water, as a key resource, and the social community. While selection and implementation of measures and technical elements of modern stormwater management approaches in newly developed urban area mostly depends of the characteristics of natural conditions, in already built-up urban environment the character and the possibility of their application are additionally dependent on the characteristics of the existing physical structures. In the second case, when the upgrading and/or reconstruction of the existing system is performed, the planning, design and construction issues are much more complex due to the following: 1) complexity of the practical options for solving the problems related to the quantity and quality of stormwater in the built environment, 2) in densely built-up urban areas, the problem of infiltrating the surface rainfall is severe, and often there is even no possibility of infiltration, and 3) activities related to the reconstruction of the existing system are most often

realized within the framework of urban regeneration projects, which is even more complex process according to the goals and structure (Vasilevska et al., 2018). On the other hand, various examples of good practice imply that the modern stormwater management approaches have found their adequate usage in the process of urban regeneration (for example Augustenborg in Malmo, Friedrich-Engels Platz in Vienna, housing area in Potsdam, residential area Nový Lískovec in Brno etc.). In addition to contributing to the solution of the problem of flooding within inherited urban areas and, in synergy with urban planning and design, to better quality of life in them, the application of principles and technical measures of modern stormwater approaches has also resulted in the emergence of completely new urban forms - water square. In line with this, the main research goals in this paper are the following: 1) to analyze principles of organization and basic characteristics of water square from physical, social and environmental point of view, and 2) to investigate a multiple benefit of their application.

2. METHODOLOGY

The methodological framework of this paper is based on an analytical approach which relies on methods of description, analysis and case study. The method of description and analysis was applied in analysing the basic characteristics and possibilities of applying the new urban form – water square, and exploring the methodological and conceptual framework of its integration into the process of urban planning and design. The benefits of implementing this form in the urban regeneration process have been investigated and analysed using the case study of Benthemplein Water Square in Rotterdam, the first water square in the world.

3. WATER SQUARE AS A NEW URBAN FORM – SETTING THE CONTEXT

Water square (dutch *Wateplein*) was designed to retain water during heavy rainfall in densely built urban areas, thus solving the problem of flooding and increasing the capacity of sewage system. This sustainable, innovative solution was created as a response to climate changes. The typology of the new urban form was devised in 2005 by urban designer Florian Boer, from the office “DE URBANISTEN”, and architect Marco Vermeulen, from “Studio Marco Vermeulenin”, for the International Architecture Biennale Rotterdam “The Flood”. The initial and typology research and design of the first water squares was conducted in 2006-2007, after which they became a part of official urban policy within the document "Rotterdam Vaterplan 2". The additional, pilot study was carried during the years of 2008 and 2009. Within it, water squares were presented as a multifunctional open space who, depending on climatic conditions (Figure 1), serve to different purposes– they are stormwater storage during and after extreme storm events, while, support by its form, contents and design, in dry period serve as a quality public open space. The plan was to bring the water on the surface, making it an element that contributes to the quality of life and not hiding it behind pipes, which supports the paradigm of modern stormwater management approaches - “living with water”.

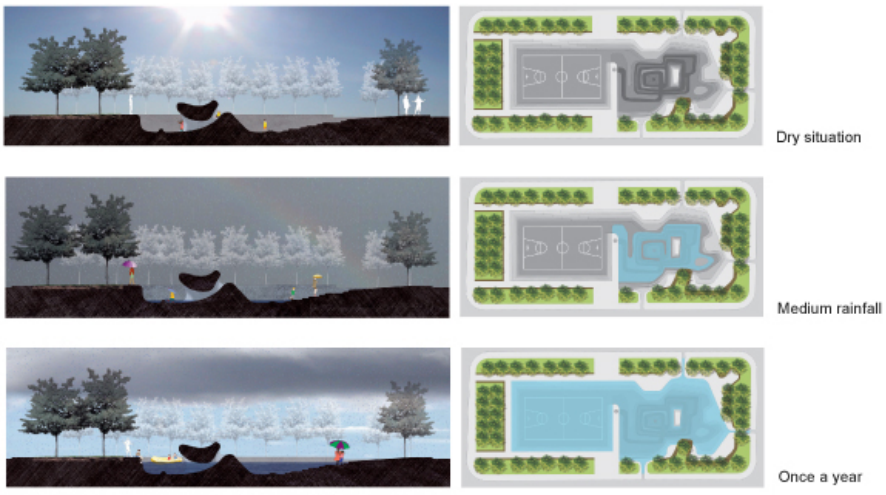


Figure 1. Relations between square capacity and different amount of rainfall.
Source: http://www.urbanisten.nl/wp/?portfolio=waterpleinen

The exemplary design was envisioned as a set of surface reservoirs, which will be used as recreational space. Most of the year it will be dry, but during heavy rainfall the reservoirs will gradually be filled with rainwater from neighbourhood. (Figure 1) The water will maintain on the square until the capacity of existing drainage system in urban basins is increased. While designing a water square one of the important features to be

considered is the town groundwater level. Lowest point of the square must be below the groundwater level, which implies that the buffering facility has to be waterproof to stop the groundwater from entering the square (https://www.urbangreenbluegrids.com/measures/water-squares/). The other features to be considered are management and maintenance of the water square after the rainwater is withdrawn.

The water square as urban form can be connected with various urban function, within residential, recreational or inner city mix-use, densely populated areas. The benefits of its implementation are multiple and include the following: 1) increasing the design potential of urban environment; 2) creating multifunctional urban areas; 3) reducing the flooding of the area.

Following the previous studies, in 2011 the Dutch office "DE URBANISTEN" designed the first water square Benthemplein in Rotterdam.

4. THE CASE OF WATER SQUARE BENTHEMPLEIN

Benthemplein is located in Agniesebuurt, the densely populated neighbourhood in Rotterdam, surrounded by "Zadkine" college, "Hofplein" Theater, professional institution for media, design and technology "Graphic Lyceum", sport center, Government Offices and other facilities (Figure 2). Rapid urbanization shaped this empty space between the buildings as unattractive and unused open space, while only some elements of landscape architecture survived due to regular rainfall that enrich the space.

Figure 2. Benthemplein water square before intervention.
Source: http://www.arquitectes.cat/iframes/paisatge/fotos_proj/8a_BIENNAL/P8441/P8441F6.jpg

The project is based on the participatory model of planning. With involvement of teachers and students of the "Zadkine" college and the "Graphic Lyceum", nearby church, "Hofplein" theatre, "David Lloyd" gym and residents of the Agniese neighborhood, in three different workshops, "DE URBANISTEN" were able to complete the first water square in 2013.

Figure 3: (a) Plan of the Water square Benthemplein with the position of the basins; (b) Deep basin in dry and wet condition
Source: (a) http://www.urbanisten.nl/wp/wp-content/uploads/URBANISTEN_Watersquare-Benthemplein-10.jpg;
(b) https://www.c40.org/case_studies/benthemplein-water-square-an-innovative-way-to-prevent-urban-flooding-in-rotterdam

The project was financed by the City of Rotterdam, the Schieland and Krimpenerwaard District Water Board, the Dutch Ministry of Infrastructure and the Environment and the European Commission's European Regional Development Fund (http://www.rotterdamclimateinitiative.nl/). Common idea was to create an attractive, multifunctional public open space which will offer set of different activities.

4.1. Water square –Rain and stormwater treatment

Benthemplein water square consists of three basins, each designed to collect rainwater form immediate surrounding, with the capacity of 1,7 million liters (Figure 3). One basin is deep and collects water only if the heavy rain occurs, but also from wider area of the square, and two smaller, shallow basins which only collect rainwater from the surrounding area. Each basin has its one catchment (Figure 4).

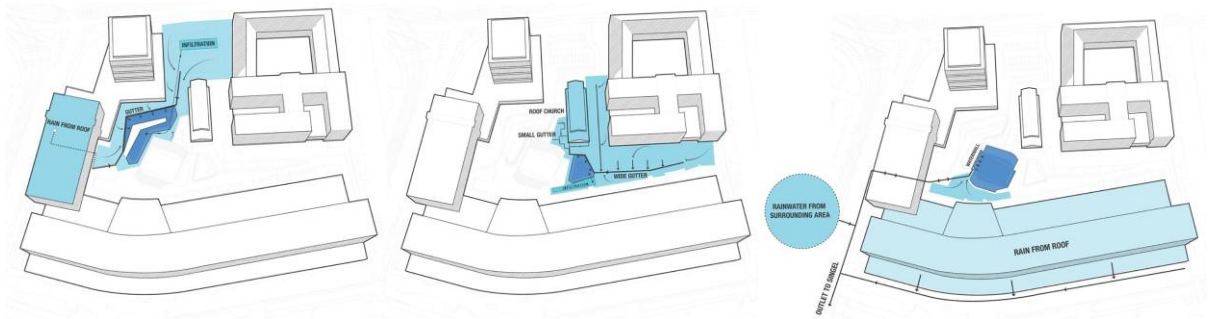


Figure 4: Catchment areas of basins 1, 2 and 3. Source: https://laud8.wordpress.com/2015/08/10/watersquare-benthemplein/

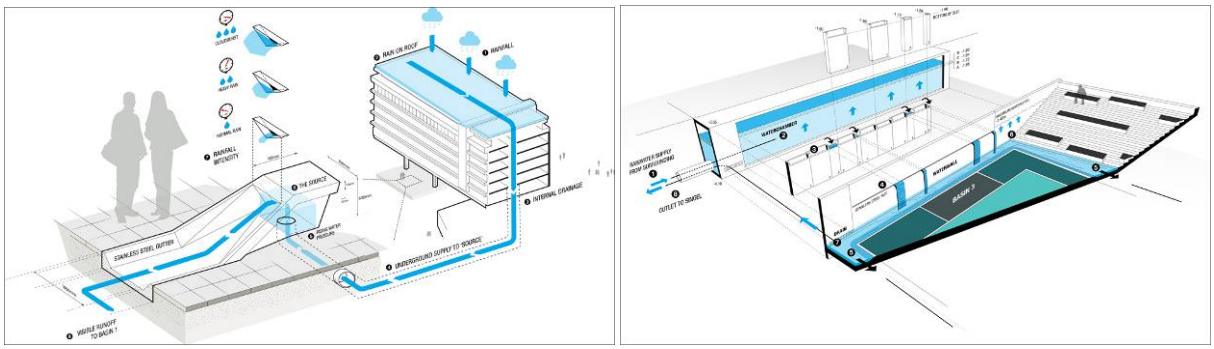
Besides the basins, water square contains some other specific technical elements which serve for rain and stormwater treatment: 1) large stainless steel gutters (Figure 5a), 2) water wall (Figure 5b), and 3) rain well (Figure 5c). Additional water features that are a part of water square are the fountains. One of them is a small fountain positioned next to the church from which the water meanders over the square into one of the undeep basins. The second one is the drinking fountain located in the deep basin.

(a) (b) (c)

Figure 5. Elements of the water square: (a) stainless steel gutter, (b) water wall, (c) rain well.
Source: (a) https://laud8.wordpress.com/2015/08/10/watersquare-benthemplein/;
(b) http://www.urbanisten.nl/wp/?portfolio=waterplein-benthemplein;
(c) http://www.arquitectes.cat/iframes/paisatge/fotos_proj/8a_BIENNAL/P8441/P8441F4.jpg

The concept of rain and storm water treatment within the square is the following - when it rains, the rainwater from the roof and surroundings is carried through large steel gutters, embedded in the pavement, to the basins. Water wall, that brings water from the wider area and rain well, that brings water from the neighboring building, visibly stream the rainwater onto the square. Rain well takes the water from the roof and through the underground system leads the water to the gutter (Figure 5). Water wall takes the rain from the further surroundings into the deep basin. The path of rainfall and method of filling the basins is shown in the Figure 6.

After the rain events, the rainwater from the undeep basins (basin 1 and 2, Figure 3 and Figure 4) moves to the underground infiltration system and then slowly leaks into the underground water. The water from the deep basin (basin 3, Figure 3 and Figure 4), flows back into the city's open water system after 36 hours.



(a) (b)

Figure 6. Concept of the water square. (a) Rain well streams the water from to roof into the gutter; (b) Water wall streams the rain from the surrounding into the deep basin. Source: https://laud8.wordpress.com/2015/08/10/watersquare-benthemplein/

In this way, the public health is secured. The water that has been buffered does not go into the city sewage system anymore. While ensuring that the underground water does not exceed the critical level, the system of the water square also allows the development of the vegetation, which reduces the urban heat island effect. The conventional mixed sewage system is relieved and lowers the frequency of his relatively dirty water to overflow in the open water whenever it reaches its buffering capacity. According to De Urbanisten by "separating storm water gradually from the black water system with each intervention, the entire system step by step moves towards an improvement of the overall quality of the open water in the city." (http://www.urbanisten.nl/wp/?portfolio=waterplein-benthemplein)

4.2. Water square – multipurpose open space

When its dry, the square is used as a recreational space and place for leisure, i.e. as a multipurpose open space. Each basin offers different kind of activities. Basin 1, the undeep one, is the place for everyone on different kind of wheels and the one who wishes to watch them showing their skills (Figure 7). Basin 2, also undeep, contains a stage which can be used for different performances (Figure 7). The deep basin, basin 3, can be used as a basketball, volleyball or football court with the side seating for the audience or as a place for leisure (Figure 3b and Figure 7). Some of the technical elements of the water square have double function. Large stainless steel gutters were intentionally oversized for the skateboarders.

Figure 7. Different activities on the water square. Source: https://laud8.wordpress.com/2015/08/10/watersquare-benthemplein/

In the urban design process, great attention was given to the planting, for purpose of achieving biodiversity and healthy and pleasant urban environment. Considering the planting plan, it gives accent to the original trees that were found on the location. Around them is the concrete high gardener with grass and wild flowers, which can be used for seating. Additionally, great attention was given to color scheme. The color scheme gives accent to the water itself. Different elements of the water square, depending on their function, have certain color - the surfaces that are flooded are painted in the shades of blue, while the elements that stream the water are made of shiny stainless steel (gutter).

It is possible to identify two dominant design approaches in relations between water square and landscape architecture: 1) integrated and 2) artful. An integrated approach is based on incorporation of the known urban elements in design of basins (amphitheater, stage, seating, etc.). Artful rainwater design refers to transforming and creating an identity of open space using a specific design forms in creating the technical elements such as gutters and rain well.

5. CONCLUSION

In line with the first research goal - to analyze principles of organization and basic characteristics of water square from physical, social and environmental point of view, conducted research implies the following: 1) the innovative water square conceptual approach leads to creating a sustainable solutions in many urban conditions regarding physical, social and environment aspects, especially in densely built-up urban area, and 2) implementation of water square concept leads to improvement of existing built environment.

Regarding the second research goal - to investigate a multiple benefit of water square application, it can be concluded that they offer numerous benefits in addition to those relating to rain and stormwater treatment. The most important are the following: quality open spaces, multifunctional open spaces, higher level of biodiversity, mitigate of urban heat island, and closer connection with nature.

Example of Rotterdam Benthemplein water square shows that the modern stormwater management approaches have found their adequate application within the process of urban regeneration with the focus on densely built-up areas. In discussion related to validity of water square implementation and accompanied costs De Urbanisten explained: „the philosophy is simple: the money invested in engenious underground drainage solution can be better spent above ground“.

ACKNOWLEDGEMENTS

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REFERENCES

1. Fletcher, T. D. Shuster, William, H., William F. A., Richard. Butler, D., Arthur, S., Trowsdale, S., Barraud, S., Semadeni-Davies, A., Bertrand-Krajewski, J., Steen Mikkelsen, P., Rivard, G., Uhl, M., Dagenais, D., Viklander, M.: SUDS, LID, BMPs, WSUD and more – The evolution and application of terminology surrounding urban drainage. Urban Water Journal, 2015, vol.12, № 7, p.p. 525–542

2. Gordon-Walker, S., Harle, T., & Naismith, I.: Using science to create a better place. Cost-benefit of SUDS retrofit in urban areas, 2007., Science Report – SC060024, Environmental Agency, Bristol

3. Rotterdam Climate Initiative. http://www.rotterdamclimateinitiative.nl/ [Accessed: 21st September 2018]

4. Urban green-blue grids. https://www.urbangreenbluegrids.com/measures/water-squares/ [Accessed: 21st September 2018]

5. Vasilevska, M. and Vasilevska, Lj., 2018. Modern stormwater management approaches in urban regeneration. Conference proceedings 6th International conference Contemporary achievements in civil engineering, Subotica, Serbia. pp. 525 -534.

6. Water square Benthemplein – DE URBANISTEN. http://www.urbanisten.nl/wp/?portfolio=waterplein-benthemplein [Accessed: 21st September 2018]

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BIOPHILIA IN URBAN PLANNING AND ARCHITECTURAL DESIGN- MODERN EXPERIENCES AND PATTERN OF APPLICATION IN SERBIA

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ABSTRACT

During the centuries-old history of the development of civil engineering, architecture has always been in a special relationship, interactive and inextricably linked to its natural environment. In today's time of expansion and accelerated technological development, when the planet becomes everyday endangered by the consequences of human activity, nature is a basic theme and support in the focus of architectural creation more than ever. Biophilia in architecture represents an innovative way of urban planning and architectural designing with an emphasis on the role of nature in the quality of living and working of man in built areas. Architecture based on this principle is the architecture of the future, conceived and created as a healthy and productive environment of a modern man, both in terms of indoor space and in the planning of local communities as active and communicative neighborhoods. Using analytical descriptive methodology and research references, this paper focuses on contemporary world experiences and analyzes selected case studies, in order to determine the elements of a possible model for architectural practice in Serbia.

Keywords: nature; architecture; urban planning; biophilia; designing

1. INTRODUCTION

Many of us have experienced emotional satisfaction from viewing or being physically present in natural environments. The central problem of this paper is that in the modern world human exposure to nature has been drastically reduced. While people often actively seek contact with nature during their leisure time, nature is frequently removed from our daily functioning. But why is this alienation from nature problematic? Many of us perhaps have the intuition that nature is in a sense good for us, or are essentially fascinated by it. In this

article we will argue that this intuition is to a certain extent supported by many empirical kinds of research. Human behavior is not just a phenomenon of will or a phenomenon of culture but also of genetic behaviors. According to Appelton (1975), we are born not with a 'blank slate,' but with distinct preferences for how we would like the world to be structured.

Beginning in the 1980s these hypotheses started to undergo empirical testing, and the results have since become rather conclusive. There is evidence that the progressive disappearance of nature from our daily lives is not insignificance, but is problematic because it has important physiological and psychological health effects. Kaplan (1995) claims that even brief exposures to natural landscapes have a variety of notable health benefits, among them a reduction of stress, the lowering of blood pressure, improvement in our ability to focus, and, indeed, giving us a brighter outlook on life. The American socio-biologist Edward O. Wilson defined this component of our biological structure as 'biophilia.'

Nature is an emotional element within the surrounding environment and is an important aspect to deal with everyday affecting everything around human. Human always communicates with nature. Since starting to build shelters and using them, nature has been used as an important and basic part in the plans and designs. Human being noticed the advantages of communicating with nature as: health, less stress and sickness. Plants and green spaces can help in perfection and safety in the cities and improvement of social relationship and interaction in residential environments (El-Ghobashy & Mosaad, 2016.)

In this paper, our approach is essentially human-centred, in that there are reasons to believe that the inclusion of such elements positively contributes to certain indexes of human wellbeing. We stand at the point of view that the problem of decreasing nature exposure can be reduced by integrating actual natural elements in the built environment. Using analytical descriptive methodology and research references, this paper focuses on contemporary world experiences and analyzes selected case studies, in order to determine the elements of a possible model for architectural practice in Serbia.

2. BIOPHILIA IN URBAN PLANNING AND ARCHITECTURAL DESIGN

Bratman (2012) defines nature as areas containing elements of living systems that include plants and non-human animals across a range of scales and degrees of human management—from a small urban park to 'pristine wilderness.' Nature experience for him is time spent being physically present within or viewing from afar, landscapes (or images of these landscapes). The distinction between physical and visual contact with nature is quite important.

Wilson (1984) determines biophilia as 'the natural pleasure that comes from being surrounded by living organisms.' Theory from social psychology emphasizes the importance to the individual of belonging to a group, and Wilson argues that we have a similar need to feel connected to natural environments.

The major factors that contribute to the biophilic effect experienced by human beings are:

- Sunlight,
- Color,
- Water and
- Living organisms.

Salingaros (2015) is expanding that list with gravity, fractals, curves, and detail.

2.1. Biophilia in urban planning

On an urban scale, biophilia suggests that the central parks of our towns do more than simply serve as the city's 'lungs'. They provide an accessible exit for people to find relaxation and relieve themselves of the pressures of urban life. It also proposes, as Beatley (2017) has noted, that if sustainability concerns suggest higher urban densities, these densities should be coupled up with a commensurate increase in accessible green or wooded landscapes. And if we consider that many cities around the world keep their remains of an earlier industrial age, biophilia offers both the opportunity and a strategy to rebuild and reforest them in more humane ways.

The concept of Biophilic Cities, or Biophilic Urbanism, has emerged as a compelling vision for how cities of the future will be designed and organized. Biophilic cities celebrate, protect, and restore flora, fauna, and fungi while taking every opportunity to integrate nature with built structures. The vision of Biophilic Cities is of a

blended nature in which remnant natural species and habitats mix with more human-designed forms of nature such as living walls, green rooftops, and sky-parks. Each city must explore the most effective and appropriate ways to integrate nature given its own unique natural settings and qualities. Biophilic cities are also resilient cities. Virtually every step or action taken to increase nature in the city will help to make it more resilient. Rising urban heat, for instance, is a growing problem, and many of the most effective planning responses, from urban forestry to ecological rooftops, will at once insert new nature and cool urban environments (Beatley, 2017).

2.2. Biophilia in architectural design

Biophilia, as a universal human feeling and innate love for the natural world, shapes up architectural spaces in different spheres of people's lives, the lives of the users of those spaces and can influence the concept of several types of architectural objects, such as:

- Workspaces (Figure 1-a),
- Educational buildings (Figure 1-b),
- Health facilities (Figure 1-c),
- Living spaces etc (Figure 1-d).

Human activities in built indoor spaces over time and in collaboration with complex social relationships lead to certain psychological and emotional states of the users of space. In work areas, in the areas where educational processes take place, in health care institutions and in all housing environments, during the longer stay, pressure, stressful emotions and psychological fatigue occur. According to research, contact with nature contributes to relaxation, psychological restoration, and normalization. According to Bratman (2012), there are three theories of restorative benefits of nature. These are:

- Stress reduction theory (Ulrich, 1984)- reduction in stress during the experience in nature;
- Attention restoration theory (Kaplan, 1995)- recovery from directed attention fatigue through experience in nature;
- The mediating effect of opinions about nature- our conscious opinions about nature relate to the impacts of nature experience on mood and other aspects of cognitive function.

Evidence both from scientific sources and from traditional wisdom is giving rise to a healthier environment. Reconnecting humans with their surroundings applies the special power of nature to improve mental and physical nourishment. The aim is to lower the stresses on the human body, helping its built in defense to fight illness and to promote healing. For most of history, medicine took the environment seriously as a factor in health and healing. Unfortunately, the environment got ignored after the industrialized world adopted increasingly technological processes.

In one classic study of the mid-1980s, the psychologist Roger S. Ulrich underscored its architectural implications. In studying the records of 46 patients who had undergone gall-bladder surgery, he found that those patients recovering in a room with a view of a few trees had fewer complaints, took less medication, and were discharged one-day earlier than patients with a similar condition yet whose room had a view of an adjacent brick wall. Since this, the field of hospital design has become ever more specialized in its use of evidence-based design.

According to Söderlund & Newman (2015) a list of socio-psychological benefits can be:

- Improved mental health,
- Reduced stress,
- Attention restoration,
- Increased wellbeing ,
- Decreased violence and crime,
- Faster healing rates in hospitals, and
- Greater altruistic behavior.

Therefore, people are increasingly demanding environments that lower stress: living and working spaces that act to keep us healthy. Architects can find design tools to help achieve this goal only by looking beyond mainstream architecture, which buys into the same overly technological worldview as conventional, intervention-focused medicine today (Salingaros, 2015).

(a) (b) (c) (d)

Figure 1: (a) Workspaces, (b) Educational buildings, (c) Health facilities, and (d) Living spaces (source: https://www.archdaily.com/21049/selgas-cano-architecture-office-by-iwan-baan, accessed: 25.09.2018.)

3. MODERN EXPERIENCES

In contemporary architectural practice, biophilic design is in the expansion, especially when it comes to competition-conceptual solutions and planning of future facilities. In the current architectural realizations around the world, which are also growing in number, the following principles are applied as the dominant ones:

- green facades and rooftops,
- glass bulkheads and transparent membranes between the interior and the external natural environment,
- elements of nature in the centers of the volume of objects and along the communications.

In the following sections of this article are analyzed the examples from practice with the aim of emphasizing the significance of the biophilic-design strategies used in architectural design.

3.1. Next-Generation Workspaces

Oliver Thomas and Keyan Rahimzadeh designed a flexible biophilic facade system for the next generation of offices, acknowledging our ever-growing desire for nature. Inspired by a competition challenge, they designed a hypothetical building in Williamsburg to house tech startups. The design is adaptive and scalable. The building system of movable panels gives multiple design solutions and flexibility. The spaces can be changed using a series of modular planters, shaders, furniture, and pop in/out glazing. Pixel facade is designed to be prefabricated with a timber frame construction, which is a natural product, allowing for a sustainable approach to the design and building process, and that is important for the biophilic aspect of the building (Figure 2). It was very important to Thomas that they create ‘a space that was replicable but unique to each environment’.

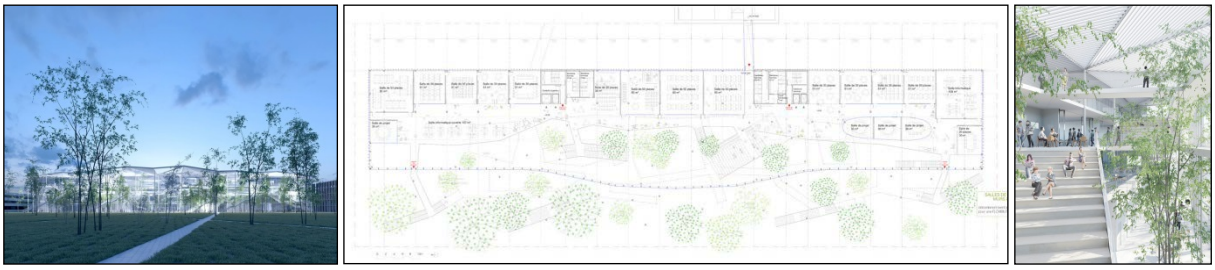
(a) (b) (c)

Figure 2: (a) View of facade, (b) Breakout spaces, and (c) View from office space (source: https://www.archdaily.com/893745/pixel-facade-system-combines-a-love-for-nature-with-next-generation-workspaces, accessed: 28.09.2018.)

3.2. Ecole Polytechnique Learning Centre Paris / Sou Fujimoto

Ecole Polytechnique Learning center (Figure 3) will combine six educational and research institutions as part of one scheme. In 2015 the team headed by Japanese architect Sou Fujimoto has been selected to complete the project. The building should be in the center of the Ecole Polytechnique urban campus at Paris-Saclay, a research-intensive and business cluster in the south of Paris. As the winning scheme is based on the idea of openness to the surroundings, flexibility, and interference the Learning Center is invaded by nature with opening up to the linear park in front with the main, large, transparent facade. The building is thus seen as an open space blurring the limits between inner and outer space. Inside is a wide atrium and a series of walkways

and staircases, platforms in a form of 'spontaneous amphitheaters', and the classrooms, all bathed in soft light that offers surprising and changing views. The team commented that the design's intention was to be 'an extension of the landscape'.



(a) (b) (c)

Figure 3: (a) Green public space in front of the facade, (b) Floor plan, and (b) View of the staircase (source: https://www.archdaily.com/616637/sou-fujimoto-lead-team-selected-to-design-ecole, accessed: 28.09.2018.)

3.3. Maggie's Oldham / dRMM

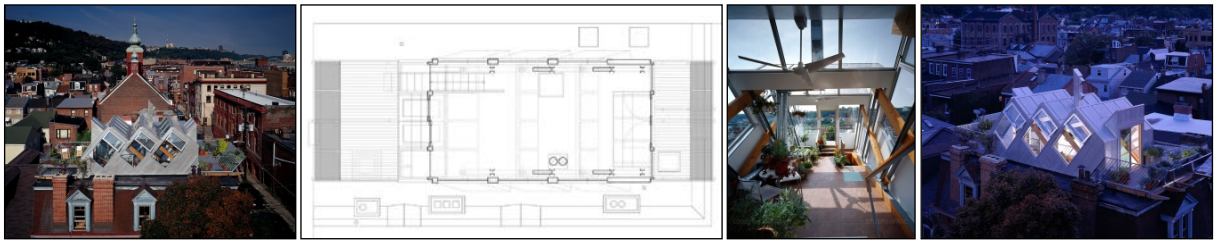
Maggie's Center in Oldham is the 21st built health-rehabilitation center in the UK. It was built according to a project of the architectural office "dRMM" from London in the 2017th (Figure 4). The center is located in the northern part of the complex of the Royal Hospital in Oldham, where the resting views to mountain range Pennine dominate. As the purpose of Maggie's Centers is to provide hope to cancer patients with a relationship of built environment towards users, the building is conceived as a union of healthy inner and outer ambient, primarily using natural and renewable materials. The main mass of the building is raised above the ground and landscaped area of the garden, from where the deep entrance porch of the building, which is there for the stay of the users in the open, is accessed through an open exterior staircase. Upon entering the building, there are undisturbed views to the central atrium, the sky and the mountain range on the horizon. Formed interior ambients, according to Alex de Rijke author architect ‘are eager to support and cheer’.

(a) (b) (c) (d)

Figure 4: (a) Entrance porch, (b) Floor plan, (c) Garden, and (d) View of the central atrium (source: https://www.archdaily.com/874795/maggies-oldham-drmm, accessed: 30.09.2018.)

3.4. Urban Biophilic Pavilion / studio d’ARC

The urban biophilic pavilion, designed by studio d'ARC, is located atop a 19th-century row house in the South Side neighbourhood of Pittsburgh. The architects replaced the old greenhouse and created both a stunning architectural structure and a space that embodies the attributes of biophilic building design (Figure 5). This pavilion integrates many current environmental solutions. Materials that are used are local, natural or recycled. In its new form, the pavilion serves as a biophilic garden. It represents a common room for the tenants that they can use year-round and includes two outside deck platforms which allow for great views of the South Side flats and slopes, Mt. Washington, and Downtown Pittsburgh.



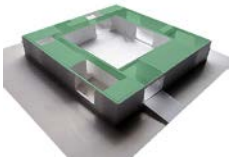
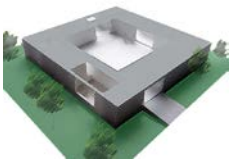
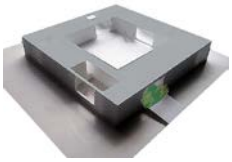
(a) (b) (c) (d)

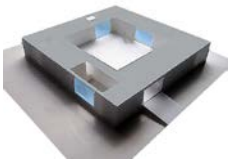
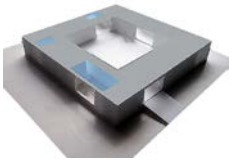
Figure 5: (a) Biophilic pavilion with two deck platforms, (b) Floor plan, (c), Greenhouse interior, and (d) View of the pavilion at night (source: https://www.archdaily.com/100780/urban-biophillic-pavilion-studio, accessed: 30.09.2018.)

4. DISCUSSION AND PATTERN FOR APLICATION IN SERBIA

In Serbia, biophilic design exists only in a rudimentary form. Among the buildings of the recent date, only in individual cases certain elements and architectural ideas, which can be said to respect the logic of the biophilic approach, are applied to design and construction. The tradition of Serbian and sometimes Yugoslav architectural practice also nurtured certain forms of biophilic concepts.

Table 1: Building – nature connection Source: Authors

Outside the building	*Inside of the building*	
Open space	*Atrium*  *Green roof* 	 
Semi-open space	*On the ground*  *Terrace* 	 

Visual connection	*Facade glazing*  *Zenith glazing* 	 

Spacious atrium in the centers of buildings of educational, administrative and medical purposes, were positive examples in realized projects, which in the exploitation proved to be a factor in raising the quality of stay for the surrounding areas. Always present demand for orientation with a lot of light when it comes to educational processes and spaces for children, regularly imposes the need for multiplying the series of spaces of the same orientation by inserting atriums or forming green pockets. The similar case is with all those facilities whose function implies unilateral orientation of a number of units along the communication, such as office spaces or rooms with different users from patients in hospitals and elderly in a nursing home to student dormitories. Similar needs for lighting and going out into an open green environment also has collective housing, and especially family facilities in which there is a long and famous tradition of atrium designing. Green roofs, terraces, and facades, although from recently, are ubiquitous in the architectural expression of today (Table 1).

The domination of glass facades in architecture contributed to the complete opening of visions in the overall width and height of the front to the surrounding greenery and the sky, from the space of the classroom, hospital rooms, and offices, traditionally characterized by full parapets and facade masses. The extreme are examples of glazed longitudinal faces of gymnasiums in schools, but on the other hand that is a wonderful example of the environment in which children's physical activities take place in conditions similar to open space.

The introduction of sunlight through roof glazing, most often in the zone of central expansion in buildings or when needed along the communications, is one of the principles of biophilia, but also one of the qualities of the interior spaces in which the penetration of natural light makes a special atmosphere, and sometimes has significant symbolism.

5. CONCLUSION

In Serbia, biophilic design exists only in a rudimentary form. Among the buildings of the recent date, only in individual cases certain elements and architectural ideas, which can be said to respect the logic of the biophilic approach, are applied to design and construction. The tradition of Serbian and sometimes Yugoslav architectural practice also nurtured certain forms of biophilic concepts.

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REFERENCES

1. Appleton, J., 1996. The Experience of Landscape. Revised edition. Wiley, London, UK.

2. Beatley, T., 2017. Biophilic Cities and Healthy Societies, *Urban Planning*, 2(4), pp 1-4

3. Bratman, G.N., Hamilton, J.P. and Daily, G.C., 2012. The impacts of nature experience on human cognitive function and mental health. *Annals of the New York Academy of Sciences*, 1249 (2012). pp 118–136

4. El-Ghobashy, S. and Mosaad, G., 2016. Nature Influences on Architecture Interior Designs. *Procedia Environmental Sciences*, 34 (2016). pp 573 – 581.

5. Kaplan, S., 1995. The Restorative Benefits of Nature: Toward an Integrative Framework, *Journal of Environmental Psychology,* 15 (1995), pp 169–182.

6. Kellert, S.S., 2005. Building for Life: Designing and Understanding the Human–Nature Connection, Island Press, Washington, USA.

7. Salingaros, N.A., 2015. Biophilia & Healing Environments: Healthy Principles for Designing the Built World. Terrapin Bright Green, LLC, New York, USA.

8. Söderlund, J. and Newman, P., 2015. Biophilic architecture: a review of the rationale and outcomes. *AIMS Environmental Science*, 2(4). pp 950-969.

9. Urlich, R.S., 1984. View through a Window May Influence Recovery from Surgery, *Science*, New Series, 224 (4647), pp 420–421.

10. Wilson, E.O., 1984. Biophilia. Reprint edition. Harvard University Press, Cambridge, MA, USA.

INTERNET SOURCES

https://www.archdaily.com/21049/selgas-cano-architecture-office-by-iwan-baan [Accessed: 25.09.2018.]

https://www.archdaily.com/893745/pixel-facade-system-combines-a-love-for-nature-with-next-generation-workspaces [Accessed: 28.09.2018.]

https://www.archdaily.com/616637/sou-fujimoto-lead-team-selected-to-design-ecole

[Accessed: 28.09.2018.]

https://www.archdaily.com/874795/maggies-oldham-drmm [Accessed: 30.09.2018.]

https://www.archdaily.com/100780/urban-biophillic-pavilion-studio [Accessed: 30.09.2018.]

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DETERMINATION OF CLIMATE CHARACTERISTICS AS A DOMINANT PARAMETER IN BUILDING DESIGN - CASE STUDY THE CITY OF NIŠ

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ABSTRACT

Precise knowledge of local climate factors and characteristics of building materials from which the building is built are of crucial importance for every architect. They represent a source of inspiration in the creative process. The aim of this paper is to show how all the climatic characteristics of an area affect designed objects. Software packages and computer programs greatly facilitate the design and analysis of influencing factors. With the help of the Climate Consultant software, and for the concrete example of the city of Nis, they were analysed in detail in order to better harmonize the project with the climatic characteristics of a specific location. The role of the Climate Consultant is not only to graphically represent the climatic characteristics of a site but to correctly and transparently display information that helps architects to reach the optimal solution. By respecting the climate of the area, we easily reach energy efficient solutions in all phases of building planning and design. Finally, the guidelines and design strategies for analysed climate of the city of Niš, are given.

Keywords: Climate Consultant software; climatic characteristics; energy efficient solutions

1. INTRODUCTION

Bioclimatic architecture dates back to ancient times. In order to provide an adequate comfort without the use of artificial systems, which have been widely used in the last few decades, it is necessary to respect the natural environment. [1]. Urban planning and architectural design directly affect energy consumption of buildings. Rationality of the solution, functionality, economy and aesthetics are just some of the criteria that each designer and planner should integrate in their design. In this way, an energy efficient solution is made better and easier. Urban planning should be closely linked to natural conditions and should involve a careful assessment of the impact of construction on the surrounding premises. In parallel with the use of the most

favourable environment, it is also necessary to provide enough greenery or artificial barriers to protect against wind, as well as other solutions to save energy.

One of the goals of architectural design is the preservation of natural resources and the creation of a healthy and humane urban climate. Before planning, an analysis and assessment of the natural conditions of the given space should be done. Numerous parameters such as: local climate, characteristics of the location and urban conditions, the shape of the building, the number of users and the way of using the facility, as well as the sources of energy used in the facility, define the guidelines for better design of the object and quality of housing to the highest level [2]. Designing with respect to microclimate is one of the most important rule for applying appropriate principles of bioclimatic planning. Planning should be in line with the desired socio-economic development. In order to achieve this, it is necessary that architects and urban planners are informed about local climatic, geographical and geological characteristics, and to have knowledge of the customs of nations inhabiting certain regions [3].

2. RESEARSCH METHODOLOGY

The aim of this paper is to show how all the climatic characteristics of an area affect designed objects. The methods used in this research are analysis, synthesis, modelling and the case study. Software packages and computer programs greatly facilitate the design and analysis of influencing factors. With the help of the Climate Consultant software, and for the concrete example of the city of Nis, they were analysed in detail in order to better harmonize the project with the climatic characteristics of a specific location. By respecting the climate of the area, we easily reach energy efficient solutions in all phases of building planning and design. Finally, the guidelines and design strategies are in line with the analysed climate characteristics of the city of Nis.

The Climate Consultant 6.0 program provides a large number of data available, and in order to find out all the required data we need to enter the .epw file (EnergyPlus Weather Format)[1]. In order to evaluate the best possible scenario and achieve the greatest comfort, the Climate Consultant counts the number of hours a year belonging to each zone within the Psychrometric chart, and then gives a percentage share of each strategy in achieving comfort in the building. Given that some of the strategies overlap and mutually support or complement each other, it is possible that some strategies in the sum give a value greater than 100%. Because of the interaction of these strategies and their interdependence, the architect in accordance with the project and their ideas have the task to opt for the best solution and thus raise the efficiency and functionality of the building to the highest possible level.

3. HUMAN POPULATION GROWTH AND FUTURE ASSUMPTIONS

The growth and increase in the number of cities is accompanied by their economic growth. With the increase in the number of inhabitants, the degree of pollution of the planet is increasing, so the consciousness in designing and thinking about architecture, respecting natural conditions, adapting to the environment is the only right solution for the preservation of future generations. Increasing energy consumption and exploitation of materials result in large amounts of waste and emissions of harmful gases. Overpopulation is still one of the biggest problems. There are assumptions that up to 2050 in urban areas will live as much as 80% of the entire world population, whose number will inevitably continue to grow.

Large cities, like university centres, must adapt to new requirements of study and student accommodation, which is achieved by proper design in accordance with local climatic conditions. There is a general belief that climate on the planet changes and that the temperature will increase significantly. Reducing the number of cold days will lead to less need for heating in the winter, but this means that there will be overheating in buildings that use natural ventilation. Facilities using artificial ventilation will have a greater need for cooling during the summer months [4]. The use of mechanical means (such as HVAC (heating, ventilation, air conditioning,) systems) has greatly changed the design approach. Formerly, the traditional modes of construction had a much greater degree of diversity, giving a kind of stamp to each built object, while today all this is different. In spite of the highest quality mechanical systems, the application of the most modern materials and the use of numerous systems for improving the comfort of the people, there is a big shortcoming in the newly constructed buildings.

1 Weather data file saved in the standard EnergyPlus format; used by EnergyPlus energy simulation software, developed by the U.S. Department of Energy (DoE); contains weather data that is used for running energy usage simulations.

Preventing increased energy consumption in buildings without providing basic living comfort does not contribute to the advancement of architecture. Considerable design and application of passive design principles instead of, sometimes, unnecessary or excessive investment in mechanical means are more desirable and more cost-effective. By adapting to the natural environment and designing in accordance with nature, we are closer to a sustainable design [5].

4. MODERN DESIGN APPROACH - RETURN TO NATURE

It is interesting that a traditional building, which dates back to the distant past, meets modern needs for energy saving. Despite the constant evolution of the architectural forms that are continuously developing these houses are still highly energy efficient today. The specificity of this type of design is its ability to adapt to the morphology of the terrain by adapting to the "non-aggressive way", while respecting the natural environment. The free-form project is a synthesis of forms that fit in with nature in accordance with the principles of sustainability. The main objective is that projects naturally fit into the environment, so the buildings are partially buried along the north front using the slopes of the terrain in order to better synergy with the natural environment [6]. Ecological design is not always the most rational in financial terms, but if we observe the lifespan of the building, it is possible to compensate all the effort and invested money. The best way to get to the characteristics of an area, the construction methods and the most optimal design solutions is to observe traditional houses and understand the real needs of people as well as their behaviour during the use of the object in which they live.

By using certain software packages, we are enabled to find out all of the most important features of a site. Using the mean values calculated during the long-term analysis of climatic conditions, we make conclusions about the application of different design principles in order to achieve the most optimal solution, while respecting bioclimatic principles. Passive design principles include a large number of interventions and a much higher degree of project consideration than classical design. Starting from the urban setting, the analysis of sunsets, dominant winds, the number of rainy days and the possibility of setting up some active systems that can be very cost-effective if a good financial budget is made and all relevant parameters are taken into account. The humidity and temperature of an area as well as the incident angle of the sun rays can also significantly affect the final design. All these principles can be applied and the most optimal solution is determined based on a detailed analysis of the climatic conditions at a given location. This is crucial because passive design principles are universal for the entire planet Earth, but the degree of exploitation of each of them can oscillate to such an extent that once what has been proved in some geographical locations as an excellent solution in other geographic areas has a totally opposite effect.

Numerous authors [7,8] have developed local methods of Bioclimatic design as well as procedures for applying passive principles of heating and cooling, as well as energy saving in order to improve the thermal comfort (microclimate) in the open space. In addition to the application of adequate design principles, it is essential to provide all the necessary comforts (light, air, heat, acoustic, visual) to users of space[9]. In this paper, the emphasis is on finding the most optimal solutions in order to provide the best thermal comfort in accordance with local climate characteristics. Air comfort can also be achieved by the proper orientation of the building, by properly selecting the material and by designing in accordance with the applicable standards. Respecting the climate characteristics not only ensures significant savings in financial terms, but also the quality of life is raised to a higher level.

5. METHODOLOGY OF DETERMINATION OF CLIMATE CHARACTERISTICS - CLIMATE CONSULTANT

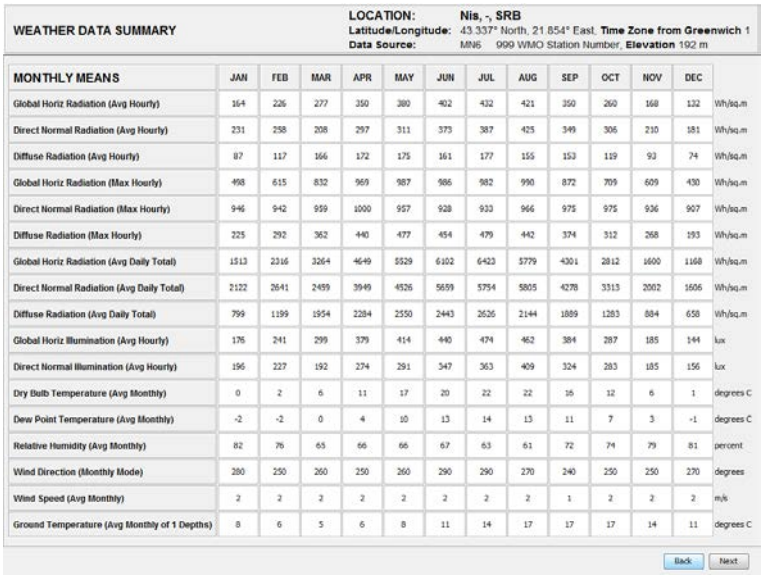
Climate is most commonly defined as the "average (mean) state of time", or more precisely, as a statistical description of mean values and variability of time, in the range of several months to several thousand or millions of years. The standard period is 30 years, by the definition of the World Meteorological Organization (WMO). These mean values are an indicator of the behaviour of spatial and time-varying sizes, such as temperature, precipitation and wind. Climate in a wider sense is a condition, including a statistical description of the climate system [10].

Precise knowledge of local climate factors and characteristics of building materials from which the building is built are of crucial importance for every architect. They represent a source of inspiration in the creative process [1]. In addition to the climate as a dominant factor, local microclimate conditions are also an important parameter for analysis. Bekkouche and others [11] proposed several basic guidelines for the design of passive objects. The building envelope has a great influence on the interior temperature of the buildings. [11,12].

Based on the analysis of the influence of orientation, thermal inertia and thermal insulation, it was concluded that thermal gains through walls and window openings represent the biggest cause of overheating in this type of object. Shading could greatly reduce the negative effects of direct sun radiation. Energy consumption is a big problem with regard to the large spending of money on air conditioning and maintenance of comfort within buildings [12].

The role of the Climate Consultant is not only to graphically represent the climatic characteristics of a site but to correctly and transparently display information that helps architects to reach the optimal solution. In this way, energy efficient, sustainable buildings are designed so that they respect the influential factors of the climate of an area to the greatest extent possible [13]. Climate Consultant automatically creates a list of guidelines for optimal design based on the characteristics of each climate. These guidelines are backed up by sketches indicating what each direction refers to, which shows that energy efficiency requires a different approach to designing buildings for each different climate [14]. Many of these strategies are in direct conflict, so for example shading works well with all cooling systems, while some strategies negate one another. The natural ventilation during the day needs the construction of light-weight and large openings, while the construction of the floors and walls of the great mass closed during the day in order to keep the cold that were achieved during the previous night. Since we only need to decide on one of the strategies offered, Climate Consultant shows us the number of hours of comfort provided by each of the offered systems, so architects can easily opt for the system that provides the most hours of comfort during the year [14].

After defining the conditions of comfort and defining the selected location, we arrive at the numerical values that Climate Consultant displays at the very beginning (Figure 1), as well as to the criteria of comfort and guidelines for energy efficient design.



WEATHER DATA SUMMARY

LOCATION: Nis, -, SRB
Latitude/Longitude: 43.337° North, 21.854° East, Time Zone from Greenwich 1
Data Source: MN6 999 WMO Station Number, Elevation 192 m

MONTHLY MEANS	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Global Horiz Radiation (Avg Hourly)	164	226	277	350	380	402	432	421	350	260	168	132	Wh/sq.m
Direct Normal Radiation (Avg Hourly)	231	258	208	297	311	373	387	425	349	306	210	181	Wh/sq.m
Diffuse Radiation (Avg Hourly)	87	117	166	172	175	161	177	155	153	119	93	74	Wh/sq.m
Global Horiz Radiation (Max Hourly)	498	615	832	969	987	986	982	990	872	709	609	430	Wh/sq.m
Direct Normal Radiation (Max Hourly)	946	942	959	1000	957	928	933	966	975	975	936	907	Wh/sq.m
Diffuse Radiation (Max Hourly)	225	292	362	440	477	454	479	442	374	312	268	193	Wh/sq.m
Global Horiz Radiation (Avg Daily Total)	1513	2316	3264	4649	5529	6102	6423	5779	4301	2812	1600	1168	Wh/sq.m
Direct Normal Radiation (Avg Daily Total)	2122	2641	2459	3949	4526	5659	5754	5805	4278	3313	2002	1606	Wh/sq.m
Diffuse Radiation (Avg Daily Total)	799	1199	1954	2284	2550	2443	2626	2144	1889	1283	884	658	Wh/sq.m
Global Horiz Illumination (Avg Hourly)	176	241	299	379	414	440	474	462	384	287	185	144	lux
Direct Normal Illumination (Avg Hourly)	196	227	192	274	291	347	363	409	324	283	185	156	lux
Dry Bulb Temperature (Avg Monthly)	0	2	6	11	17	20	22	22	16	12	6	1	degrees C
Dew Point Temperature (Avg Monthly)	-2	-2	0	4	10	13	14	13	11	7	3	-1	degrees C
Relative Humidity (Avg Monthly)	82	76	65	66	66	67	63	61	72	74	79	81	percent
Wind Direction (Monthly Mode)	280	250	260	250	260	290	290	270	240	250	250	270	degrees
Wind Speed (Avg Monthly)	2	2	2	2	2	2	2	2	1	2	2	2	m/s
Ground Temperature (Avg Monthly of 1 Depths)	8	6	5	6	8	11	14	17	17	17	14	11	degrees C

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Figure 1: Climate characteristics of Niš [15]

After that, a sequence of diagrams follows. Some of them are Temperature range by months during the year, Average daily temperature for each hour of the month each year, Diagram of solar radiation for inclined roof planes rotated in relation to the south, Diagram of sky cover with clouds, Wind speed diagram, Average values of monthly soil temperatures at a depth of 1 meter, Comparative display of temperature and humidity, A comparative display of air and dew point temperatures, as well as The effect of shading on the comfort of the building user. Figure 2 shows The effect of shading on the comfort of the inhabitants of the building. Climate consultant also provides Windrose Diagram that displays the direction of theminant winds,their speed and frequency in accordance with the given values of the temperature and humidity of the air for the given location.

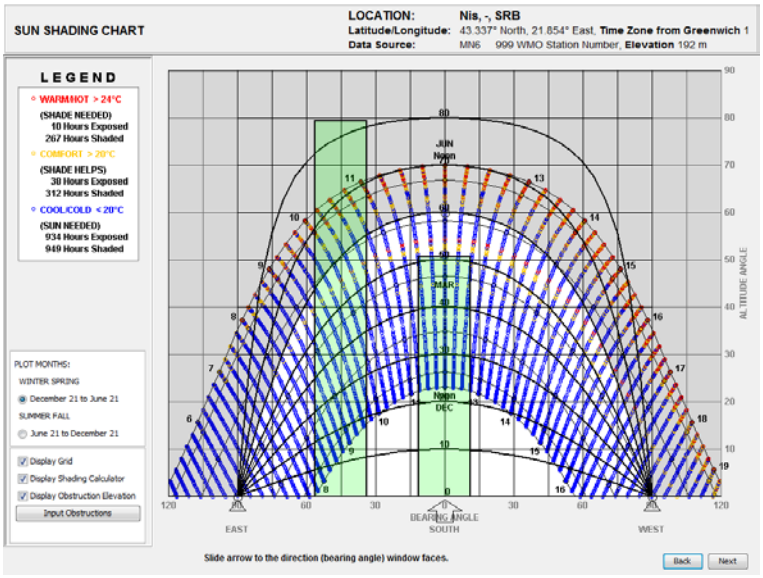

Figure 2: The effect of shading on the comfort of the inhabitants of the building [15]

6. RESULTS AND DISCUSSION - DESIGN STRATEGIES IN ACCORDANCE WITH BIOCLIMATIC PRINCIPLES

Bioclimatic charts facilitate the analysis of the climatic characteristics of a particular site in order to improve the human comfort. One of the most powerful tools shown by the Climate Consultant is Psychrometric chart and is presented in Figure 3. Psychrometric chart shows different combinations of temperature and humidity at any time. This chart may also indicate design guidelines that would allow increased internal comfort without the use of mechanical devices. All of these diagrams are structured and refer to the "comfort zone" [16]. It shows the ratio of absolutely dry air temperature (horizontal axis) and humidity (vertical axis). This ratio is shown as the ratio of humidity (in grams) (amount of water per kilogram of dry air), or as steam pressure. The curved line on the left side represents saturated air (relative humidity 100%). The fact is that air at lower temperatures can retain less moisture than at higher temperatures. Each point on the chart represents a value measured over an hour's time. Some of the points can also represent values longer than one hour in case the temperature and humidity values during the month are repeated several times. The color of each point is whether the comfort is achieved (green - comfort, red - no comfort).

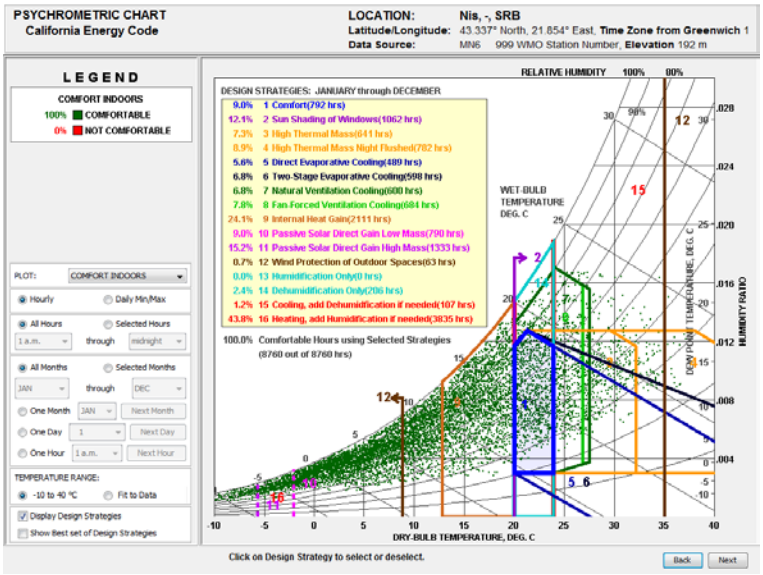

Figure 3 - Psychrometric chart [15]

Each of the strategies is characteristic of different climatic conditions and there is no single universal approach. This is especially noticeable for buildings where the envelope has a significant role in design (houses, schools, small shops or offices), in contrast to the facilities in which the interior equipment and dimensions and the arrangement of premises are dominant in relation to the envelope of the building (e.g. Large Business premises, factories, hospitals).

All values that the program displays directly depend on the data entered and the calculation model for the comfort that is defined at the very beginning of the calculation. By applying different combinations of the proposed strategies, the most optimal value or the most rational realization of comfort can be achieved. The program itself can propose the application of these strategies, but also the designer, depending on the possibilities or limitations of the application of some of the design principles, can decide what to apply. In addition to each strategy, the number of comfortable hours (of 8760 hours per year) is also given, as well as the percentage share in the overall comfort within the facility. It is possible to examine individually every hour, day and month, a certain period (which is useful if the facility only periodically used) and on the basis of the entered data to reach a final decision on the application of appropriate principles of bioclimatic architecture.

In the case when the Climate Consultant itself shows the proposed set of applied strategies, the greatest possible number of comfortable hours is achieved without the use of conventional heating and cooling systems. In this way, the program allows us to avoid some contradiction, illogicality or overlapping of some of the design principles (those that have the same effect).

It is also possible to mark whether it is a well-defined period (it is possible to define a certain period of time, it is even possible to examine the best possible way to achieve comfort for accurately defined hours during the day). Climate Consultant, depending on the given time intervals, calculates the number of comfortable hours during the given period for the given climatic characteristics. This tool allows us to preliminarily experiment and accurately reach the number of comfortable hours even before the design. Architects in this way can greatly guarantee that users of the space will not only visually but also ambiently enjoy the projected building.

Gaitani, Mihalakakou, and Santamouris analysed two different cases of calculating the thermal comfort conditions [8]. The first involves the study area as it is, while others involve the inclusion of various architectural improvements in accordance with the principles of bioclimatic design. The conditions of thermal comfort are significantly improved by applying adequate architectural measures, mainly due to the implementation of green areas, as well as the use of building materials with high values of radiation and reflection.

Based on analysed climatic influences, it is necessary to form a list of guidelines that would improve the project and facilitate the work of architects. For climatic impacts of Nis and on the basis of all indicated criteria, the Climate Consultant 6.0 program takes into account the proposed design strategies. Of course, this is an iterative process, and with the change of some of the parameters, the architect's strategies will be changed in their project. The guidelines are listed in order to see more clearly the potential benefits:

- In order to increase passive solar gains, the most important thing is that the object is oriented towards the eastern west with its long side, so that the building is most exposed to the southern sunshine. The position of trees plays an important role in passive solar design. The width and position of streets and access roads are the main influencing factors on the arrangement of trees. [17],
- When designing an object, the shape factor should be considered. Reducing the surface of the building envelope reduces unwanted heat losses during the winter as well as the heat gain during summer. The layout of the rooms should be designed so that the rooms in which we spend most time in the winter period have a direct sunlight, which also helps building to reduce the energy consumption for heating,
- Low emission, double glazing on the west, north and east side of the building, and ordinary glass on the south facade increases solar gains. Over-glazing on the south side results in overheating in many buildings. For this very reason, it is necessary to pay special attention to analysing and designing blinds and overhangs [18]. Properly designed roofs reduce the need for using air conditioners,
- The influence of massive and light construction of the preservation of the environment has a large [19]. Massive walls in the interior have a multiple role. During winter, they accumulate solar radiation during day, which they emit into the room after during night. In the summertime, cold air is stored during night ventilation, so it is pleasant to stay in that room during next day. Massive walls

accumulate heat for a long time, so it is much harder to quickly achieve the desired conditions of heat comfort,

- It is essential that "building breathes", but that does not mean that we should allow a lot of infiltration losses. All details must be accurate and well resolved in order to achieve the desired comfort. By allowing natural ventilation during summer nights, we can save money for cooling while increasing the comfort. During warm summer days, fans placed on ceilings can significantly affect the comfort inside the building, so the impression is that the temperature is set to at least 3 degrees lower than the real temperature,
- Heat gains from equipment, lighting, as well as space users reduce the need for heating, so frequent use of the student dormitories improves its performance. It is assumed that the thermal insulation is well calculated and carried out in accordance with the regulations. What is also important to note is that in the summer period it is necessary to provide good natural ventilation.

7. CONSLUSIONS

Development trends of the methodological aspects of bioclimatic architecture show that the design in accordance with ecological principles is becoming simpler and more accessible [20]. Rational use of energy is one of the most important factors for improving the economic balance of the country, saving resources and preserving the environment. Knowing all bioclimatic parameters and correct use of local climate and microclimate conditions in planning and design, contributes to immediate comfort of the users of these facilities, as well as the rational use of energy and its exploitation. Bioclimatic principles of design and planning depend on the knowledge of traditional forms of construction in different regions. Architects and urban planners are constantly struggling to preserve environmental values and continuity in architecture and culture. Economically or environmentally friendly design is possible only with complete consideration and analysis of influencing factors. Designing energy-efficient buildings does not necessary mean that projects will be more cost-effective and environmentally-friendly [21]. Using different passive technologies does not significantly affect energy efficiency. Improper design of some passive systems can actually reduce the overall energy efficiency of objects (e.g., it may result in dissatisfaction with the influence of solar heat and reflection in the summer period) [22].

In order to bring the philosophy of the construction of this type of object closer to the professional public, examples of modelled construction models, calculated values of energy consumption and acceptance by users are of paramount importance. That is why this brief overview of the climate characteristics of the city of Niš has mentioned some of the basic principles and conditions which are extremely important in this type of design. Adequate examples and proposed design strategies in accordance with the above principles make it easier to understand this matter and make it more available to architects and planners. Architects and designers need to pay more attention to the quality of the space they design, which would make the design of passive solar facilities more appealing to the general public [18]. The need for thermal comfort at low prices is the principle of modern architecture. Most of people who buy a passive house are motivated to do so with a desire to provide a low-cost thermal comfort. The visual aspect and aesthetics are the second most important factor, which suggests that admirers of passive solar architecture have a clearly built awareness of the quality of the architectural projects [18]. This work is just one of the possible ways to adequately analyse climate characteristics of the site and a thorough approach to building design and be more conscientious for future generations.

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REFERENCES

1. Gallo, C., 1994. Bioclimatic architecture. *Renewable Energy*, 5 (2). pp 1021–1027.

2. Ranđelović, D., 2012. Bioclimatic principles of urban design and planning. in: Z. Grdić (Ed.), *IV Int. Symp. Students Dr. Stud. Fields Civ. Eng. Archit. Environ. Prot.*, University of Nis, Faculty of Civil Engineering and Architecture, Niš, Serbia. pp. 226–233.

3. Pucar, M., Pajević, M., and Jovanović Popović, M., 1994. Bioklimatsko planiranje i projektovanje: urbanistički parametri. *Zavet*.

4. Yang, L., Yan, H., and Lam, J.C., 2014. Thermal comfort and building energy consumption implications – A review. *Applied Energy*, 115. pp 164–173.

5. Kalvelage, K., Passe, U., Rabideau, S., and Takle, E.S., 2014. Changing climate: The effects on energy demand and human comfort. *Energy and Buildings*, 76. pp 373–380.

6. Lembo, F., Marino, F.P.R., and Calcagno, C., 2011. Semi-underground house models as new concepts for urban sustainable environment. *Procedia Engineering*, 21. pp 570–579.

7. Zr, D.L. and Mochtar, S., 2013. Application of Bioclimatic Parameter as Sustainability Approach on Multi-story Building Design in Tropical Area. *Procedia Environmental Sciences*, 17. pp 822–830.

8. Gaitani, N., Mihalakakou, G., and Santamouris, M., 2007. On the use of bioclimatic architecture principles in order to improve thermal comfort conditions in outdoor spaces. *Building and Environment*, 42 (1). pp 317–324.

9. Bogdanović, V., 2000. Arhitektonsko građevinske konstrukcije-toplotna zaštita zgrada. Građevinsko-arhitektonski fakultet u Nišu.

10. KLIMATOLOGIJA - nauka o klimi • MeteoPlaneta, http://meteoplaneta.rs/klimatologija/, [Accessed: 8th June 2018]..

11. Bekkouche, S.M. a., Benouaz, T., Yaiche, M.R., Cherier, M.K., Hamdani, M., and Chellali, F., 2011. Introduction to control of solar gain and internal temperatures by thermal insulation, proper orientation and eaves. *Energy and Buildings*, 43 (9). pp 2414–2421.

12. Hamdani, M., Bekkouche, S.M. a., Benouaz, T., and Cherier, M.K., 2012. Study and Effect of Orientation Two Room of Buildings Located in Ghardaia, Algeria. *Energy Procedia*, 18. pp 632–639.

13. Milne, M., Liggett, R., and Al-Shaali, R., 2007. Climate Consultant 3.0: a tool for visualizing building energy implications of climates.

14. Milne, M., Liggett, R., Benson, A., and Bhattacharya, Y. (n.d.) Climate Consultant 4 . 0 Develops Design Guidelines for Each Unique Climate. *American Solar Energy Society*.

15. Climate Consultant Download Page, http://www.energy-design-tools.aud.ucla.edu/climate-consultant/request-climate-consultant.php, [Accessed: 6th July 2018].

16. Givoni, B., 1992. Comfort , climate analysis and building design guidelines. *Energy and Buildings*, 18. pp 11–23.

17. Hongbing, W., Jun, Q., Yonghong, H., and Li, D., 2010. Optimal tree design for daylighting in residential buildings. *Building and Environment*, 45 (12). pp 2594–2606.

18. Yakubu, G.S., 1996. The Reality of Living in Passive Solar Homes : A User-Experience Study Keywords : Introduction Low Energy Housing in Milton Keynes. in: WREC 1996, pp. 177–181.

19. Mendonça, P. and Bragança, L., 2007. Sustainable housing with mixedweight strategy—A case study. *Building and Environment*, 42 (9). pp 3432–3443.

20. Bondars, E., 2013. Implementing Bioclimatic Design in Sustainable Architectural Practice. *Architecture and Urban Planning*. pp 84–86.

21. Pacheco, R., Ordóñez, J., and Martínez, G., 2012. Energy efficient design of building: A review. *Renewable and Sustainable Energy Reviews*, 16 (6). pp 3559–3573.

22. Tzikopoulos, A.F., Karatza, M.C., and Paravantis, J.A., 2005. Modeling energy efficiency of bioclimatic buildings. *Energy and Buildings*, 37 (5). pp 529–544.

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QUALITY CRITERIA OF URBAN OPEN SPACES IN HIGH - RISE RESIDENTIAL COMPLEXES IN THE PROCESS OF URBAN REGENERATION

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ABSTRACT

Urban open spaces in high - rise residential complexes built in the second decade of the 20th century are often marginalized spaces without usable value and other attributes of relevance for use by tenants. It is in a large coalition with the multiple significance of these spaces for the quality of life of tenants. The contribution of open spaces to the quality of life is first determined by their potentials for creating adequate spatial conditions for the different types of activities of the daily free time of tenants and the exercise of physical activity in the direction of improving psycho-physical health. In addition, open spaces are important for achieving spatial-ambient values, as well as for encouraging good neighborly relations, communion, territoriality and sense of belonging. Bearing in mind that there are no unique criteria for the quality of open spaces in high - rise residential complexes, the aim of this paper is to point to the desirable characteristics of these spaces in accordance with the contemporary principles of urban design and practice in the process of their regeneration. These criteria can serve as a basis for further research of the modes of urban regeneration of open spaces, with the aim of improving the quality of life of tenants of high - rise residential complexes.

Keywords: urban open spaces; high - rise housing; urban revitalization; quality criteria

1. INTRODUCTION

The evolutionary flow of the development of urban open spaces in high - rise residential complexes shows a series of transformations in accordance with urbo-architectural practice and social priorities. Creating a pleasant residential environment that can meet the changing demands and wishes of tenants in a long-term perspective, which ensures adequate hygiene conditions and comfort, is one of the greatest challenges of practical practice and at the same time a complex and socially important task. This particularly refers to housing in high - rise residential complexes, which in some areas often have negative attributes. Namely, one of the main problems of high - rise residential complexes is devastation of open spaces, which is reflected through inflexibility, unattractiveness and low level of order, which contributes to deterioration of basic living values and quality of life (Bogdanović Protić, 2009). With modest design, as well as maintenance and management problems and lack of adequate standards and legal regulations, open spaces lose functional, social and aesthetic dimension. Furthermore, their long-standing neglect leads to a disruption of their primary

function - a comprehensive component of quality of life. All this indicates the need for their regeneration. In this context, the aim of this paper is to identify the desirable criteria for the quality of open spaces that can be used both for the evaluation of their current state and for directing the directions of transformation in the process of urban regeneration. In this paper the standard methodology of scientific research is applied, using a few methods. By collecting and systematizing research material and empirical method of knowledge, the basics for determining the criteria of quality of urban open spaces in high - rise residential complexes are considered. The method of analysis and synthesis determines, first, the criteria for the quality of urban open spaces. After that, the systematization method is used for identification of the aspects of the quality of urban open spaces, in accordance with the aim of this paper. These criteria can serve as a basis for further exploration of the modalities of promotion of open spaces, with the aim of improving the quality of life.

2. QUALITY CRITERIA OF URBAN OPEN SPACES

Modern approaches to the regulation of urban open spaces in foreign practice tend to synergistic treatment of their problems. Partial approaches have led to a narrow view of open spaces, the absence of a system of values, their inadequate role and importance for the quality of life of tenants of a high rise residential complex. This points to the need to review the meaning of the quality of open spaces and redefine the criteria and aspects of quality in the regeneration process. In spite of numerous theories of the corresponding open spaces that we encounter in literature, the unique criteria for the quality of open spaces are not harmonized, nor are they defined by a single value framework (Coorey, 2007). In the late 1970s and early 1980s, Bentley et al. (1985) formulated a new approach to urban design, known as the *responsive environment.* This approach has emphasized the need for more democratic environments and maximizing the level of choice of content and activities available to users. In addition to the above-mentioned attributes, open spaces should be harmonized with the principles of public-private delineation, be human-made, and surface treatment and urban equipment should be adequately applied, in accordance with the purpose of space (Curran, 1983; Ashihara, 1970. Bai, 1993; Gehl, 1987; Li, 1999).

In determining the criteria of the quality of urban open spaces in this paper, it starts from the fact that the open spaces are places where residents like to spend their open time, which they perceive as entertaining, safe, inviting and attractive, where they are satisfied and they are proud of. Particularly, the development of good neighbourly relations and joint activities of tenants in open areas is particularly encouraged, which is an important indicator of the quality of life of tenants of residential complexes (Bogdanović Protić, 2016). Identification of numerous needs and requirements in open spaces in high - rise residential complexes imposes the need to determine the quality of their spatial-functional structure in the context of various functional, socio-cultural, ecological and aesthetically aesthetic demands of urban development.

Starting from the multiple significance of open spaces for quality of life and the identified quality criteria defined by the review of multidisciplinary literature, those who are relevant for directing the regeneration of open spaces are systematized: functional-spatial, ecological, psycho-social, visual-aesthetic and technological-organizational (Bogdanović, Protić, 2016.). It should be emphasized that various researchers cite a wide range of experience, functional, social and environmental aspects of open spaces. This leads to the conclusion that all these aspects must be treated synthetically when assessing the state of open space, and for the purpose of determining the types of problems and levels of deprivation present. In this respect, the aspects of the quality of open spaces have been established, from which the principles for critical analysis of the state of open spaces in complexes with high rise housing are derived. Bearing in mind the complexity of the problem of the quality of open spaces, it can be concluded that the established quality criteria can not be final or complete, that is, it is possible and desirable to supplement them and align them with the social, economic, architectural and urban trends and changes in the needs of the tenants.

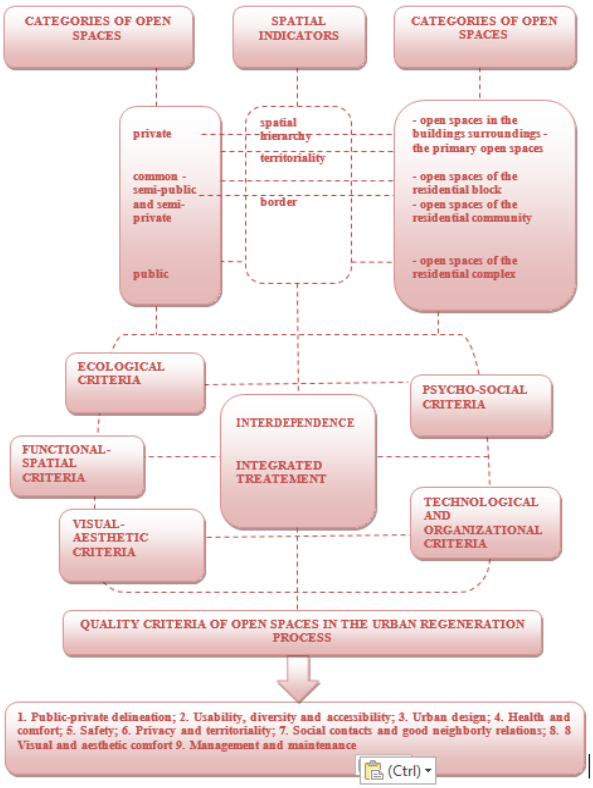

Figure 1: Integration of spatial indicators and criteria for open space quality in high - rise residential complexes

Source: Bogdanović Protić I., 2016. Definisanje modela revitalizacije slobodnih prostora kompleksa sa višespratnim stanovanjem u funkciji unapređenja kvaliteta života, Građevinsko–arhitektonski fakultet Univerziteta u Nišu

In the context of all this, 9 key aspects of the quality of open spaces have been identified (Bai, De-mao, 1993; Bogdanović, Protić, 2016; Curran, R., 1983; Coorey, 2007), as it can be viewed in Figure 1. They arise from the adopted characteristics of successful open spaces and the principles for achieving successful open spaces, as well as from the defined general criteria for the quality of open spaces. Thanks to the multiple significance of the quality of open spaces, as a determinant of quality of life, the interpretation of established quality criteria at all spatial levels in high - rise residential complexes is of particular importance (Figure 1). All this in the direction of a comprehensive study of the quality of open spaces in high - rise residential complexes, directing the direction of regeneration.

3. ASPECTS OF QUALITY OF URBAN OPEN SPACES

3.1. Public-private delineation

In the function of creating a suitable environment for active housing and stimulating social relationships and joint activities, it is important to get acquainted with the hierarchy of open spaces in high - rise residential complexes based on the rules of access and the regime of space use, i.e. public-private delineation (Lozano, 1990). The hierarchy of open spaces is also in the function of urban design and is considered essential for achieving privacy and territoriality in residential complexes. The basic typology of open spaces based on the rules of access and the regime of the use of space implies three types of open spaces: 1. private, 2. common and 3. public (Lička et al., 2012). In addition, common spaces can be semi-private and semi-public spaces (Ruland, 2002). All types of open spaces have their relevance for the tenant's life and preferably all are represented (Figure 2). Spatial Borders provide a degree of privacy, enabling people to exercise control over their own activities and activities of other (Dendy, 1998).

Figure 2: Typology of open spaces according to public-private delineation

Sources: a) www.pt.rwth-aachen.d [Accessed: 21st March 2016]. b) Knoll, T., Moser, K., 2009. *Evaluierung von Freiflächen im geförderten Wohnbau, Knoll, Planung & Beratung Ziviltechniker GmbH,* Wien c) www.ura.gov.sg [Accessed: 15th November 2017].

3.2. Usability, diversity and accessibility

The usability of open spaces is a prerequisite for the realization of open time activities and various occupancy activities, and in this sense open spaces can be perceived as positive or negative. Key principles related to this aspect of quality are: availability, multi functionality, good urban design, maintenance of open spaces and compliance with the needs of tenants, easy accessibility from residential buildings, comprehensibility, layout of hiking trails, public-private delineation, offer of different types of activities, contents for different age categories of tenants (Figure 3).

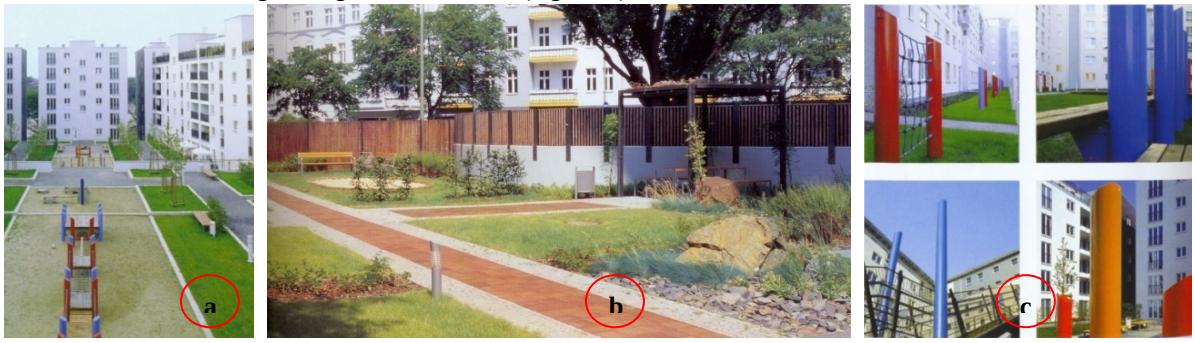

Figure 3: Usability, diversity and accessibility – examples

Sources: Knoll, T., Moser, K., 2009. *Evaluierung von Freiflächen im geförderten Wohnbau, Knoll, Planung & Beratung Ziviltechniker GmbH,* Wien

3.3 Urban design

The usability of open spaces depends largely on urban design (Figure 4). Several studies indicate that the key principles of a good urban design are: urban equipment, landscaping, materialization, variability and flexibility. In contrast to previous ideas that urban equipment should be fixed, today most experts advocate a more liberal concept of urban equipment tailored to specific purposes. It should be flexible and multifaceted - adaptable to various joint activities of tenants. Particular attention should be paid to communication spaces, where different space and centre sites intertwine, so urban equipment should also be foreseen in the context of daily activities, but also specific, occasionally.

Figure 4: Examples of good urban design a) various seating areas b) paving c) children's playground
Sources: a) www.pinterest.com [Accessed: 14th February 2018]. b) www.designrulz.com [Accessed: 15th January 2018]. c) Lička et al. (2012)

3.4. Health and comfort

Health and comfort support the provision of favourable microclimate and are primarily related to ecological criteria for the quality of open spaces, but also for others. A favourable microclimate depends on the presence of vegetation (Figure 5), landscape orientation, topography, types of paving and the presence of water surfaces. Its effects can be seen through comfort-comfort: visual advantage, air, thermal and acoustic comfort of tenants, which is manifested by the effect on the senses, and through the experience of open spaces, pleasant or unpleasant. It can be achieved by the proper orientation of open spaces and adequate urban design, by placing spatial elements that provide shelter from sun, wind and impurities as well as planned greening.

Figure 5: a), b), c) A favourable microclimate achieved by virtue of the abundance of vegetation

Sources: a), b) Kirsten, R., Zwoch, F., 1998. *Landschaftsarchitekten - Landscape Architecture In Germany, Nelte,* Wiesbaden

c) Http://Urbanplanet.Info/Urbanism/Revealing-Ecological-Potential-Open-Spaces-Urban-Fabrics/[Accessed: 14th February 2018]

3.5. Safety

Safety is considered a key factor when choosing a tenant to use a certain open space. This includes both physical and social dimensions. The basic design principles, whose application can achieve safety are: adequate lighting of open spaces; comprehensiveness, ability to control and clear boundaries of space; differentiation of pedestrian and motor traffic; prevention of antisocial behavior; good urban design; regular maintenance; absence of parking in open and green spaces (Figure 6). Security implies adequate space availability, such as appropriate location of activity schedules (such as barriers and signs) in order to prevent incidents or injuries, while social security refers to the absence of vandalism (Li, 1999).

Figure 6: Safe open spaces a) adequate lighting b), c) possibility of observation from residential buildings
Sources: a) www. uli.org [Accessed: 1st June 2016] b), c) Lička et al (2012)

3.6 Privacy and territoriality

Privacy and territoriality are very important aspects of the quality of open spaces and are closely related. They can be realizedby application od these principles: public-private delineation; personalization / creativity of tenants (Figure 7); spatial possibilities for intimacy, peace, harmony, silence, protection against noise; adequate space; protection against unwanted eyes; a sense of security, security; schedule of activities, conflicts. Territoriality is a delimitation of open spaces, which allows individuals or groups to use space and defines (Li 1999). This implies psychological identification with the city, which is symbolized by the attitudes, possessiveness and distribution of urban equipment.

Figure 7: a), b), c) Examples of personalization on open spaces
Source: Lička et al. (2012)

3.7. Social contacts and good neighbourly relations

A man as a social being has the need to establish contacts with other people, and socialization is of particular importance in high - rise residential complexes. The quality of the residential environment, that is, the spatial and design potential of open spaces, plays a decisive role in promoting good neighbourly relations. It is achieved by applying a quality urban design, by building seating space and gathering, adequate distribution and types of urban equipment. It includes: equipment for gathering, meeting, joint activities, social games; communicating with neighbours; frequency of use of open space; user structure - different age categories of tenants; participation of tenants in the arrangement and maintenance of open spaces. That is why the significant multifaceted character of these spaces is also important for the purpose of integrated treatment of the interests of different actors (tenants) in the context of social interactions as an important parameter of the quality of life of tenants of high - rise residential complexes.

3.8 Visual and aesthetic comfort

The visual and aesthetic experience of the space is conditioned by the individual perceptions and demands of individual users. However, in general, achieving this aspect of the quality of open spaces is possible by applying the following principles: good urban design, spatial and ambient integrity, the attractiveness of space, diversity, the presence of elements of nature, the suitability of a human measure (Figure 8). It can be said that the aesthetic dimension of open spaces is a key component that attracts tenants to stay in this area, that is, which favours the creation of inviting spaces. Represented colours, styles and spatial shapes can affect the emotions and behaviour of tenants, either in a positive or negative way, they can act incentive, cause user benefits, or act monotonously and reflectively (Li, 1999), and they must be especially minded about them designing open spaces.

Figure 8: Examples of open spaces that encourage good neighborly relations and which are visually and aesthetically pleasing
Sources: a), b) Nelte, H. M., 2003. *Landschaftsarchitekten III. Neue Entwürfe ausgewählter Landschaftsarchitekten aus ganz Deutschland, Wiesbaden* c) http://www.urbanforestry.info/landscaping/parks-and-open-spaces/[August 24th 2018].

3.9 Management and maintenance

Regular maintenance manifests itself to the degree of usable value of open spaces. The appearance and hygiene of open spaces affect the satisfaction of the tenants in this area, and therefore the length of their stay. On the other hand, in unsustainable, abandoned and dirty open spaces, the frequency and length of tenant's residence is low, and such areas are repulsive to tenants. Long-term neglect of open spaces leads to an increasing devastation and constant disturbance of the quality of life of tenants. The share of tenants in joint activities in open spaces and in their improvement and upkeep contributes to the improvement of the feeling

of pride of tenants and the responsibility for the housing environment. Participation also allows them to make choices for alternative urban design and affirmation of space quality such as security, readability, identity, which will enhance their sense of belonging and control (Bogdanović Protić, 2012).

4. CONCLUSION

In the current conditions, we are facing a trend of marginalization and degradation of the quality of urban open spaces in high - rise residential complexes, which lose their basic functions and basic living values. By unifying the different requirements that these spaces should fulfil in the quality of life function, systematized quality criteria that are relevant for their regeneration are also considered. A particular challenge is to harmonize the mutual relations of the varied and changing needs of tenants with established criteria for the quality of urban open spaces, as an instrument for determining the conditions that open spaces should fulfil in order to represent the desired destination of tenants in their spare time. The criteria and aspects of quality set forth in this paper cannot be final or complete, but can be adopted in the process of urban regeneration. They can be used both for the evaluation of their current state and for directing the directions of transformation in the process of urban regeneration. Also, these criteria can serve as a basis for further exploration of modalities of promotion of urban open spaces, with the aim of improving the quality of life.

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REFERENCES

1. Ashihara, Y., 1970. *Exrerior Design in Architecture*, Van Nostrand Reinhold Company, New York

2. Bai, De-mao, 1993. *Residential Area Planning and Environment Design*, China Building lndustry Press, Beijing

3. Bentley, L., Alcock, A., Murrain, P., McGlynn, S., Smith, G., 1985. *Responsive Environments: A Manual for Designers*, Architectural Press, London

4. Bogdanović Protić, I., 2009. *Urbana regeneracija višespratnog stanovanja*, Zadužbina Andrejević, Beograd

5. Bogdanović Protić I., 2012. *Tenants' participation as a tool for urban regeneration of multi-family housing*, Proceedings of the International Conference ‘’Indis 2012: Planning, design, construction and renewal in the civil engineering’’, Novi Sad, pp. 757-763

6. Bogdanović Protić I., 2016. Definisanje modela revitalizacije slobodnih prostora kompleksa sa višespratnim stanovanjem u funkciji unapređenja kvaliteta života, doktorska disertacija, Građevinsko-arhitektonski fakultet Univerziteta u Nišu

7. Coorey, Shaleeni B. A., 2012. Design of open spaces in high density zones: case study of public housing estates in Hong Kong, Phd Thesis, University of Hong Kong

8. Curran, R., 1983. *Architecture and urban Experience*, Van Nostrand Reinhold, New York

9. Dendy, S. H., 1998: Resident Involvement in the Landscape Architectural Redesign of Public Housing: Creating Opportunities for a Sense of Ownership, Control, and Efficacy through a Participatory Design Process, Master Thesis, Virginia Polytechnic Institute and State University, Blacksburg

10. Gehl, J., 1987. *Life Between Buildings: Using Public Space*, Van Nostrand Reinhold, New York

11. Li, Y., 1999. *Space Between Buildings in Beijing's New Housing*, Master Thesis, School of Architecture, McGill University, Montreal

12. Lička, L., Dlabaja, C., Grimm-Pretner D.et al., 2012. FreiWERT, Untersuchung der Qualität und Wertigkeit von Freiräumen von innerstädtischen Neubauprojekten und Darstellung innovativer Lösungen, Berichte aus Energie- und Umweltforschung, Wien, pp. 141–160

13. Lozano, E. E., 1990. Community Design and the Culture of Cities: The Crossroads and the Wall, Cambridge University Press, New York

14. Ruland, G., 2002: *Freiraumqualität im Geschosswohnungsbau*, Stadtent Wicklung, Wien

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ARCHITECTURAL AND DESIGN REORGANIZATION OF THE RESIDENTIAL YARD IN THE MASS BUILDING UP OF VOLGOGRAD IN THE 80-S OF THE 20TH CENTURY

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ABSTRACT

The article is devoted to the problem of yard space improvement in the modern building up of the city of Volgograd. A conception of "eco-yard" has been developed here. The territory of two streets of one of the city's districts was chosen as a place for creation an "eco-yard". The reorganization of yard space is suggested from the point of view of creating a comfortable visual environment. The article has brought to light the main factors negatively affecting physical and psychological condition of a person. The lay-out and methods of green plantations composition in separate areas of the residential zone were determined. The climate peculiarities of a southern town such as Volgograd were surely taken into account. Choosing the methods of greenery planting, we also considered the territory building up, residential constructions, the number of storeys and population as well as the age of the latter. Intensive roof greenery planting and vertical greenery planting of buildings facades has been suggested for the improvement of visual environment for inhabitants and reduction of unfavorable impact of urban zones. Various methods and types of green plantations to meet the complex of functional requirements and achieve the composition harmony of a dwelling and nature have been also determined in the article. The conception of "eco-yard" includes a division of a yard territory into the following parts: a sports court, a children playground, a quiet corner for a rest, a household part, and parking. The scientific novelty of this work lies in the research rested upon the sociological, aesthetic and functional analysis of modern condition of yard space. A complex architectural and design solution for creating ecologically oriented environment is suggested here. Some photographs and graphical pictures are presented.

Keywords: *Volgograd, reorganization, "eco-yard", yard space, visual environment, greenery planting.*

1. INTRODUCTION

With the development of urbanization and growth of big cities, deterioration of ecological situation, and the change of idea of citizens' life the problem of town environment enhancement and preservation of man and nature connection has arisen very urgently nowadays. In the formation of an architectural image of town and high level of yards' accomplishment, issues referring to architecture and nature harmonization, variety of small architectural forms are acquiring a great importance. For the investigation and architectural and design reorganization we have chosen not-organized and not-acceptable for the population residential yards which have needed a correction of the earlier formed recreation space for a long time. [1,3] These are residential yards in the mass building up of the 80-s of the 20th century in the Traktorozavodskii district of the city of Volgograd. They were constructed in the architectural traditions of the Soviet period. As the investigation has showed they have deficit of green plantations and are characterized by low sanitary-hygienic standards of environment. (Fig. 1) Lack of organization and functional filling of these residential yards is also a drawback here. The man's need of his tenure adaptation motivates reconstruction and improvement of residential space. Here lies the modernity and urgency of yard territories reconstruction. The present research aims at creating humane architecturally spatial environment, close to nature and comfortable for living.

The following problems are being solved in the work: the analysis and generalization of theoretical and practical base of a residential yard formation in Volgograd, the study of home and foreign experience of creating comfortable yard space, the analysis of residential yards due to different factors (nature and climate conditions, a functional solution, an aesthetic estimation); recommendations for architectural and design reorganization of a residential yard.

In the domestic science a fragmentary study of yard space formation is related to the 60s of the 20th century. At that time appeared Yu. S. Lantsberg's investigation [7], devoted to improvement of yard territories in the in-line building up of the 50-60s. In these works the main attention was focused on the normative and operational aspects.

Figure 1: (a), (b), (c), (d) Current state of the yards.

The problems of landscape improvement, peculiarities of yards compositional decision and aesthetics of urban environment were regarded by the researchers of the late 60-80s: E.S. Balakshina [2]; Yu.B. Khromov [6] and others.

A lot of various trends in landscape designing are presented in the work of a prominent English landscape architect John Simonds. [9] The subject matter of a residential yard research is being expanded in some other works. Some works broaching problems of urban environment reconstruction and town landscape started being printed. In the process of developing a residential yard design the use of various materials, as well as color and lighting were thoroughly studied. [4]

A special research devoted to the problem of residential yards formation and their architectural and design solution has not been carried out in the regional practice up till now. The idea of a special significance of greenery planting for Volgograd was touched upon in the book by Volgograd architects V.E. Maslyaev and A.F. Lipyavkin. [8] However, the authors did not touch upon the problem of residential yards space organization.

2. METHOD OF RESEARCH

The method of investigation is based on the complex study of the problem and includes the following points: the study of scientific works, normative and project documents related to the problem of yard space

improvement; carrying out nature investigation and analysis of residential yards in the building up of Volgograd of the 80-s of the 20th century aiming at estimating their modern condition.

3. THE CONCEPT OF "CREATING ECO-YARD"

In the present work, for the sake of development a conception of the residential yard space reorganization we have chosen a system of greenery planting from other means of creating a comfortable yard space. An area with the most typical architectural characteristics located in the city of Volgograd in the boundaries of Myasnikov, Pavlov, Otrada and Selenodol'skaya streets was chosen for the investigation of residential yards. The estimation of yards of the chosen area had preceded the reconstruction. It was found out that this area had the yards of different types: with spilling over, local and open space. (Fig. 2) The architectural and aesthetic analysis of the chosen territory was carried out to suggest a certain conception of residential yards reorganization. The foundation of "an eco-yard conception" was taking into account all the requirements necessary for microclimate improvement creation of psychological comfort for the inhabitants.

Planting of greenery has a special significance for a residential yard in Volgograd. Volgograd's climate is continental. The city gets much warmth. The summer here is long and dry. In July the air warms up to + 34—36 degrees Celsius, sometimes the temperature maximum is + 41-45 degrees Celsius. Due to strong winds there is much dust in the city. Thus, the problems are caused by the climate conditions. A considered system of greenery planting is an important factor for reducing this negative effect.

Greenery planting in the yards is performed with taking into account functional zoning. Greenery in any forms becomes a boundary of certain zones. Both town space and residential yard space "serve as a receptacle of certain life functions". [5]

Table: Typology of yard spaces. In the city of Volgograd, the 20s - 90s. XX century.

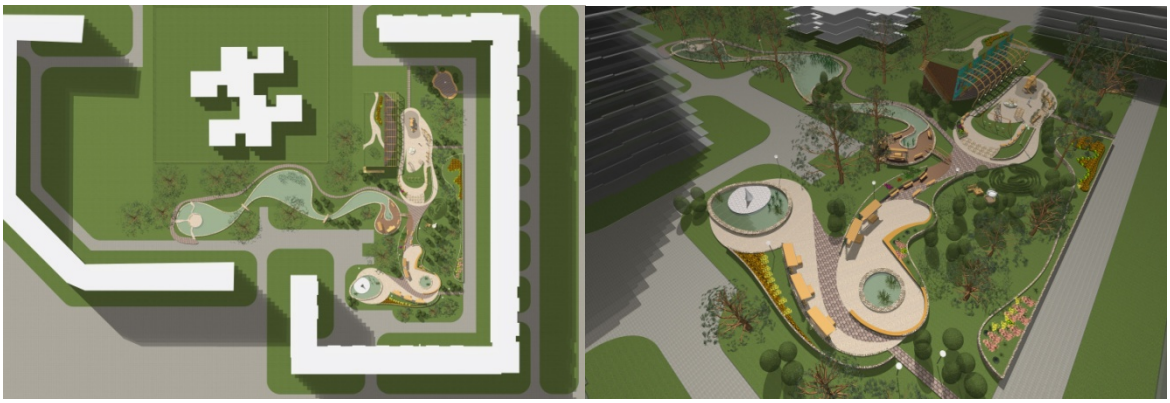
Periods / Types of yards	20th-30th years	The end of the 40's - 60's.		70th-90th years	
		The end of the 40's - 50's.	60th years	70th-80th years	90th years
Type 1. Open yard spaces.	Subtype 1-a.			Subtype 1-b.	Subtype 1-c.
	 «yard garden»			 «yard-niche»	 «mini-yard»
Type 2. Closed yards.		 «atrium courtyard»			
Type 3. Overflowing yard spaces.		Subtype 3-a.		Subtype 3-b.	
		 «atrium courtyard»		 «courtyard-stream»	
Type 4. Local yard spaces.			Subtype 4-a	Subtype 4-b	
			 «yard-loggia»	 «courtyard-well»	

Figure 2: Table: Typology of yard spaces. In the city of Volgograd, the 20s - 90s. XX century.

In the residential yard of Volgograd greenery creates shady veil saving the territory from the scorching sun; in other seasons of the year it diminishes gusty winds. Greenery formed individual characteristics of each of the chosen for the research yard. Such nature factors as the change of foliage color in different seasons of the year, the structure of branches and correlation of deciduous plants and evergreen conifers was taken in consideration. One yard was arranged on the basis of spring blossom of the trees of the same type or shrubbery (lilac, jasmine). (Fig. 3) Birch-trees, silver poplars, and snowball trees were planted in another yard. In the third yard the whole composition is founded on the variety of plants of green color: trees, shrubbery, ornamental grasses and a lawn. (Fig. 4)

In all the yards there is vertical greenery (creepers) on the facades of the buildings. The bright colors of flowers on the balconies make the facades look even more picturesque. The compositional connection of buildings and surrounding improvement elements has been also taken into consideration as a very important factor. One of these elements is creating an artificial water body, which is especially vital for Volgograd with its very hot summer. The usage of greenery and water not only intensifies the element of ornamentation in the yard space decoration and goes with small architectural forms, but it also decreases air pollution and combats against dust. The water bodies are surrounded by benches, bushes, vases with flowers and decorated with tiles of different colors. They are located according to the principle of traditional Japanese gardens, so that the mirror of the water was well seen from balconies and loggias, that is from visual angles close to a vertical line.

Splashing pools for children are also stipulated in the yards. The place for these pools was chosen in view of insolation. Near the pools there is a small beach of fine pebble and sand. (Fig. 5)

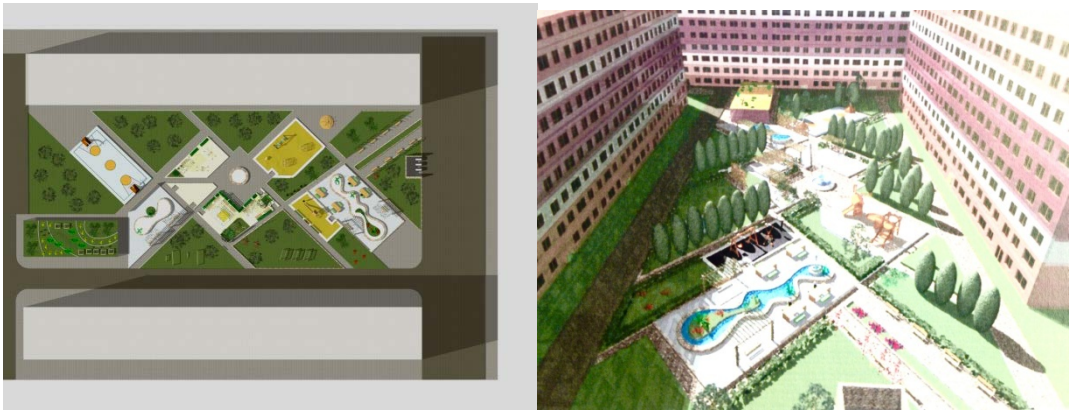


(a) (b)

Figure 3: Planting of greenery yard. Example 1. (a) Plan, (b) Project proposal.

(a) (b)

Figure 4: Planting of greenery yard. Example 2. (a), (b) Project proposal.



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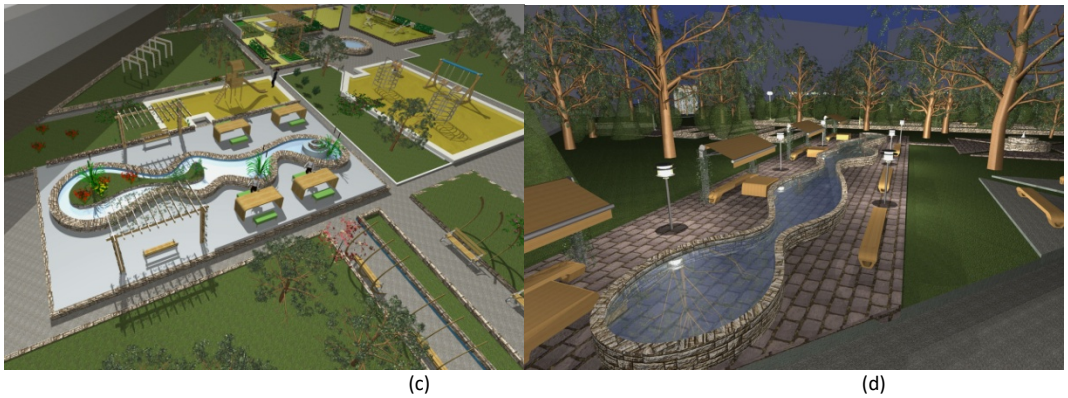

(c) (d)

Figure 5: Planting of greenery yard. Example 3. (a), Plan, (b), (c), (d) Project proposal.

The application of landscape design will help to create a favorable micro-climate in the yard space and realize the idea of "an eco-yard".

The carried out research of these residential yards in Volgograd let us to find out that the formation of residential yard space is influenced by the following factors: social, aesthetic, economic, and climatic.

The complex analysis of residential yards of the 80-s of the 20th century resulted in the following basic theses:

- It has been found out that a transformation of a residential yard space depends on the planning methods of a building-up strictly regulating a yard size.
- The typology of residential yards in the mass building-up of the 80-s of the 20th century has been defined more precisely.
- The analysis of domestic and foreign experience of the architectural and design projection of the residential yard environment under the conditions of more and more growing urbanization has been carried out.
- The main principle of the realization of creating a comfortable for inhabitants residential yard environment, the priority of which lies in a psychological and emotional approach to a choice of means for achieving this aim, has been found out.
- The basic recommendations on greenery, as well as functional zoning, small architectural forms, and transport for a group of yards of the Traktorozavodskoy district of the city of Volgograd have been made.

4. GENERAL CONCLUSION

The complex of measures suggested for reorganizing a residential yard of the 80-s of the 20th century in the Traktorozavodskoy district can be taken as a basis in the process of residential yards reorganization in Volgograd. The realized analysis of some residential yards of the city leads us to the conviction that the traditional approach to the problems of residential yard environment should be changed. The photographs of residential yards of the 80-s of the 20th century in the Traktorozavodskoi district and relevant design suggestions can be used as additional material for actual designing.

The declared above recommendations on the reorganization of residential yards in Volgograd are not final and absolutely certain. These ways are just recommendations; they can be improved and changed in the process of projecting not only a reconstruction of existing residential yards, but also new yard spaces. Resting on the domestic and foreign experience it is possible to form "an eco-yard" and create modern favorable architectural and landscape environment for the residents of the city of Volgograd.

REFERENCES

1. Akhmedova E.A. and Shabanov V.A., 1989. Town environment: problems of reconstruction.
2. Kuibyshev, p. 106.
3. Balakshina E.S., 1969. "Improvement of a residential building territory". M.: Stroyizdat. p. 192
4. Brunch, Melwill K., 1979. Projecting of town environment./The translation from the English language by A. I. Man'shavin; redacted by O.V. Kudinov. M.: Stroyizdat. p. 176; Mustafaeva O. A. and Nikol'skaya L.V., 1980. Human environment: quality and emotions. /Building and architecture. Leningrad, N2 Leningrad. pp. 24-26.
5. Efimov A.V., 2006. "Design of architectural environment". M: Architecture. p.504; "Town coloring". 1990. M.: Stroyizdat. p. 272; Sychyova A. V., 2007. "Landscape architecture". M: Oniks. p. 110.
6. Fomin V.A., 2001. Videoecology. What is good for an eye and what is bad? M.: TASS-REKLAMA. p. 47.
7. Khromov Yu.B., 1969. "Outer improvement and planting of greenery in residential complexes". M. p. 160.
8. Lantsberg Yu.S., 1961. "Improvement of yard territories" M.:Municipal economy. p. 124.

9. Maslyaev V.E. and Lipyavkin A.F., 1985. Volgograd. M.: Stroyizdat. p. 215.

10. Simonds J.O., 1965. “Landscape and architecture”. The translation from the English language by A.I. Man’shavin M.: Stroyizdat. p. 195.

Photos of the author. Visualization of project proposals - Ilya Mordvintsev.

A STRATEGIC POINT - GEOGRAPHICAL ASPECTS IN THE DEVELOPMENT OF THE CITY OF ZALĂU

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ABSTRACT

This article proposes a brief approach regarding the influence of geographic conditions in the becoming of the city of Zalău. Residence of Sălaj County, the city of Zalău is located in the north western part of Romania, along the valley of the same name, in the contact area between the Transylvanian depression and the Western Plain, at the junction of the Apuseni mountains and the Eastern Carpathians. Located near the border of the former Roman Empire in the area formerly inhabited by the 'Free Dacians', Zalău was the crossing point between Central Europe and Transylvania, along the so-called 'Salt Route'. Given the circumstances, over time, the geographical settlement of the city influenced its territorial role. The current urban structure is obvious as a result of the history of urban becoming, from being a strategic point during old times, to the prosperous municipality of today.

Keywords: geographic aspects, built heritage, strategic point, hydrographic basin

1. INTRODUCTION

This article proposes a brief approach regarding the influence of geographic conditions in the becoming of the city of Zalău. Given the circumstances, this case study research analyses the ways in which the territorial role of the settlement was influenced by the geographical traits of the city.

2. TOPONIMY

Zalău is the administrative residence of Sălaj County, formerly called Silvana or Silvana Country, which derives from the word 'silva', hence it is also called Silvana, meaning 'place with forests'. The city is situated at the foot of the Meseş Mountains, in the Latin inscriptions being called Meches.[1]

There is a similarity between the two names Zalău (Ziloc) - Sălaj (Zila) and it is assumed that both would originate in the Latin radical 'silva' (forest) or 'zilai' (red wine), which then evolve differently.[2]

In support of the name of the city there are several hypotheses about:

- the city's position within the natural environment: L. Szikszai said that the name of the city would be of Turkish-Avaric origin, coming from the word 'silah', 'slaj' meaning 'belt', S. Petho said it is of Slavic origin and means waist, and O. Vintiler says that it would also be of Slavic origin, meaning 'depression'.
  N. Gudea supports the Slavic origin of the word 'jilava', 'zilava', 'Zila', which in ancient Slavic would mean 'marshy land'.
- resources and occupations of the inhabitants: Al. V. Matei suggested that the name could come from the thracic 'zilai' which means 'wine'

In 1808 Zalău was certified as 'Waltenberg vel Zillenmarkt' 'waltenberg' meaning 'mountain with forests'; 'markt' - the market, as a result of the privilege granted by King Matei Corvin on 1 August 1973 to hold a trade fair in that location on certain days of the year. The fair was held in the current Iuliu Maniu Square, the central

1 Chende-Roman, Gheorghe, *Toponime – Din onomastica Ţării Silvaniei,* ed. Silvania, Zalău 2008 p.13.

2 Chende-Roman, Gheorghe, *Dicţionar etimologic al localităţilor din judeţul Sălaj*, ed. Silvania, ed. Caiete Silvane, Zalău 2006 p. 300

square of the city. The whole phrase 'Waltenberg vel Zillen-markt' can be translated as 'Zalau market near the forest mountain.' [3]

The Romanian form at the end of the 19th century - is Zilahu, Zelahu and the most widespread - Zălau. The present form, Zalău, has been used since the twentieth century, analogous to various toponyms finished in '-u'.

3. GEOGRAPHIC SETTLEMENT

Residence of Sălaj County, the city of Zalău is located in the north western part of Romania, along the valley of the same name, in the contact area between the Transylvanian depression and the Western Plain, at the junction of the Apuseni mountains and the Eastern Carpathians (Fig. 1).

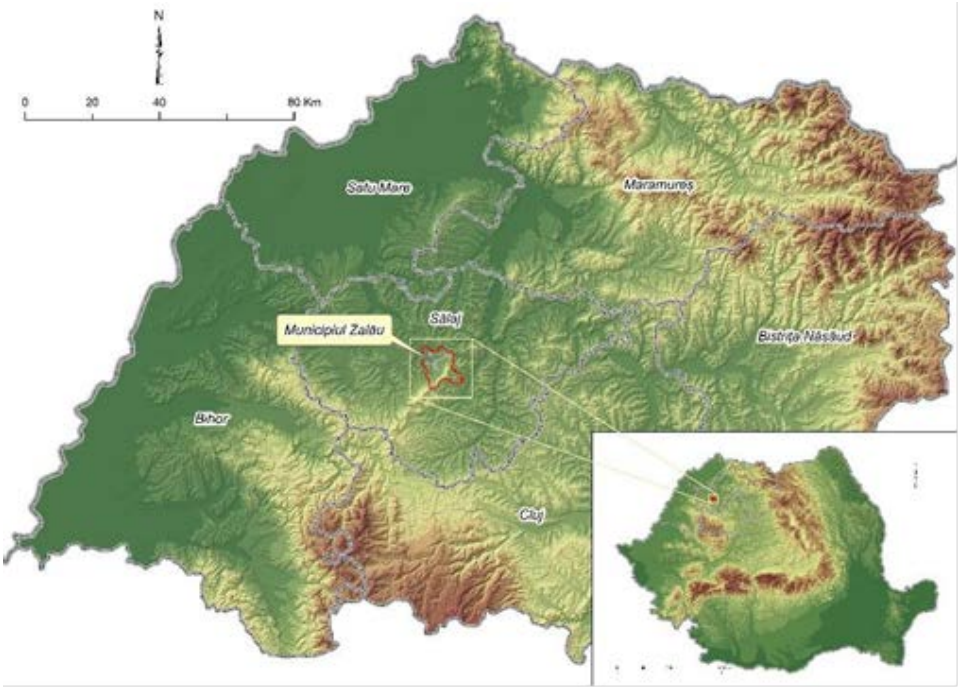

Figure 1: Zalău – Position in the territory of Romania (credits: Andreea-Maria Pop)

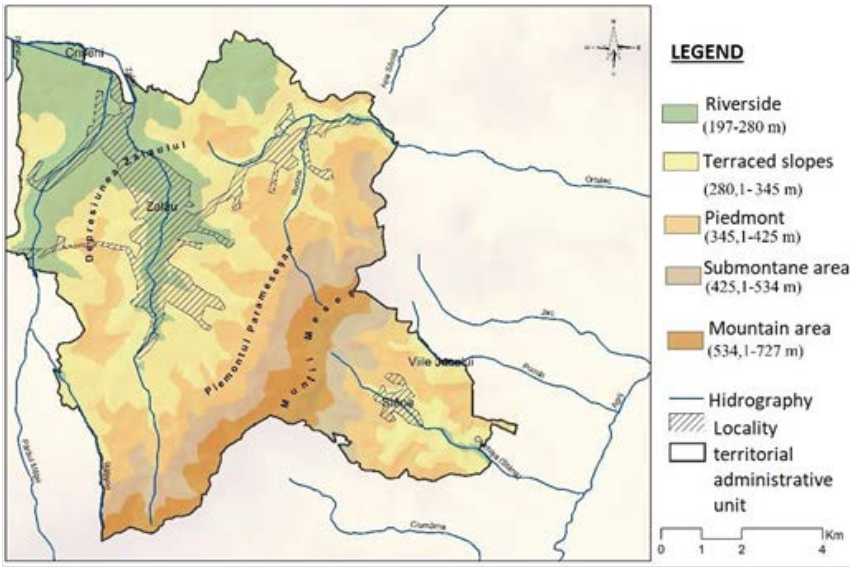

Figure 2: Zalău – Morphogenetic steps (credits: Andreea-Maria Pop)

3 Chende-Roman, Gheorghe, *Dicționar etimologic al localităţilor din judeţul Sălaj*, ed. Silvania, ed. Caiete Silvane, Zalău 2006 p. 301

The town is situated in a depression surrounded to the southeast by the mountains of Meseş and the rest of the hills, and due to the rough relief, the locality has developed vectorially - along the valley of Zalău River (successive to a nucleic initial development in the old hearth of the city) (Fig. 2).

The city's hearth is located in a depression area formed by erosion at the foot of the Meseş Mountains, which dominates the city to the south, extending mainly to the north of the old hearth where new neighbourhoods and industrial areas were located during the 1960s and to the south-east, its location being on the relatively narrow meadow terrace of the Zalău valley, as well as on the slopes that delineate this terrace.

The Zalău depression is reduced in extension, having the shape of an elongated bay in the south-north direction, on the upper course of the Zalău valley. Its altitudes range from 250 to 450 m.

The administrative territory has a varied relief, and the slopes, as dominant elements of the landscape, are characterized by the large fragmentation by the incipient hydrographic network and the torrent character forming the receiving basin of the Zalău Valley. The predominant slopes face northeast and southwest in the direction of flow of the valley of Zalău, east and west on the secondary tributaries and to the forests.

The Zalău River develops its basin and its upper course on the administrative territory of the city of Zalău, and it springs from the western flank of Meseş Mountains.

Figure 3**:** Zalău city centre – aerial view (credits: by author)

The city of Zalău is located mostly in the main valley of Zalău River, the meadow and its lower terrace, which together take the form of a depression basin, flanked from the south by the steep Meseş with an altitude of about 200-300 m and from the north by an upper terrace on the right of the Ortelec Stream (Fig. 3).

The structure of the subassembly provided favourable conditions for the formation of aquifer artesian horizons, important in the water supply of the city.

Thus, regarding the relief typology, three major forms of relief are evident:

- fluviatile relief
- hilly relief
- massive structural crystalline rocks relief.

4. SOME HISTORICAL ASPECTS

On the current territory of the city were found traces of habitation dating from the Middle Neolithic (4000-2700 BC), from the late Neolithic (2300-1800 BC), but also from the last part of the Bronze Age represented by various settlements, tools and vessels.

In the Bronze Age, Zalău, being located on an important connecting route between Transylvania and the Upper Tisa region, favoured the formation of a community. Relief has also influenced the evolution of the local community, thus developing a mixed economy, based both on the exploitation of the resources of the meadow area and those of the mountainous area.[4]

Since the Iron Age, Dacian traces have been discovered, namely coins of silver. On the northern border of the locality, a Dacian settlement was identified on a terrace of the Zalău Valley – semi-sunken dwellings, large buildings on wooden posts - which functioned in the 2nd century BC. until the 4th century AD.

There is also a Dacian fortification situated southeast of the city, grouped in front of the passing through the Gate of Meseş.[5]

The access was controlled by fortifications made by the Dacians, later also used by the Romans.

In the Roman era, the Dacian Inter-Carpathian territories have been incorporated into the Roman Province of Dacia. This area has proved to be of strategic importance, being transformed into the independent Dacia Porolissensis Province with its capital at Porolissum, 8 km away from Zalau.[6] The Romans used the Meseş Mountains to install the advanced line of limestone towers in the north-west sector of Dacia Porolissensis.[7]

This deployment of tactical forces was aimed at controlling the barbarians in order to ensure the peace of the province.

When they conquered a territory, the first thing the Roman Legionaries did was building the castles, bridges, and roads - an efficient defensive system for the army, the merchants, settlers, officers and merchandise to circulate and everything needed for the consolidation of the Roman rule over a new province. Only two days later, behind them, came the road. In 108 they arrived at Napoca, then at Porolissum, Zalău.

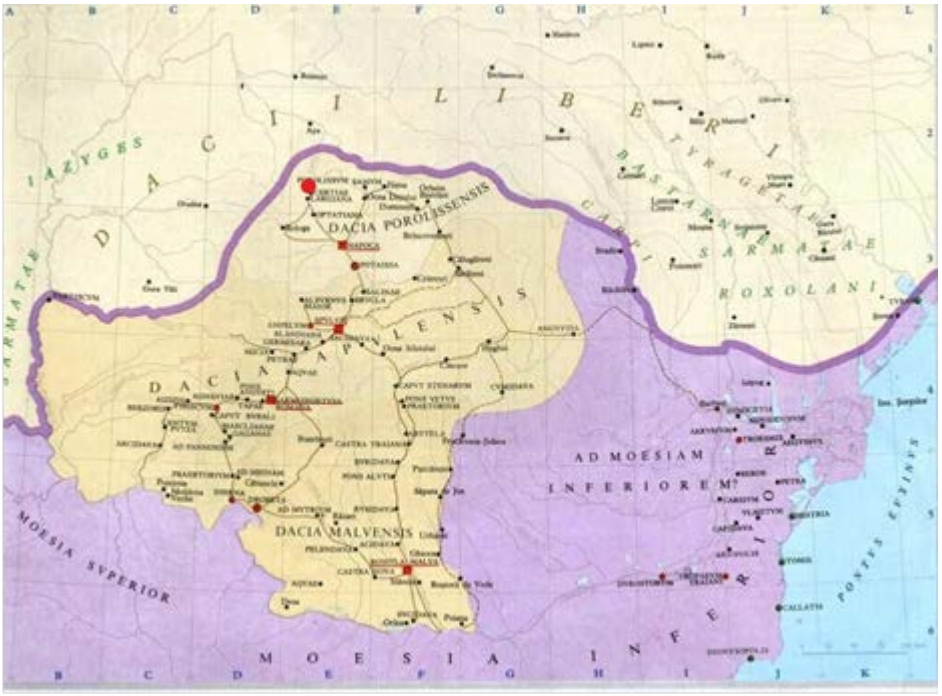

Figure 4**:** map of the Roman roads in Dacia in the 3rd century

There was a main road that crossed the province from one head to the other. The road started from Laderata (Banat), passed through a number of localities to reach Sarmisegetuza. From the capital, it headed north-east,

3 Caiete silvane – Zilah, Zălau, Zalău – Dovezi ale locuirii din preistorie ed Caiete silvane p. 4

5 Gudea, Nicolae; Părău, Valer; *Zalău – un oraş la frontiera de nord-vest a Transilvaniei – Schiţă monografică,* finanţată de Consiulium Municipal şi al Primăriei oraşului Zalău, Zalău 2013

6 Chende-Roman, Gheorghe, *Toponime – Din onomastica Ţării Silvaniei*, ed. Silvania, Zalău 2008, p 13-15.

7 Gudea, Nicolae, *Limesul de pe munţii Meseş*, Banca Comercială Română S.A. Sucursala Sălaj, Zalău 1997.

reaching Apulum, which was a major hub. From here it climbs to Mureş and reaches north to Potaissa and Napoca for the final destination to be Porolissum (Fig. 4).

On the Peaks of the Meseş Mountains were identified and researched Roman towers built for observation and signalling, all in connection with the military complex at Porolissum[8], these being considered the most important vestiges of Roman military architecture on the administrative territory of Zalău. It was on the northern European border of the Empire and formed the basis of Dacia's defensive system in its north-western part.

In the immediate vicinity of this system were found traces of the settlements belonging to the free Dacians arranged topographically on the valleys.

From the Early Middle Ages, dwellings, windstorms, household annexes, winds, and pits from the 8th-9th centuries have been identified along the ring road. These settlements have always been founded near water sources, on the shore or on higher routes in their immediate vicinity.

The Romanian defense system and the location of the defensive elements changed radically when the Hungarians occupied the territories situated west of the Meseş Mountains and they temporary stopped at the Gates of Meseş (906 AD). This occupation has had a great impact on the city's configuration due to the new leadership.

In 1473 the city was offered the privilege of trade fair, a privilege that offered economic independence given that it could trade freely with the whole country and subsequently in 1601 these privileges are strengthened again.

The old city centre has a spontaneous street network built up during the medieval period and in the sixteenth and nineteenth centuries, following the valley line and the level curves, and demonstrates the takeover of historic roads from the territory as the urban area.

In the interwar period Zalău and its suburbs was an administrative unit of Sălaj County.

In 1950 Zalău belongs to the Cluj region, having the status of district. After a new administrative-territorial division, in 1968, Zalău became the capital of Sălaj County, and in 1979 it acquired the rank of municipality.

5. EVOLUTION OF THE URBAN FUNCTION

Due to the relief, this settlement originally had only two natural gates that made it possible to enter the city, namely: to the southeast, to the mountainous area - 'Meseş Gate' and to the northwest the gate created by the narrow meadow of the valley of Zalău. These were the ways of communication with Transylvania in medieval times.[9]

The city had significant strategic and influencing roles in the human geography of the Carpathian Romanian space during Antiquity and the Middle Ages.

Because of the difference from other passers-by in northwest Transylvania, being very accessible, short, wide, straight and without level drops, it facilitated the formation of the main traffic route between the Pannonian Plain and the centre of Transylvania. Thanks to this accessibility, this is the place where the famous 'salt road' was passing by and over time Zalău received various privileges from both the kings of Hungary and the princes of Transylvania (Fig. 5).

On August 1, 1473, Matei Corvin, the king of Hungary and Bohemia, gave the city the rank of trade fair - Oppidum Zilah, a privilege that offered economic independence.

In 1601, Zalău's privileges are strengthened, with its own leadership, with administrative, legal, fiscal and military powers being on the road to economic emancipation.

Being a dangerous area in a continuous state of war, the Transylvanian principles frequently strengthened the privileges to stop the emigration of the inhabitants to other territories. Thus, Zalău thrived in times when other Transylvanian settlements suffered both economic and urban losses.

8 Gudea, Nicolae , *Dacia Porolissensis I*, 1985, p. 143-281.

9 www.wikiwand.com

Figure 5**:** The Meses Gate and the salt road marked on the current map of Sălaj County (credits: www.pe-harta.ro – edited by author)

These measures did not, however, exempt the city of Zalău and the area adjacent to armed attacks followed by robberies. Arriving at the Meseș Gate, the Turks and Tatars have plundered the city many times and destroyed the properties of the inhabitants. The last attack took place at the beginning of the 17th century. As a result, the built heritage dates back to the second half of the eighteenth century. In 1784 the population number was around 2850 inhabitants.

On the 1st of August 1870 the city of Zalău becomes a municipality, given its importance in that period.

In the interwar period the population number was approximately 8550 inhabitants, double compared to 90 years prior.

We observe the dramatic increase of the city during the industrialization period in the 1960s, which did not fundamentally affect the functioning of the locality. Since 1968 new factories, new social-cultural buildings and new residential districts have been built, the city expanding on the arteries that converge to the historical centre of the city and the main boulevard. By the year in 1991 the city had approximately 68,400 inhabitants.

Since 1990, Zalău has again witnessed a major development, with 11 new neighbourhoods with more than 2,000 houses. The vineyards that bordered the city turned into neighbourhoods and the main direction is the development of single-family houses, as a result, the number of new built housing blocks is decreasing.

Currently the administrative area of Zalău has a surface of 90.09 square kilometres and a population of approximately 6200 inhabitants.

6. URBAN DEVELOPMENT

Through its urban development, as well as its location in a special natural setting, the settlement had the power to impose its own features and values, the spatial configuration being supported by compositional defining lines:

- the course of the Zalău Stream (to which the panorama of the hill masses converges) - insufficiently capitalized as a distinctive element of the physical configuration;
- arteries that converge to the central core, generally going through historical trails;
- the core - nucleus retains its old character by conforming parcels, fronts, volumetry and street configuration.

The urban development of Zalău is the consequence of the social changes registered in the Romanian society after the Second World War. The socialist industrialization program was decisive regarding the population growth in Zalau. The current structure, configuration and morphology of Zalău is due to socialist development policies. The industrialization also resulted in large urban transformations accompanied by massive changes in the volume, composition and evolution of the population (Fig. 6, 7, 8).

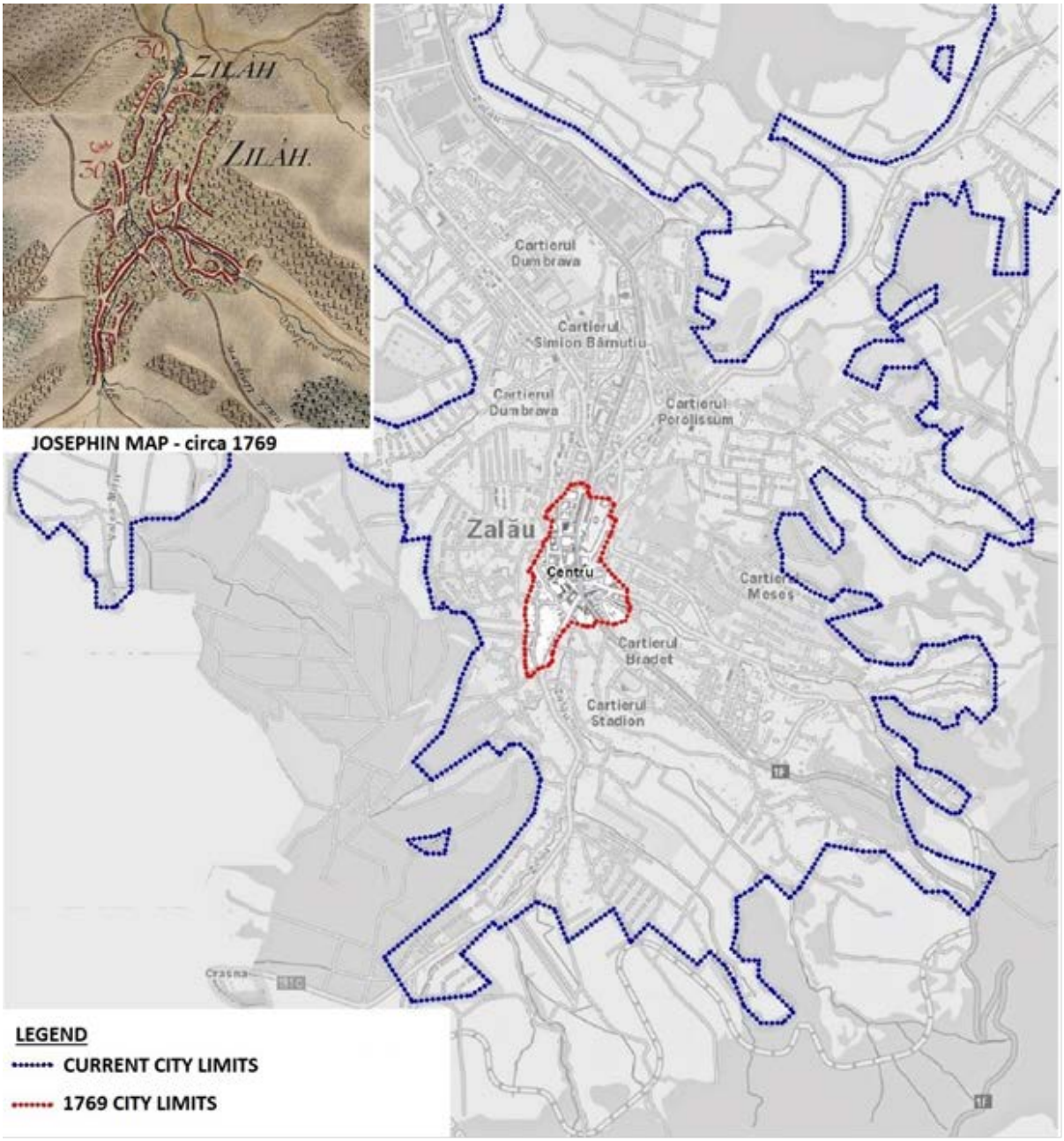

Figure 6**:** Evolution of urban territory in time - Josephin map edited by author

Figure 7**:** Aerial view of Zalău - 2018 – southern side view (credits - by author)

Figure 8: Aerial view of Zalău - 2018 – northern side view (credits - by author)

7. CONCLUSIONS

Although the city Zalău does not preserve a built dowry that bears the mark of its age, its urban structure is the witness of its development in a specific territory. From the strategic settlement on the Salt Road, so important in the old times, to the socialist- industrial city and then today's municipality, the capital of the Sălaj County - the city of Zalău keeps alignment along the valley of the Zalau River and the role of the entrance gate in Meseș Mountains. The old nucleus, the old hearth of the city, prove the role of the geographic settlement in development of Zalău.

REFERENCES

1. Chende-Roman, Gheorghe, Toponime – Din onomastica Ţării Silvaniei, ed. Silvania, Zalău., 2008. Pp 13.
2. Chende-Roman, Gheorghe, Dicţionar etimologic al localităţilor din judeţul Sălaj, ed. Silvania, ed. Caiete Silvane, Zalău., 2006. pp 300.
3. Caiete silvane – Zilah, Zălau, Zalău – Dovezi ale locuirii din preistorie ed Caiete silvane, pp 4.
4. Gudea, Nicolae; Părău, Valer; Zalău – un oraş la frontiera de nord-vest a Transilvaniei – Schiţă monografică, finanţată de Consiulium Municipal şi al Primăriei oraşului Zalău, Zalău 2013.
5. Gudea, Nicolae, Limesul de pe munţii Meseş, Banca Comercială Română S.A. Sucursala Sălaj, Zalău 1997.
6. Gudea, Nicolae , Dacia Porolissensis I, 1985., pp 143-281.

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VULNERABILITY OF THE TRADITIONAL HOUSE AND ITS IMMEDIATE YARD AREA IN CITY CENTERS OF THE CITIES OF SOUTH SERBIA

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ABSTRACT

The number of preserved buildings with elements of traditional architecture is getting smaller in urban centers in the south of Serbia. The contemporary flows of life as well as the urbanization that accompanies them have contributed to the fact that instead of family houses with gardens full of greenery, the city center is dominated by block buildings for multi-family dwellings without green areas around them. The construction of single-family houses is relocated to the outskirts of the city. In this paper, will be analysed a few remaining residential buildings built in a traditional way of building, in the city centers of the south of Serbia, which still have a residential function, or the ones which changed its purpose. In this paper, the preserved objects are analysed from the aspect of comfort they offer by comparing those who have maintained the green environment, with those who have not, in order to show the advantages of green oases within the city core.

Keywords: traditional house; city core; green surroundings; vulnerability

1. INTRODUCTION

Houses with large courtyards, surrounded by greenery, can rarely be found today in urban city centers. The construction of such facilities is now relocated to the suburbs, while city centers are intended for the block system of multi-family housing. Within the group of residential buildings, however, there are still houses built in the traditional style, mostly houses from the period of Ottoman Empire, which due to their monumental values have been placed under the protection of the law, and as such have survived to this day. Many of today's urban centers have emerged in the area of earlier city structures, today protected by historical heritage. It is precisely this space that can be turned into green belts of the modern city and as such obtain bioclimatic significance in addition to historical and touristic importance it has. (Petrović et al, 2015)

These buildings were mostly built in the post-and-pan system, and over time they have experienced major or minor changes in the field of function, as well as in the field of applied materials, constructive parts, and improvement of thermal properties. This paper analyses this type of buildings, primarily in the area of Niš, with a reference to the cities of south Serbia. In this paper the authors tried to answer the question whether the green environment of these buildings was preserved, if the buildings themselves were preserved, or has it necessarily undergone changes. Does the change in the function of the buildings by their revitalization and transition from private to public ownership necessarily affect the green environment?

1.1. A few words about the characteristics of the Balkan house curtilage of oriental type

The residential architecture of the cities of Serbia at the end of 18th century and in 19th century belonged to the type of city architecture of the same period throughout the Balkans. The style of building houses in the south of Serbia evolved in an area where two cultures, the Oriental-Byzantine world and the medieval west, collided. Nevertheless, the established title for this architecture over time was "Turkish" or "Oriental", while today the term "Old Balkan profane architecture" has been adopted. Given the dominance of the influence and the circumstances of the formation, it is possible that the more suitable name would be the **Balkan architecture of the Oriental type**. The persistent and multiple influences that the Turks had on everyday life of the population, and above all the influence of Islam as the ruling religion, left a strong mark on housing architecture. This was felt first of all in cities where many rules of behavior and life were in general subordinate to Turkish regulations, which in large part affected the design of all construction forms.

In the central city core, the houses were compact, leaning against each other with a backyard behind them. In the countryside, as well as in the city, regardless the owner was a craftsman or a trader, a Christian or a Muslim, or a prominent figure from the class of Turkish feudal authorities, the principle of a functional organization was based on the need to protect the privacy of the family life and enable uninterrupted moving of family members in the backyard, so that usually there was a guest room or a summer kitchen facing the street. The traditionally closed way of the family life was reflected not only in the enclosure of the yard, the size of which was determined by the availability of the land, and which surrounded the house with as many sides as possible, dense greenery and massive walled fences with a strong, full gate protecting it from the rest of the world, but also in a clear grouping of rooms where family members stayed, and those where they received visitors. These characteristics of houses and gardens of folk architecture from 18th and 19th centuries are recognized on examples from Macedonia, Kosovo and south Serbia.

Everyday problems of inhabitants of Niš and other towns from this part of Serbia were water supply. The main channels, and then the smaller channel systems, which were called streams, brought water into blocks of houses. These shallow channels were at the bottom and on the sides covered with stone, so the water did not dissipate and it was clean. In each backyard, there was a slight widening in the channel itself, and often a small walled pool, or even a trough carved in stone from which the water could be taken.

The absence or a bad sewage system was also a problem. The toilets were built next to the house, and septic tanks were dug behind the house. In smaller houses, the toilets were next to the gate for easier connection with the channels that drained the wastewater in the shortest way-gravity into the river or outside the city.

2. BUILDINGS ON THE TERRITORY OF THE CITY OF NIŠ

On the territory of the city of Niš, there are also several residential buildings, city houses built during the Ottoman domination, which during their existence survived larger or smaller changes. The changes were made only in the field of function, construction and materials of the very building. In some cases, the change in the purpose of the function also involved changes within the yards, in terms of paving, concreting, and the like.

The paper analyses several emblematic objects with elements of folk architecture, in the city core of Niš. This is the Stambolija House, which after a couple of reconstructions and revitalization today has been turned into the Stambolijski restaurant. The next one is the building of the former Turkish consulate, which after its collapse, was reconstructed to its previous appearance and today operates as a hostel. The only object that has not changed its function is the house of Mišić, which still has a residential character.

2.1. The Mišić House

The house of Mišić in Niš is one of the private dwelling houses from the 19th century, located in the city center. It was built as a residential building of a Turk, between 1861-1864. (Andrejević, 1996) After the liberation from the Turks, the trader from Niš, Đoka Mišić bought the house from its owner Šemzi-hanuma, and therefore, under his surname, it is registered in the Institute for the Protection of Cultural Monuments in Niš (Andrejević, 1996). In 1994 the house was declared a cultural monument as a valuable building of old urban architecture.

The house of Mišić is a ground-floor building of a compact base with an entrance porch - doksat, with a basement beneath a small part of the building and without a used attic space. The layout of rooms is the same as from the earliest days of its existence, consisting of two blocks of two rooms symmetrically arranged in relation to the central corridor. The hall itself is of significant dimensions, with natural light and two entrances -

the main entrance on the south and the side one on the north facade of the house. The relatively rectangular size of the house is disturbed by two annexes – a department in the north-east corner of the building, as well as an auxiliary room in the south-east corner of the building that is accessed from the backyard. (Mirić and Jovanović 2005) The house today still has a residential function.

In the past, the yard was surrounded by a high wall with an access gate, inside the yard there was a well, a fountain and a grapevine pergola, while the garden was rich in flowers and trees (Andrejević, 1996).

The backyard of the house is now bordered on the west side by the facade of the Court building, on the side of the street there is a high wooden fence, and from the east it rests on the wall of the grammar school. The yard is still full of greenery, but unfortunately it is poorly maintained, it has grown into bushes and wild trees.

(a) (b) (c

Figure 1: (a) today's appearance of the yard, (b) street view, photo A.M. Petronijević, (c) current position, drawing A. Mirić

2.2. The building of the Turkish consulate

The building of the former Turkish Consulate is located in the central part of Niš and was built in the mid 19th century by the Turkish aga, whose name was not recorded in the then Ćibir-Kaptan Mahal (ćibir - prominent, powerful). After the liberation of Niš from the Turks in 1878, the owner conceded the building to Turkey, which opened a consulate in it. It is a ground floor symmetrical house, with a protruded two-part doksat on wooden pillars. The building had five rooms, two larger guest rooms in the front and three smaller ones in the back, a central hall and a spacious doksat. The back part had two smaller wooden doors which led to a room with a chimney and a kitchen area (Andrejević 1996). The roof was covered with Spanish roof tiles. The ceilings were decorated with oriental ornaments and the columns were carved. After the work of the Consulate was terminated in 1890, the building was used for administrative and residential purposes. After the Second World War the building was completely abandoned. The building was placed under the protection of the law in 1988. Unfortunately, the building collapsed around 1995. During 2011, it was reconstructed according to its original appearance, in visual terms. The interior is adapted for accommodation services, and since 2012 there is a hostel in it.

(a) (b) (c)

Figure 2: (a) The former appearance of the building and the environment, (b) and (c) the ruined object http://aurorahostel.rs/galerija/ accessed on September 25,2018.

Although the object has been restored in visual terms, the greenery has disappeared from the space around it. In order to satisfy the catering function, it was necessary to create several parking places. Multistorey residential buildings were built along the plot boundary on which the building is located, while most of the plot itself is tiled, and the backyard of the building is covered with gravel.

(a) (b)

Figure 3: (a) and (b) the present look of the building and its environment, photo A. M. Petronijević

2.3. The Stambolijski Restaurant

The house of Stambolija is also located in the center of the city. The construction of the house began in 1875 and was completed in 1878, when Niš was liberated from the Turks. The house has all the elements of the Balkan architecture of oriental type. The house has the first floor, with a bay window in the middle. The building is symmetrical with a central hall around which the rooms are arranged. The building is characterized by well-preserved wooden ceilings decorated with rosettes (Andrejević, 1996).

Like the previously mentioned objects, the house of Stambolia was declared a cultural monument back in 1949. However, due to the lack of funds, it was not renewed for the needs of the Old Niš Museum, as it was planned, and almost due to its poor condition it lost the status of cultural monument. That did not happen because in 1970, at the Institute for the Protection of Cultural Monuments of Niš, the design for the revitalization of the house was completed, and it was demolished and restored in 1981 (Andrejević, 1996). After the adaptation the restaurant Sinđelić was located in the house. During 2016, the building was once again renovated, and now there is a restaurant Stambolijski in it.

Most of the yard, according to the revitalization design made in 1970, is paved with stone and covered, intended for guests. Only a small part of this space is with greenery and suitable for children to play.

Figure 4: The garden of the Stambolijski restaurant, photo A. M. Petronijević

3. BUILDINGS IN THE CITIES OF SOUTH SERBIA

A similar situation is with buildings in the cities of south Serbia. Often, although the objects themselves are preserved, they still function, their green environment is not.

For example, the house of Šop Đokić in Leskovac was built in the first half of the 19th century. The building is with a first floor, in a post-and-pan system. It belongs to the type of Balkan architecture of oriental type. Particularly distinguished is the divanhana (a room for duscussions and negotiations) on the first floor, positioned in the central part, oriented towards the yard (Cultural Monuments in Serbia). Today, the Tourist Organization of Leskovac is located in the house, and the procedure for returning property to the Šop Đokić family is being conducted, from which it was confiscated and nationalized. The building is in good condition, and its surroundings are made of stone slabs, the entire yard of the complex is paved with them.

Figure 6: House of Šop Đokić and its surroundings today, Photo: National Museum in Leskovac

The surroundings of Giga's house in Vlasotince are somewhat better, that is, with somewhat more green areas than the previously mentioned objects. The house is revitalized from the residential building, and it has the function of the main library "Desanka Maksimovic". It was renovated after the fire that affected the building in 2008. Since 2013, the building has been re-used and it contains a part of the Library Fund and Management, while in the ground floor there is a multifunctional space intended for exhibitions, book promotions and the like ... Since the building is located on a small plot, surrounded by other buildings, the yard is not completely paved, but the part is left under the greenery.

Figure 6: Giga's house in Vlasotince, Author: Maja.nbv

It would be unfair not to mention another pearl of the old-fashioned architecture of the Oriental type - Selamluk, today the National Museum in Vranje. Regardless of the fact that Selamluk's constructive assembly has made it dilapidated and prone to collapse, in the specificity of its purpose and construction techniques it presents a testimony of the standard of living of a certain social class and social relations of the epoch of construction (Mirić et al, 2016). The significance of the building is even greater because Haremluk was preserved on the same plot as part of the ambient unit. The authenticity of the space is disturbed and the value of the monumental whole is reduced by modern urban design of the closest environment and the assimilation of the yards shared by the buildings. Although the formation of a small plateau in front of Selamluk and the construction of a wall around the complex made this place physically and symbolically isolated in relation to the environment, which visually gave it the significance, it is a pity that nothing of the original greenery was preserved (Mirić et al, 2017).

Figure 7: Selamlik in Vranje, Photo: A. Mirić

Perhaps the brightest example of the revitalized object of this period, in terms of the green surroundings, is the house of Hristić, today the Museum of Ponišavlje in Pirot. The backyard of the house is abundant with greenery making the ambience pleasant

Figure 8: Museum of Ponišavlje in Pirot, Photo: E. V. Petrović

4. CONCLUDING CONSIDERATIONS

The paper presents the results of the analysis of houses from the territory of Niš, Vranje, Pirot, Leskovac and Vlasotince, the rare examples of the old Balkan architecture of oriental type that have been preserved to this day. Because of their historical, aesthetic and architectural values, all these objects are established cultural property, subject to the provisions of the Law on Cultural Property and a special regime of protection and maintenance.

Conservation principles imply the preservation of as much of the original structure as possible, which in the case of residential buildings would include the yard as their functionally unbreakable whole and the closest environment that has its historical value. However, in the case of the objects under consideration, by subsequent interventions the area that was once occupied by the yard was changed beyond recognition. As a rule, the low and high plants of the original green area were replaced by the paving of different types. In some buildings, cobblestone made a kind of homage to the type of paving which relates to the original state of buildings created in 18th and 19th centuries, during the Ottoman domination period. Surely, this principle is not a good alternative to the dense greenery that surrounded these houses, creating a specific microclimate and a characteristic atmosphere, it cannot be universally accepted and should not be understood as a recommendation.

There are rare exceptions, such as the House of Mišić from Niš, which is still a residential building, in which the concept of greenery is preserved to this day. However, the greenery is not planted by plan nor is it cultivated. It is neglected to such an extent that most of the year it hides the view of this significant cultural asset. Bright examples still exist in this part of Serbia. Among them is the Ponišavlje Museum in Pirot, a former house whose purpose has been changed, but the carefully preserved courtyard of a specific atmosphere is preserved.

There are few preserved buildings that belong to the old-Balkan architecture of the oriental type in the area of south Serbia. In cities with up to 100,000 inhabitants (Vranje, Pirot, Leskovac, Vlasotince) one building has been preserved. In Niš, a city of 300,000 inhabitants, three buildings have been preserved. In addition, primary and secondary structural elements are preserved, but in the largest percentage, not the environment of the building. In order to fully demonstrate the concept and architectural style of the building, it is necessary to preserve and reconstruct the appearance of the immediate ambient unit, which in the case of residential buildings of this type is the yard. Residential buildings of the late 18th and 19th centuries were not surrounded by large paved surfaces, but by natural greenery and vegetation. In that sense, in further preservation of the presented facilities, attention must be directed to re-establishment and cultivation of green environment. This would, in addition to the architectural and cultural value, also affect the restoration of the bioclimatic value.

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REFERENCES

1. Andejević, B., 1996. Spomenici Niša. Zaštićena kulturna dobra od izuzetnog I velikog značaja. Prosveta, Niš, Srbija.

2. Documentation of the Institute for the Protection of Cultural Monuments, Niš

3. Documentation of the National Museum in Leskovac

4. Grupa autora, 2007. Spomeničko nasleđe Srbije - nepokretna kuturna dobra od izuzetnog i velikog značaja, RZZSK Beograd, Srbija.

5. Maja.nbv – the author of the photo of Giga's house – her own work, pod licencom CC BY-SA 4.0, sa sajta Vikipedija https://commons.wikimedia.org/w/index.php?curid=58353200

5. Mirić, A. and Jovanović, M., 2015. Balkanska arhitektura orijentalnog tipa – Kuća Mišićevih u Nišu. Међународна конференција Савремена достигнућа у грађевинарству, Subotica, Srbija. pp 739–745.

6. Miric, A., Jovanovic, G.and Kurtovic Folic, N. 2016. The Selamluk in Vranje, Part I, Architectonic form development based on historical sources, Facta Universitatis, Series: Architecture and Civil Engineering, Vol. 14, No 3,

7. Miric, A., Jovanovic, G.and Kurtovic Folic, N. 2017. The Selamluk in Vranje, Part II, Architectonic characteristics of structural and decorative elements, Facta Universitatis, Series: Architecture and Civil Engineering, Vol. 15, No 1,

8. Petrović, N.et all i 2015. Uticaj istorijskog nasleđa na formiranjezelenog pojasa u centralnoj zoni grada., Zbornik radova Građevinsko-arhitektonskog fakulteta u Nisu, No 30, Niš, Srbija. p 201.

9. Spomenici kulture u Srbiji, 2018. http:// http://spomenicikulture.mi.sanu.ac.rs [Accessed: 30st September 2018].

10. Valčić, D., 2002. Graditeljsko nasleđe Vlasotinca. Informativni list Vlasina, Vlasotince, Srbija.

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THE DREAM ABOUT GREEN CITIES - THE URBAN HERITAGE OF FUNCTIONALISM, BIALYSTOK - MOSAIC OF SPATIAL URBAN FORMS

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ABSTRACT

Bringing nature into urban areas has been concerned by the urban designers for more than hundred years. Still debate is in progress. Author concentrates in article on nowadays relation between districts constructed after 1945 and modern realisation in downtown of city Bialystok. This case represents example of rebuild city from war damage. The result of city reconstruction is mixed spatial structure of the downtown area, consist elements of historical, communist and modern compact form of development of city space. Basing on the analyses of natural elements in past urban plans, it is showing the process of afterwar new definition of city space by urban planners, consisting ideas of CIAM IV. Comparing formal greenery elements like parks, green squares and other elements of public domain with the modernist housings' estates, presents typology of the spaces. Finally, it is concentrating on the fragments of spaces on the boundaries of analysed types of urban structures and recognize advantages of this situation. Because of historical spatial plans of city, it is discovered the process of reduction designed public green areas system, even in socialist period, also in nowadays much more liberal times. However, there are large complexes of modernist housing estates giving the feeling of the green image of city. The smaller scale of analyses show that social and recreation programme of modernist neighbourhoods is attractive for inhabitants of new investments, realized without these elements. Contemporary idea of compact city is attractive. However, it is also creating new problems how to preserve nature in much more density form of city. Bialystok case, with historical form of unfinished reconstruction, show diversity spatial urban structure, giving opportunity to observe mixed form of past urban ideas in real organism of city. Still, the sociological research could give interdisciplinary point of view for this relation. In conclusion in this case there is chance to preserve greenery in modernists neighbourhoods as kind of value, not only of itself inhabitants but also for community of city.

Keywords: greenery; urban heritage; Bialystok urban history

1. THE DREAM ABOUT GREEN CITIES

The nature element in the urban theories is present since the XIX century. The idea connecting city with nature founds in texts of F.L. Olmsted, E. Howard, F.L. Wright, Le Corbusier. Especially the XX century history of urban theories is giving many examples of projects considering greenery in city for instance: the garden cities, the industrial city (Cité industrielle), the radiant city (ville radieuse), the functional city. In fact, all of visionaries were attempting to escape from the industrial model of city for closer to nature. The CIAM IV principal resolutions postulated 'The material elements which urbanism can arrange, and combine are the sky, the trees, housing, workplaces, collective places (which include places and recreation), and traffic' (Mumford, 2002). Before war visionary and revolutionary ideas were difficult to realize in existing cities. The idea of city reform had been considering by the large group of specialists and was ready for implementation. 2'nd World War changed the situation, especially in Europe. Many of cities was destroyed. After 1945 year started reconstruction and building new modernist housing estates, also in countries at east site of Iron Curtain. When in United States and in west European countries appear criticism of the ideas of CIAM functional city, the Soviet bloc and China used this idea on a massive scale. As a result, there is used term 'socialist modernism' which started from 60's of the XX century and finished with end of communism period in 1989 year. Meanwhile the effects of 2'nd phase of industrial revolution were led to concept of sustainable development (World

Commission on Environmental and Development, 1987). The environmental aspects were present in New Athens Charter (1998) and postulated: 'The principles of sustainable development should be the essence of planning for a city where the citizen is at the centre of the planning process [...]. The processes should embrace biodiversity and the relationship between man and nature […] The spatial distribution of land uses will also have a key effect on the sustainability profile of the city' (New Charter of Athens, 1998).

The polish afterwar urban designers (in period 1945-1956) were strongly under the influence of 'polish school of city planning', which contained different elements from European's design schools. The realities of post-war socialist economy and destroyed cities allow for designers to entered with new elements into spatial structure of existing towns. One of these new elements, according to functional city idea was the natural elements, housing buildings in parks, special ventilation areas, urban designing according to sun movement. One of examples of this process is Bialystok downtown[1]. The historic centre placed over Biała river before war was dominated by textiles factories. The river and city located in valley was strongly polluted. The main idea of urban planners was creating the green corridor in city centre (around Biała river) connected by system of green areas with surroundings neighbourhoods. The author of dream of green city Bialystok was prof. Ignacy Felicjan Tłoczek responsible for conceptual plan made in 1948 year.

2. THE URBAN HERITAGE OF FUNCTIONALISM IN BIALYSTOK CASE

The city Bialystok with 300 thousand of inhabitants is capital of region of Podlasie. Afterwar renovated and reconstructed area of downtown in spatial structure consist elements of ideas of functional city in realities of socialist country. One of the most noticeable aspect in space are new housing settlements realized after war.

Bialystok is typical example of XIX century industrial city, which after war was rebuild according to CIAM, vision of modern industrial city with functional spatial structure and with expanded system of green areas. This vision was not accomplished, like it happens at long investment process. As a result, contemporary downtown area, enclose historical town, has got different types of spatial structures: housing estates, fragments of historical urban structures, new urban structures realized after 1989 year. The boundaries between mentioned urban structures is subject of research and analysis in this article. Moreover, the mixed structure of downtown is this element which is characteristic for Bialystok spatial structure of the downtown area. The modernist monofunctional spatial zones (housing cooperatives[2]) so criticized, for example by Jane Jacobs, are prevail in the downtown are. After an economical changes new player appeared, the private investors, basing on simple profit purposes, they filled the empty plots or demolish the buildings in areas with historic suburbs structures, without, the preservation statuses. Nowadays, betweenwhiles, there appear ideas to systemic solution for liquidation of the housing cooperatives at the level of national law. The main argument is that these types of organization is artefact of socialist economy and their activities lead to abuse. The result of such decision would be division of the cooperative areas and the creation of small housing communities. Free areas (the green, sport facilities and others) would go on the real estate market. The other problem relates to citizen's needs, with increasing number of cars, they demand more spaces for parking places, of course, this is done a cost of open green spaces.

A question that should be asked, is it reasonable to protect open areas of housing cooperatives?

2.1. Natural elements in past urban plans

Presented schemes of general plans shows the different methodology of urban design. The conceptual plan from 1948 year used different types of public green spaces, which creates system of green spaces. In that time the group of socialist urban designers believed in deep changes in urban designing practices based on land communalization and ideas of functional city - called visionary period. The next decades bring much more realistic forms of green areas in the city plans. Since 1959 year, in every next general plan was reduced area of public greenery. Why it happened? The industry and housing investments were priority in the weak socialist economy. In that case the public spaces for instance: parks and green areas, had got the lower priority. Second

[1] Article based on researches from diploma project, The role of the new urban planning ideas in post-war formation of Bialystok downtown in the years 1944-1974.

[2] The described housing cooperatives were working in central planning system of socialist economy. There were responsible for realization of housing programme and almost monopolized the multi-housing building construction. The citizen had not possibility to buy the new apartment besides system of the organized cooperatives.

reason it was changes in methodology of designing. The plan from 1974 year kept the essential elements of green system, but all smaller elements have been moved for the local master plans. In result the system of green public spaces planned in 1948 year was reduced and scattered (compare with figure 2).

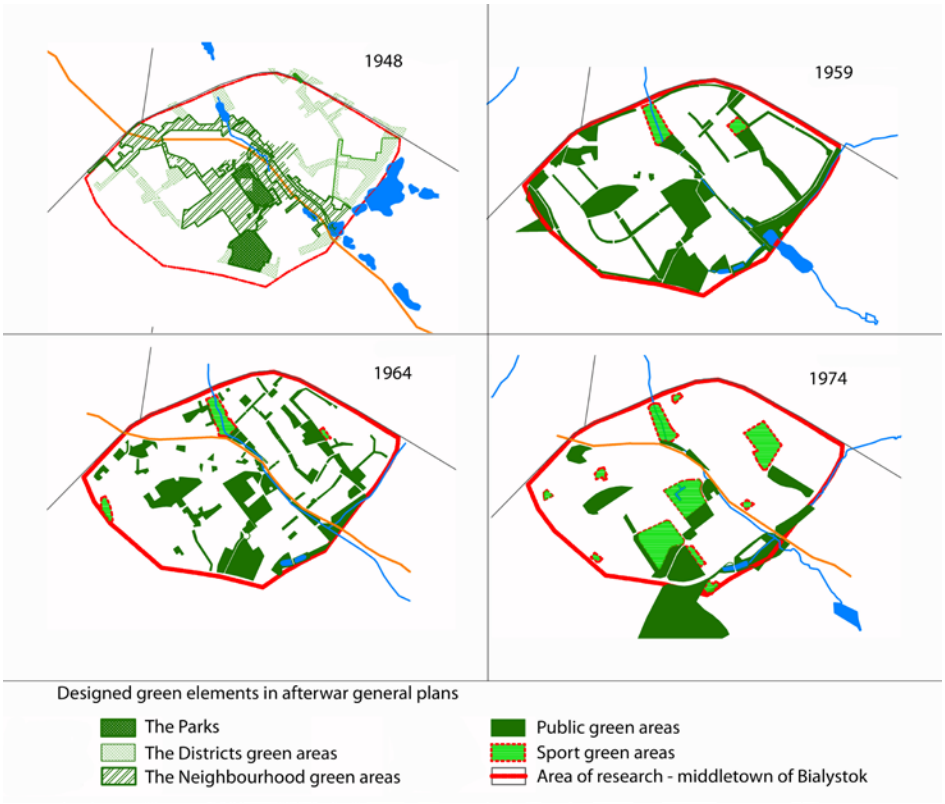


Figure 1: Schemes of general plans of the city from 1948 to 1974, showing changing methodology in designing of green areas.

2.2. Nowadays green elements in spatial structure of middletown of Bialystok

In this case, when the idea of green public spaces was unrealized, but city have got image of 'green city' in centre area, is appearing question so which element of the spatial structure deciding for this. The main reason, was reconstruction of city because of apartments needs, caused by afterwar demographic peak and migration process[3]. In fact, the historical city centre, which was destroyed and most of surroundings historical suburbs, are now downtown area. The model of Soviet city planning was based on the compact industrial city in contrast to west capitalist model of suburban sprawl. This direction of urbanization was result of political and economic purposes. Because of reconstruction, the density of land use was increased. Strict rules of building law, urban planning norms and the development process monopolized by large housing cooperatives allowed to design complexes of modernist housing neighbourhoods. Their characteristic feature is a large share of green areas in these complexes. Figure 2 shows contrast between the areas of green public spaces – parks and squares, compared to areas of housing estates.

[3] The number of inhabitants in 1946 year – 46 759 was increased to 270 000 in 1990 year.

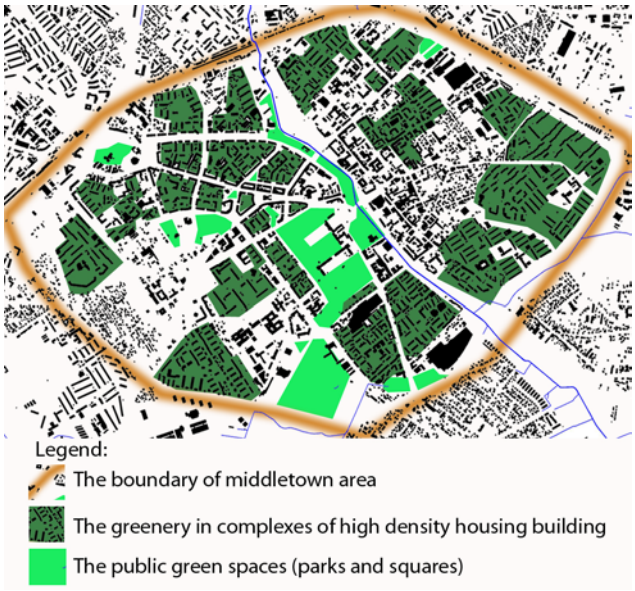


Figure 2: Typology of green spaces, comparison public green spaces with complexes of modernist housing cooperative areas.

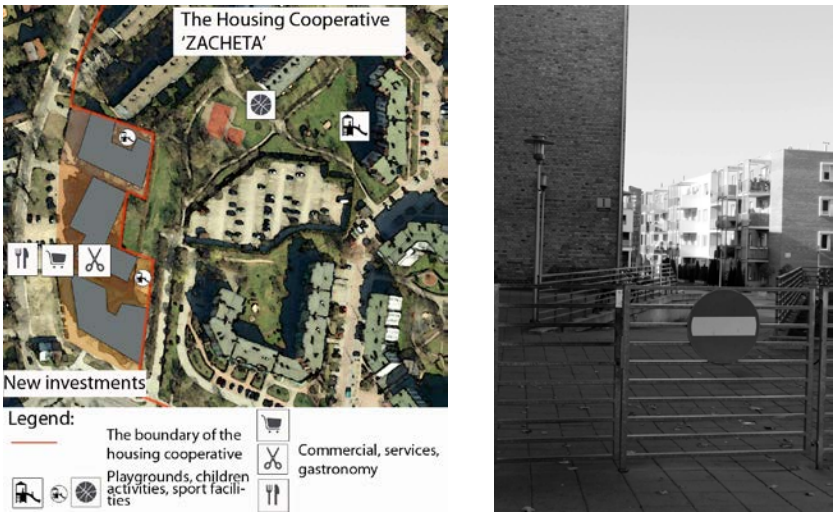
The greenery in high density housing estates (for all city area) shares 5,3%, in total green areas when the parks and squares share only 1,2% (Table 1). For the green image of the city are responsible the design methods of the idea of the functional city.

Table 1: The type of greenery spaces in Bialystok town. Comparison different types of natural elements. The table is not included all greenery elements, only those which are important for subject of article. The data's source: Ecophysiography studies for Bialystok city, 2011. https://www.bialystok.pl/pl/dla_biznesu/zagospodarowanie_przestrzenne/dokumenty_planistyczne_/

Name of the class	*Area (ha)*	*percentage share in total green spaces*	*Percentage share in area of city*
Greenery in low density housing estates	*896*	*12,8%*	*8,8%*
Greenery in high density housing estates	***371***	***5,3%***	***3,6%***
Greenery in administrations and commercial areas	*316*	*4,5%*	*3,1%*
Parks and Squares	***83***	***1,2%***	***0,8%***
Forest and other complexes of trees	*2225*	*31,9%*	*21,8%*
City gardens	*300*	*4,3%*	*2,9%*
Total green areas	*6984*	-	*68,4%*

2.3. Neighbourhood relations

The heritage of funcional city are 'houses in parks', with high quality space for children (playgrounds, sport facilities, schools and kindergartens). The quality of green areas in modernist neighbourhoods has got its price. Monofunctional housing complexes are almost lacking of commercial, services and gastronomy. Their inhabitants needs to move or travel for commercial centres or city centre. In good situation they use public transport, in worse version use private cars.



(a) (b)

Figure 3: (a) The situation map of transboundary area between new investments and housing cooperative, and (b) example of exclusive, closed area of new investments.

The contemporary downtown housing buildings areas don't own facilities for children, in some cases housing association is resigned from such facilities. No places for walk with dog, jogging or walk with children and distance to green public spaces is caused why inhabitants of these buildings use open green spaces of housing cooperative areas. New city planning policy assume, that new investments in middletown increase the land use and enter on this area more services. The emptied areas are filled by new developers investments with high percentage of building area (in presented area it was 70% - figure 3a). In such condition, obligated by building law, services like playgrounds, green areas are designed with minimal share. These buildings, working as housing association, are fenced and closed area. The liberal economic investments, like developer investments, is directed for profit, in result new investments they own traditional model of multifunctional structure like shops, services, repeating the design language of traditional city.

(a) (b)

Figure 4: (a) Modern passage in new investment area, and (b) Open green spaces in typical modernist housing cooperatives area

On the other hand, inhabitants of modernist complexes use commercial zones placed in new investments. Described process is possible thanks to mixed spatial structure of this part of city. The rightly criticized idea of monofunctional zones in the modernist cities, here by process of new investment, is leads to the reduce of negative factors in both spatial structures.

2.4. Middletown area of Bialystok – mosaic of spatial urban forms. Conclusions

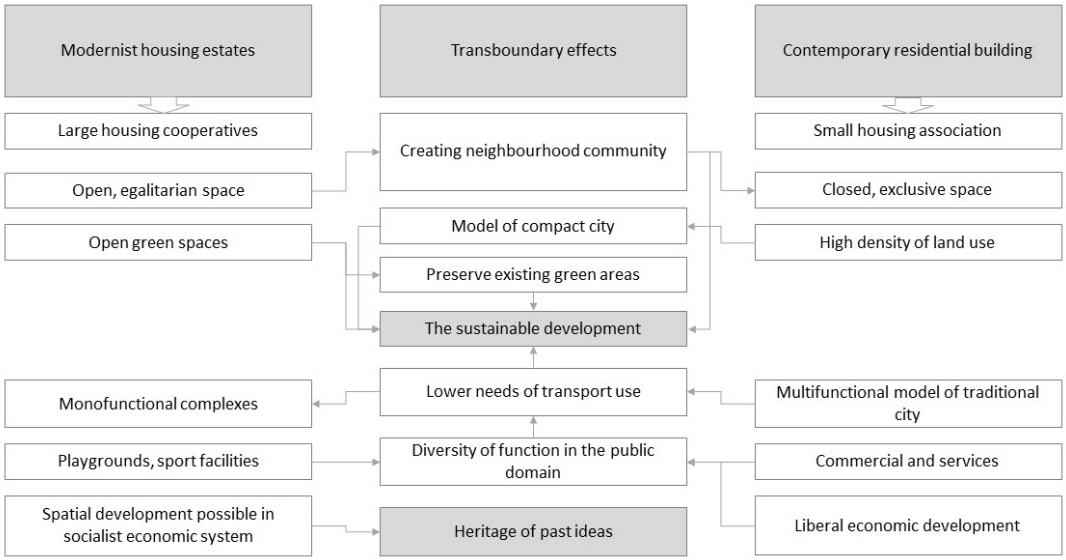


Figure 5: Scheme show transboundary effects of described spatial urban forms.

Summarize, it is necessary shows transboundary effects of two different spatial structure of housing zones (figure 4). The interactions between users from both structures (open, egalitarian of green areas in housing cooperatives and commercial zones in new investments) allow to create neighbourhood community. They build awareness of place, not only 'bedroom district'. Open green spaces of housing cooperatives complement lack of public green spaces and by the way how they were designed, as large complexes, allow to preserve existing green areas. Economic reasons are caused of intensive density of land use in new investments, bringing closer this indicator for the model of compact city. Presented social, economic and environmental effects are compatible with concept of the sustainable development. To fully understand the interactions between users of both spaces, it is advisable to perform sociological research.

The other group of effects relates to the function, the disadvantage of modernist monofunctional housing zones is reduced by the multifunctional programme of new investments. The diversity of function, according to postulates of contemporary city planning strategies, is natural result of process. In the same way, the lack of services and facilities in both types of housing structures, are filled. The inhabitants of all area have got mixed-use areas, already found in historical structures of cities. Also, it decreases needs of the uses transport, especially, individual car travel.

The last aspect of described mosaic of spatial structures is historic element. The housing cooperatives realization in the shape which is now, were only possible in central planned, socialist economic system. It is heritage of difficult period, but in contrast to modern developer investments demonstrate the higher quality in designing of social programme in housing.

3. CONCLUSIONS

Summarizing presented materials and described processes, of which result is modern spatial structure of Bialystok downtown, is possible to say:

- the green areas of modernist complexes of housing cooperatives is kind of value, not only for its inhabitants but also for community of city,
- because of mentioned reason there is need to preserve the open areas of this complexes, not only by ownership regulation, but also by available system solutions in law (in polish realities is preservation by provisions of local master plans or place on the list of the preservation of monuments and cultural heritage), what is in public interest,
- considering the issues one step further, is it possible to cooperate within a public private partnership (PPP) to include the described green areas in the greenery system.

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REFERENCES

1. Howard E., 1898, Garden Cities of To-morrow (Miasta Ogrody Przyszłości). Polish translation in Trzewia Lewiatana, Miasta Ogrody Przyszłości (A. Czyżewski, E. Howard). Państwowe Muzeum Etnograficzne w Warszawie, 2009. pp 143-222

2. Le Corbusier, 1924, Urbanistyka. The Polish translation, 2015, Fundacja Centrum Architektury, Warszawa.

3. Olmsted F.L., 1870, Public Parks and Enlargement of Towns. Chapter in The City Reader (Eds. R.T. LeGates, F. Stout). The Routledge Urban Reader Series, Fourth Edition. pp 307-313

5. Mumford E., The CIAM Discourse on Urbanism, 1928-1960, 2002. The MIT Press. pp 87

6. Wright F.L., 1935, Broadacre City: A new Community Plan in Architecture Record. Chapter in The City Reader (Eds. R.T. LeGates, F. Stout). The Routledge Urban Reader Series, Fourth Edition. pp 331-336

7. Report of World Commission on Environment and Development, 1987. http://mom.gov.af/Content/files/Bruntland_Report.pdf [Accessed: 4th October 2018]

8. New Charter of Athens, 1998. www.planum.net/download/nwchart-uk-rtf [Accessed: 10th October 2018].

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CONTRIBUTION OF PUBLIC-PRIVATE PARTNERSHIP TO THE DEVELOPMENT OF THE ENERGY EFFICIENCY MARKET

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ABSTRACT

Linking public and private sectors enables support to ongoing development and implementation of local strategies for sustainable development, in order to improve the quality of life. The essence of private sector involvement in traditional public affairs is to reduce the fiscal pressure on local budgets, accelerating infrastructure investments, improving services, and encouraging the growth of output and job creation. The basic elements of the concept are the protection of the public interest, a clear allocation of responsibilities, risk sharing and raising the level of quality of public services. The use of public-private partnership is the right way to increase energy efficiency in the public sector because the private partner guarantees the energy savings from which the fee will be paid, thus taking over the bulk of the risks for the implementation of projects. The improvement of energy efficiency both in terms of production and consumption has been recognized as one of key elements of the energy policy of the Republic of Serbia, in accordance with the Energy Development Strategy of the Republic of Serbia until 2025 with projections until 2030. The implementation of measures needed to achieve this goal requires mobilizing significant financial resources, promoting energy efficiency, and further liberalizing the energy market.

Keywords: Public-Private Partnership (PPP), Concessions, Sustainable Development, Energy Efficiency, Project Proposal, Public Interest, Comission for Public-Private Partnership

1. GENERAL REVIEW OF PPP

PPP is the direct consequence of the economic needs of country to develop a partnership with private capital, instead of obtaining credit capital intended for construction, and development of infrastructure, and the development of sustainable system that provides services of public interest. It is very important that public and private interest, although in partnership, remain in constant competition which is realized in legal frameworks of PPP[1]. The PPP model is justified and much more effective than the existing, traditional way of financing and providing services. Consideration of the priority project and the possibility of applying the PPP model refers to whether the project would solve the existing problem and meet the public interest (public goal), and whether the PPP model is applicable to the defined priority project, as well as which risks the public sector could incur, etc.

This model is first and foremost expected to help build capacities of local governments, as well as provincial and state authorities, but also ensure all public institutions work on identifying possibilities and drafting projects, and during implementation, on monitoring the quality of services and the measurement of results. There are great expectations concerning an increase in private capital inflows into projects that can improve the quality of public services and investment in infrastructure, equipment and services. Otherwise, projects that are not prepared seriously and skillfully enough could become a long-term burden on the budget, and push up public debt, and create environmental and social-economic risks. A state or local authority, as a purchaser of services, products or works, is one and a private company, as the supplier, the other side of the equation. The procedure is based on the principles of the protection of public interest, efficiency, transparency,

[1] Cvetkovic P., Sredojević S., 2013. *Javno-privatno partnerstvo, Priručnik za sprovođenje na nivou lokalne samouprave*, Stalna konferencija gradova i opština - Savez gradova i opština Srbije, Beograd, str. 13-14.

equal and fair treatment, free market competition, proportionality, environmental protection, autonomy of will and equality of contracting parties.[2]

In further text it will be analyzed the importance of PPP for energy sector development. The main goal of this paper is to point out the significance and the impact of PPP as financing model for energy efficiency projects. PPP and energy efficiency are a very important field from the perspective of future urban planning.

2. PUBLIC-PRIVATE PARTNERSHIPS AND ENERGY EFFICIENCY IN THE REPUBLIC OF SERBIA

PPP is a very complex and multidisciplinary concept, one whose characteristics are particularly evident in energy efficiency projects. In addition, the time dimension is an additional requirement and challenge for all participants in the procedure. The shortest length of a PPP project is 5 and the longest possible 50 years. The Law on Public-Private Partnership and Concessions regulates conditions and fashion of creation, suggestion and approving of projects of PPP; rights and obligations of public and private partners; authority of Commission for PPP; conditions and the way of concessions; the subject of a concession; legal protection during the acts of assignment of public contract , as well as presents the basic principles:

- The protection of the interests of the public;
- Efficiency;
- Transparency;
- Equal and just treatment;
- Free market;
- Proportionality;
- The protection of environment;
- The autonomy of will;
- The equality of both partners.[3]

The reasons for adoption of the Law Amending the Law on Public-Private Partnership and Concessions (2016) are reflected in the need of further regulation and clarification of certain provisions after four years of its implementation, further alignment with the *Acquis communautaire* as well as strengthening the role of the Ministry of Finance in the approval and contracting process in order to control fiscal risks that the public-private partnership and concession projects are implicitly imposing.[4]

For successful implementation, knowledge is needed of both the laws governing this field and a number of other matters, including public finances, corporate financing, project financing, project management, negotiation skills, project management skills, and the sector's specific characteristics. Accordingly, the steps envisaged by the domestic legal framework for PPPs and concessions are numerous.

When it comes to the PPP market in Serbia, energy efficiency projects are among the priorities on the development side of a large number of local governments.[5] Namely, out of 86 projects proposed by the PPP Commission[6] since 2012 for implementation through the public-private partnership model, as many as 32 project proposals, refer to the field of energy efficiency at the local government level.

Bearing in mind the affirmative legal framework in the field of EE, as well as local governments' development needs, a significant number of projects based on modern technology and solutions can also be expected in the future, thus contributing to the further strengthening of the domestic PPP market.

Public-private partnership is one of the important mechanisms for financing projects for improving energy efficiency in the public sector, as declared in all action plans. These projects, unlike some others, are paid depending on implemented measures, over a shorter or longer period, which enables the use of a special type of PPP. Under the ESCO model of contracting energy services, the private partner, in addition to providing financing for the project, guarantees, based of its expertise, savings to be achieved and from which the fee is

[2] Zakon o javno-privatnom partnerstvu i koncesijama, „Službeni glasnik RS", broj 88/2011, 15/2016, 104/2016.

[3] Zakon o javno-privatnom partnerstvu i koncesijama, „Službeni glasnik RS", broj 88/2011, 15/2016, 104/2016, član 5.

[4] Jovanovic, A., 2016. Legal and Institutional Framework of Public-Private Partnership in the Republic of Serbia, Proceedings, International conference on urban planning - ICUP2016, Faculty of Civil engineering and Architecture, University of Nis, Nis, str. 137.

[5] Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva, Privredna komora Srbije, Beograd, 2018, str. 43.

[6] Odluka o obrazovanju Komisije za javno-privatno partnerstvo, „Službeni glasnik RS", broj 13/2012, 108/2012, 44/2013, 64/2013, 104/2013,115/2013, 20/2014, 15/2015.

paid during contractual period, taking over most of the risks. These are energy services with a guaranteed effect.[7] In order to facilitate the implementation of the ESCO concept, based on the Law on Efficient Use of Energy[8], the Ministry of Mining and Energy adopted the Rulebook on Determining the Model of Energy Services Contract for the implementation of measures to improve energy efficiency, when a contracting side is from the public sector, under which the contract models defined for public buildings and lighting are forms of PPP.[9] This contract model is binding for the public sector.

3. ASSESSMENT OF THE JUSTIFICATION AND PREPARATION OF THE PPP PROJECT

Preparation for the PPP process consists of the establishment of a multidisciplinary team in the public body that will be responsible for the implementation of the PPP process. Of course, the team should enjoy community and political support from the team leader (e.g. mayor), with possible engagement of external advisors, the performance of feasibility studies, etc.[10]

Then, the procedure is formally announced, followed by the formal preparation of the PPP project proposal in accordance with the provisions of Article 27 of the Law on Public-Private Partnership and Concessions.[11] Necessary consents by the competent public body, by the PPP Commission and the Ministry of Finance, which propose the project for implementation through PPP, should be provided.

Implementation of the procedure for selecting a private partner includes, inter alia, a timely announcement of the public invitation, preparation of tendering documents, defining criteria for selecting the most favorable bid, bid submission deadlines, possible guarantees, and finally the formal procedure for awarding a public contract. In concessions and projects with a value greater than EUR 50 million, the procedure for selecting a private partner - a concessionaire is to be implemented in several stages.

Once the required consents of the competent public body are obtained, the signing of a public contract on PPP takes place, followed by setting up a special purpose vehicle, with compulsory registration of the public contract in the Public Contracts Registry.[12]

Mandatory and continuous monitoring is particularly important for the public body - to monitor the contract, to manage changes to the contract and the project, and to do so in the spirit of good partnership. Should a problem arise, all mechanisms available to overcome the situation should be used, such as mediation, but also dispute resolution.

Upon completion of the project, it is very important to analyze experience within the process in order to achieve an exchange of conclusions and avoid bad practice in the future.

The application of these steps must be accompanied by the application of laws that regulate not only the field of PPPs and concessions, but also other laws and acts relevant for the respective sector, making sure specific characteristics of the local environment and of the individual project are considered.

The analysis of launched PPP projects on the Serbian market and direct participation in the implementation of PPPs shows that those projects that have successfully entered the implementation phase were carefully prepared. Economic cost-effectiveness analyses were objectively implemented, the establishment of project and expert teams with experts of various adequate qualifications was immediate, and there was a good balance of professional and political support, with appropriate attention paid to the inclusion of and communication with the public.

The phase of objective assessment of the justification of applying the PPP model and the phase of quality preparation of the PPP/concession project proposal are crucial for the success of implementation.[13]

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[7] Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva, Privredna komora Srbije, Beograd, 2018, str. 15-16.

[8] Zakon o efikasnom korišćenju energije, „Službeni glasnik RS“, broj 25/2013.

[9] Pravilnik o utvrđivanju modela ugovora o energetskim uslugama za primenu mera poboljšanja energetske efikasnosti kada su korisnici iz javnog sektora, „Službeni glasnik RS“, broj 41/2015.

[10] Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva, Privredna komora Srbije, Beograd, 2018, str. 45.

[11] Zakon o javno-privatnom partnerstvu i koncesijama, „Službeni glasnik RS“, broj 88/2011, 15/2016, 104/2016.

[12] Public contracts shall be recorded in the Public Contracts Register which maintained by the ministry in charge of finance as a unique electronic data base on the public procurement portal - as sub-portal.

[13] Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva, Privredna komora Srbije, Beograd, 2018, str. 45.

4. THE ROLE OF COMMISSION FOR PUBLIC-PRIVATE PARTNERSHIP IN THE REPUBLIC OF SERBIA

There is a growing interest of local governments in the PPP model, which can be used to improve the quality of services to citizens while at the same time cutting costs, as well as to enable the transfer and use of new knowledge and technologies in the public sector, helping local governments achieve their strategic goals faster. Since municipalities and cities are often unable to independently invest in certain infrastructural projects and public services due to a lack of budget funds, one of the options is to involve the private sector and use the PPP model. The basic elements of the concept are the protection of the public interest, a clear allocation of responsibilities, risk sharing and raising the level of quality of public services. Each partner assumes the risk it can manage, which improves efficiency. Public-private partnerships in energy efficiency improvement projects, such as, for example, the reconstruction and modernization of public lighting, reduce budget spending and raise the level of efficiency in providing services. All this is aimed at providing benefits to the owners of infrastructure and society as a whole and protecting the environment, while at the same time enabling the public partner to use organizational, technical, financial and innovative skills of the private partner.

Since its inauguration, the Commission has approved a total of 86 project proposals with or without concession elements. These are mostly projects of municipalities in the field of urban and suburban passenger transport, public lighting, municipal waste collection and production of heat and electricity from renewable energy sources. Since basing local development planning completely on public revenues represents too narrow a foundation for a faster community development, it is necessary to enhance budget financing by attracting private capital to build infrastructure and improve the quality of public services. All this is an indicator that PPP is becoming the most realistic option for local as well as regional and national infrastructure projects, since in recent years an increasing number of projects has been moving in that direction.[14]

Promoting PPP and its wider application can be of great benefit not only for the private sector, but for society as a whole. Private capital is one, but not the only option for solving the problem. Arrangements should be made after carefully and objectively assessing all pros and cons, comparing the advantages and disadvantages of this model with the traditional way of financing and providing services. When public entities decide on a PPP model, they should give clear priority to the public interest, or public law, to the extent it secures benefits for citizens.

The Commission is profiled as a professional (not a political body). Following the adoption of the Law on public-private partnership and concessions adopted by-law (Decree on the establishment of the Public-Private Partnership), which provides that "the implementation of any project of PPP necessary to obtain a favorable opinion of the Commission" (paragraph 5. Decision).[15] This is clearly committed to the "binding" nature of the above the Commission's opinion: the absence of a positive or negative opinion means giving the project a PPP is not approved.[16] The Commission analyzes a project proposal and gives an opinion on whether it can be implemented in the form of a PPP, or whether it contains all the elements envisaged by the law. First and foremost, in addition to the proposed project and goal, an important part of the business plan is the cost estimate and the analysis of the results of invested funds, the model's financial feasibility for the Commission, along with project financing details and the planned risk allocation. [17] Meanwhile, it must be bear in mind the quality of public services and environmental protection, as well as the safety, health and security of employees.

In terms of energy efficiency projects, initial conditions aim to achieve savings in municipalities by cutting energy costs, and one of the examples is the reconstruction of public lighting systems through the use of energy efficient, modern and economical light sources. A high degree of mechanical and electrical protection and high quality and durable materials provide a long life-span. An important component is environmental protection, since air pollution is reduced, meaning the emission of carbon dioxide is decreased to comply with European standards.

[14] Špiler M., Jovanović A., 2017. Efekti javno-privatnog partnerstva kao modela finansiranja u Republici Srbiji, Institucije i ekonomija – šta (ne) možemo uraditi bolje, Univerzitet Istočno Sarajevo i Ekonomski fakultet Pale, Andrićgrad, str. 390.

[15] Jovanović A., 2013.*The Role and Importance of the Public-Private Partnership in the Republic of Serbia in Financing Local Economic Development*, IN: Osmanković J., Pejanović M., (ed.) Proceedings, Local Economic and Infrastructure Development of SEE in the Context of EU, Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo, p. 421.

[16] Jovanović A., 2013.*The Role and Importance of the Public-Private Partnership in the Republic of Serbia in Financing Local Economic Development*, IN: Osmanković J., Pejanović M., (ed.) Proceedings, Local Economic and Infrastructure Development of SEE in the Context of EU, Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo, p. 421.

[17] Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva, Privredna komora Srbije, Beograd, 2018, str. 25.

5. CONCLUSION

Serbia has started to apply the best practices of the countries of the European Union in order to improve energy efficiency at all levels, increase security of energy supply and competitiveness of the industry, reduce the import dependence and negative effects of energy on the environment, as part of an integral energy policy. State institutions and local governments increasingly recognize the importance of energy efficiency, and PPP as a model that enables them to implement projects of public importance in this area. Although potential opportunities are not enough used, good examples are becoming increasingly common in domestic practice. For example, in the utility sector, this type of cooperation between private and public sectors is currently raising the energy efficiency of public lighting - replacing old by new LEDs, as well as in primary and secondary schools where instead of boilers on the fuel oil, new based on bio-mass energy are installed. The possibilities of PPP for raising energy efficiency were among the first used by the municipalities of Ada, Zabalj and Topola, city of Krusevac and city of Pirot, relying on a comprehensive legal framework, carefully conducted feasibility studies and good practice. Enhancing the energy efficiency of public buildings, public lighting, heating systems and other utility systems, by using modern, more efficient technology and equipment using renewable energy sources, will be contributed to the fulfillment of obligations that Serbia has in the context of EU integration and as a member of the Energy Community.[18]

The expectations from PPP are immense in terms of increase an influx of private investments in those local projects with the potential of improving the quality of public services, by investing the funds into new infrastructures, equipment and services. Commission for PPP has crucial role in fulfilling such expectations. Arrangements of PPP should be established after a thorough and impartial assessment. Promotion of PPP and its wider application could be very beneficial not only for private sector, but as well for the society in general.[19]

REFERENCES

1. Akintoye A., Beck M., Hardcastle C., 2003. *Public Private Partnerships: Managing Risks and Opportunities*, Blackwell Publishing Company.
2. Custos D., Reitz J., 2010. *Public-Private Partnerships*, American Journal of Comparative Law, The American Society of Comparative Law.
3. Cvetković P., Sredojević S., 2013. *Javno-privatno partnerstvo, Priručnik za sprovođenje na nivou lokalne samouprave*, Stalna konferencija gradova i opština – Savez gradova i opština Srbije, Beograd.
4. European PPP Expertise Centre: *The Guide to Guidance: How to Prepare, Procure and Deliver PPP Projects*, 2011. European Investment Bank, Luxembourg.
5. Jovanović A., 2013. *The Role and Importance of the Public-Private Partnership in the Republic of Serbia in Financing Local Economic Development*, IN: Osmanković J., Pejanović M. (ed.) Proceedings, Local Economic and Infrastructure Development of SEE in the Context of EU Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo.
6. Jovanovic, A., 2016. *Legal and Institutional Framework of Public-Private Partnership in the Republic of Serbia*, Proceedings, International conference on urban planning - ICUP2016, Faculty of Civil engineering and Architecture, University of Nis, Nis.
7. Pavlović-Križanić T., 2012. *Lokalna javno-privatna partnerstva u Srbiji - između propisa i realnosti*, Časopis za javnu politiku POLIS, Stalna konferencija gradova i opština - Savez gradova i opština Srbije i Centar za javnu i lokalnu upravu - PALGO cetar, Beograd.
8. Rosenau Vaillancourt P., 2000. *Public-Private Policy Partnership*s, Massachusetts Institute of Technology.
9. *Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva*, 2018. Privredna komora Srbije, Beograd.

[18] Unapređenje energetske efikasnosti kroz model javno-privatnog partnerstva, Privredna komora Srbije, Beograd, 2018, str. 7.

[19] Jovanović A., 2013. *The Role and Importance of the Public-Private Partnership in the Republic of Serbia in Financing Local Economic Development*, IN: Osmanković J., Pejanović M., (ed.) Proceedings, Local Economic and Infrastructure Development of SEE in the Context of EU, Academy of Sciences and Arts of Bosnia and Herzegovina, Sarajevo, p. 424.

10. Špiler M., Jovanović A., 2017. *Efekti javno-privatnog partnerstva kao modela finansiranja u Republici Srbiji,* Institucije i ekonomija – šta (ne) možemo uraditi bolje, Univerzitet Istočno Sarajevo i Ekonomski fakultet Pale, Andrićgrad.

LEGAL SOURCES

Zakon o javno-privatnom partnerstvu i koncesijama, „Službeni glasnik RS“, broj 88/2011, 15/2016, 104/2016.

Zakon o javnim nabavkama, „Službeni glasnik RS“, broj 124/2012.

Zakon o energetici Republike Srbije, „Službeni glasnik RS“, broj 57/2011**.**

Zakon o efikasnom korišćenju energije, „Službeni glasnik RS“, broj 25/2013.

Pravilnik o utvrđivanju modela ugovora o energetskim uslugama za primenu mera poboljšanja energetske efikasnosti kada su korisnici iz javnog sektora, „Službeni glasnik RS“, broj 41/2015.

Strategija razvoja energetike Republike Srbije do 2025. godine sa projekcijama do 2030. godine, "Službeni glasnik RS", broj 101/2015.

Odluka o obrazovanju Komisije za javno-privatno partnerstvo, „Službeni glasnik RS“, broj 13/2012, 108/2012, 44/2013, 64/2013, 104/2013,115/2013, 20/2014, 15/2015, 5/2018)

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WALKABILITY IN HISTORIC URBAN FABRICS AND ITS ROLE IN URBAN PLANNING AND DESIGN

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ABSTRACT

In today's world of Automobile based urban life, pedestrians are receiving the least attention in cities. With cars taking over every part of the city during Modernism era, importance of human-scaled spaces was being forgotten. After decades of motor vehicles running the city, disadvantages of this planning have been proved. Public health, air quality, environmental effects and social life of urban areas are the main targets of this misery. Among these problems are the historic core of the cities which could not keep up with modernisation pace and consequently lost their habitants in a short time, While, according to Iranian examples, urban historical fabrics got rich and valuable assets of communities, these valuable rich urban fabrics cannot provide us with wide boulevards and therefor are facing a level of inactivity. Therefore, this inactivity at centre of cities leads to lack of social spaces and social public interactions among pedestrians which might end up in dead urban life if not taken care of. Another factor explaining the importance of historic fabrics, is that the absence of modern tools at time of them being built caused the residential and public spaces construction to be best adapted to their settings. Buildings needed to provide their heat and cold by the use of architectural skills rather than modern technologies. Therefore, the very brilliant climate adapted ideas in building the fabric is still noticeable which are forgotten in Today's city construction.

In this paper, the reasons why walkability is playing a major role in cities and why it is important to be emphasized in historic centres and its dedication to climate change issues are being discussed. The relation between a high quality urban life and walkability is studied and through that, the main factors in measuring walkability in a rich historic neighbourhood are being defined. The way walkability can help this fabric gain urban vitality again and help us re-value the historic sites in both terms of social life and climate adapted architecture is addressed.

Keywords: walkability; urban life quality; historic centre; climate adapted architecture

1. INTRODUCTION

In order to best study the subject, clarification of the issue is required. Cities in the past were benefiting high walkability standards and walking used to be the main transportation mode. Upcoming with industrial revolution and cars taking over the cities, pedestrians are being forgotten. In modern urban planning, cars receive higher priority over people in urban spaces. Whilst supposed to help human life become easier, nowadays, cars are dominating humans' urban space. Started from almost 100 years ago, motor vehicles showed up in Iranian cities and at the same time, pedestrian dominance in cities began to diminish. Cars began to become popular and desirable by most people, while poor public transportation system in addition to curved roads in historic centers being incompatible with automobiles, caused the pedestrian life and urban vitality in old towns to be threatened.

The historic fabric is an integrated system of residencies, valuable landmarks, bazaars[1], infrastructures, roads and specific architectural forms which are created and developed through hundreds of years. What makes this fabric unique and noticeable, is the gradual formation of it which carries years of social bonds and cultural values inside, which is in fact, the missing component of today's urban life. Therefore, urban planning and urban design are now focusing on environmental qualities which can best encapsulate manmade constructions with communicational potentials and come up with ideas of creating public spaces with high social capacity and better pedestrian experience among them. The other significant factor of these fabrics in Iranian cities is the Architecture. Best solutions of climate-adapted housing and public space structure can be found in most of them. In fact, our ancestors best turned the lack of modern tools into opportunities of using architecture along with the city's domestic materials, temperature and, sunlight. While modernism leads us to cubic living machines trying to tame the nature failed, we still have constructions fully respectful to their settings and environment available in historic sites.

Therefore, it is now clear that we need to take another look at these fabrics on behalf of rich architectural values which can be taken into consideration for future urban developments. The social life of public spaces and climate adapted constructions are among the ultimate resolutions of urban design today. In this paper, the way walkability is believed to be helpful in bringing urban vitality back to this fabric and how it can help us revalue and regenerate urban life in cities is being discussed. We will figure out why and how walkability also matters in terms of climate change and the most important factors of walkability in historic fabrics are defined. These studies are held through a theoretical survey as well as experimental interactions with locals and specialists.

2. BASIC THEORIES

Quality of life is about social, cultural, economic and spatial conditions of an urban space that can indicate amount of satisfaction among citizens gained from the public space (Shammai et al, 2004). Quality is among basic concerns of urban planning/design; represented through terms of 'Urban Quality', 'Environmental Quality', 'Quality of Life' and 'Public Space Quality'. In order to create a quality urban space in historic sites through walkability encouragement and with regards to climate change issues, basic concepts are defined as follows:

2.1. Placemaking

In order to recreate successful urban spaces, we first need to figure out what is a place and what are the steps of a space turning into a place. Based on PPS[2], Placemaking inspires people to collectively reimagine and reinvent public spaces as the heart of every community. Strengthening the connection between people and the places they share, placemaking refers to a collaborative process by which we can shape our public realm in order to maximize shared value. More than just promoting better urban design, placemaking facilitates creative patterns of use, paying particular attention to the physical, cultural, and social identities that define a place and support its ongoing evolution (PPS, 2018). Behzadfar (2018) states that there are nine core features that develop a space into a place. They are space, form, perception, society, landscape, function, time, environment and management (Behzadfar et al, 2018). Therefore, every single place needs nine main characteristics to become a place.

2.2. Regeneration

When facing lack of vitality in a valuable old urban structure, the term "Regeneration" gets into consideration. Among different approaches in urban design strategies, regeneration best addresses historic sites' deprivations. Roberts and Sykes (2000) state that urban regeneration is a comprehensive and integrated vision and action to address urban problems through a lasting improvement in the economic, physical, social and environmental condition of an area. They feel that given its emphasis on partnership and strategic approach, it can perform an enabling role in achieving sustainability. This definition of regeneration is one of the best definitions along with purpose of this paper.

[1] Traditional markets in Iranian cities

[2] Project for Public Spaces is a non-profit organization dedicated to helping people create and sustain public spaces that build strong communities. They are the central hub of the global placemaking movement, connecting people to ideas, resources, expertise, and partners who see place as the key to addressing our greatest challenges.

2.3. Climate change

The most general definition of climate change is a change in the statistical properties (principally its mean and spread) (Solomon et al, 2007) of the climate system when considered over long periods of time, regardless of cause. The term "climate change" is often used to refer specifically to anthropogenic climate change (also known as global warming). Anthropogenic climate change is caused by human activity, as opposed to changes in climate that may have resulted as part of Earth's natural processes (UN, 1994)[3]. Climate change was incorporated in the title of the Intergovernmental Panel on Climate Change (IPCC) and the UN Framework Convention on Climate Change (UNFCCC, 2016).

2.4. Walkability

Walkability refers to a wide range of urban design projects which are somehow connected to Pedestrians. A walkable place is a place in which residents with any age or capability can feel the joy and pleasure, comfort and tranquillity and amenity while walking as a pedestrian or a user. Nosal (2009) believes walkability is 'The extent to which the built environment is friendly to the presence of people living, shopping, visiting, enjoying or spending time in an area' (Nosal,2009). Talen (2013) defines a walkable neighbourhood as a tangible, definable, culturally significant phenomenon motivating scholarship in a wide variety of fields, and generating research results with cross-cutting applicability (Talen, 2013).

Walkability is believed to help us improve quality of life in different aspects. Shafiei (2001) states that walking consists of seven different activities including jogging, stopping, sitting, lying, running and watching (Shafiei, 2001). Walking in the streets is the initial way of experiencing the city. Benefits of walkability lays into categories of:

- Public Health: Public Health Agency of Canada held a research on role of physical activity in preventing the diseases in 2003. The results indicate that while physical inactivity in addition to drug usage can increase blood pressure and has a risk of heart attack, physical activity may decrease risk of Diabetes type II and breast and cologne cancer by 50 percent (Public Health Agency of Canada, 2003). Walking has proved benefits on health which are not deniable and urban walkability is even mentioned in World Health Organization programme of health cities.
- Socio-economic aspects: when there is no appropriate public space in city, the first groups disappearing in city are elderlies, children and people with disabilities. Walking ways are among tools of creating social encounters benefiting economic activities and communicational atmosphere. In walking ways people can have different choices of walking, sitting, stopping, watching and interacting with others and as Buchanan believes, walking freedom in cities is a good sign of a civic society, it can be concluded that a higher number of active walking ways is a rather good symbol of a high quality and high cultural city (Pakzad, 2006).
- Creating and developing better Pedestrian paths can affect urban life regeneration. People enjoy pedestrian ways because of their amenity, freedom of movement, peace and disappearance of cars. They see pedestrian ways as places to meet and trade. They gradually become used to spending more time in public space and this can lead to better social interactions and ultimately raise of civic cultures including respect to different groups of people and higher social responsibilities. Specially children and youngsters can learn social behaviour techniques in healthy public spaces (Farrokhi, 2008).
- Theoretically, neighbourhoods with better design for pedestrians benefiting mixed use strategies are believed to create richer context for social interactions. Coffeshops, restaurants and other communicational spots amid pedestrian paths are vulnerable places of good social activities. Even running into other people and saying a 'Hello' can help develop a self-confidence and connections between the residents (Leyden, 2003).
- Environment: in the era of endangered ecological resources and endangered species being in a crucial situation, paying attention to ecological compatibility is of a high importance. Human culture needs to better merge with natural systems. Tibbalds believes that if you are emphasizing on having personal freedom among which, is the right to use motor vehicles, you should be ready to pay all its

[3] "Climate change means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods."

environmental expenses including congestion, collisions, air pollution, sonic pollution, environmental pollution, lower quality of life, acid rains, global warming and health issues (Tibbalds, 2006).

- Walkability helps reduce need for motor vehicles in cities which directly leads to better air and environmental qualities and a peaceful urban atmosphere. Walkability also highly encourages people to use public transportation system. Expanding green areas and greenways is another feature of walkable development which can have a significant impact on social and environmental health in cities (Farrokhi, 2008).
- Walkability and urban structure preservation: Human-scaled spaces are the lost feature in modern cities. High-rise zone is now found in almost every city where cars and motor vehicles need to move between them. Such spaces imply sense of being lost and fearful onto people inside. Creating more high-rises means tearing city fabrics to provide cars access (Farrokhi,2008). Therefore, encouraging walkability is directly linked to more human-scaled spaces which already exists in historic core of the cities. Experiencing urban identity, affiliation and benefiting urban quality is gained through walking and feeling rich urban environment. Walkability can signify rich characteristics of old textures by the means of discouraging cars and high-rise building in the city (Farrokhi,2008).
- Respect to city settings and gradual formation of main structures is another target reached via encouraging walkability. Cities with better public transportation systems tend to less intervene and change ecological system of the city due to less CO2 emission and glasshouse gases creation.
- Security and Safety: These two concepts are among main factors of urban sustainability in urban literature. An urban public space is not considered walkable if it cannot provide minimum of Security and Safety. Creating the sense of safety in an urban space is not gained via authority or police control, although controlling the crime and insecurity by means of urban lighting and sometimes presence of policemen is achieved, but more importantly the sense of Safety is a feature which needs people being present in the place. An active social life of pedestrians from all different groups walking the city in all day and night both provides and is affected by place safety (Farrokhi, 2008). Consequently, a city with better pedestrian network is a city with higher safety.

Regarding all the discussions above, it's concluded that bringing urban life back to a historic site which suffers from inactivity, regeneration of high quality urban spaces is needed. Approach of placemaking in these sensitive rich fabrics are best addressed via encouraging and developing walking areas. The reason why walkability is the best strategy for such sites is that it concerns and implies features which can not only take care of existing valuable landmarks and texture but also provides the place with possibilities of developing an active social life. Regarding all aspects of health, Socio-economic life, environmental footprints, respecting available structure and creating safety in public spaces, walkability is seen as a remedy of wounded heart of the city.

In addition to all mentioned concerns, climate adapted planning is not to be forgotten in today's era of climate change and endangered nature. Cities are the largest human residencies on the earth where the most side-effects of environmental carelessness are taking place. Walkability helps the historic fabrics receive attention from residents. Gradually regaining its urban vitality, historic fabric can provide us with better climate adapted architectural values while at the same time creating less ecological footprints on behalf of more pedestrian-based city rather than car-based.

3. FINDINGS

Through studies in an Iranian city[4], several features of historic fabric are recognized remarkable and reusable. They include integrated urban space consisted of walking paths and pause spots (public spaces) all united, covered Bazaars which expand on the ground level through alleys which are great for trade and social interactions in a comfortable weather zone, low-rise introspective housing built from clay and mudbrick (local materials) with underground construction and use of water for cooling plus sunlight-oriented plan for heating.

The most important factors of walkable neighbourhood to be studied in historic urban fabrics are: Safety (pedestrian safety, women and children safety), Security (pedestrian/vehicle way separation, parking lots locating, speed limits), physical desirability (pedestrian way width, topography, comfortability, paving's quality), accessibility (different transportation modes, lightening, station locating, fast and easy movement, continuity of pedestrian paths) and vitality (social activity, local-scaled shops, mixed-used zoning).

[4] City of Yazd in Iran which is comprehensively studied in author's Master's Thesis

4. CONCLUSION

Historic centers of the cities contain best climate adapted architecture and human-scaled social atmosphere which are being dismissed amid process of cities developing toward higher buildings and wider autobahns. Motor vehicles dominance in a city is equal to more problems in terms of health and public social life. Disadvantages of automobile oriented planning are already proved in megacities. In conclusion, urban planning today, urges a shift in approaches toward inner city revaluation and regeneration which can provide human life with better quality places and less environmental footprints. Adopted lessons from the past combined with global experiences create a vision toward future that can help urban planning reach a new approach. This approach is supposed to be a solution for today's urban issues. Achieving a green sociable city center is a reachable goal if old values already existing receive proper attention.

REFERENCES

1. Behzadfar M. et al, 2018, "The Principles of City Gateways (Corridors)", First edition, Armanshahr, Tehran, Iran.
2. Farrokhi M., 2008, "نقش محور های پیاده در توسعه پایدار شهرها", Proceedings of First Sustainable Urban Development in Iran Conference, Tehran, Iran.
3. Hulme, Mike., Concept of Climate Change, in: The International Encyclopedia of Geography, Wiley-Blackwell/Association of American Geographers (AAG), Retrieved 16 May 2016.
4. Leyden, K. M., 2003, Social Capital and the Built Environment: The Importance of Walkable Neighborhoods, Public Health, 93(9), PP 1546-1551.
5. Nosal, B., 2009, Halton Region Health Department, Creating Walkable and Transit-Supportive Communities in Halton, Oakville, Ontario.
6. Pakzad J, 2006, A Guidline for Designing Urban Sapces in Iranian Cities, Shahidi, Tehran, Iran.
7. Roberts, P. W., & Sykes, H. ,2000, Urban regeneration: A handbook, SAGE, London.
8. Shafiei S., 2001, Urban Design Principles, Salimi Publicatons, Tehran, Iran.
9. Shammai. A, Pourahmad. A, 2004, Urban rehabilitation and renovation, a geograpgic perspective, Fifth edition, University of Tehran Press, Tehran, Iran.
10. Solomon, S., Qin, D., Manning, M., Chen, Z., Marquis, M., Averyt, K.B., Tignor, M., Miller, H.L., eds. 2007, "Understanding and Attributing Climate Change", Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change (IPCC).
11. Talen, E., 2013, The walkable neighborhood: A literature review, International journal of sustainable landuse and urban planning, PP 63-42.
12. Tibalds, f., 2006, Making peoplefriendly towns, h.a.laghai and f.jadali, University of Tehran Press, Tehran, Iran.
13. "The United Nations Framework Convention on Climate Change", 21 March 1994.
14. PPS, 2018. https://www.pps.org/ [Accessed: 28th September 2018].
15. Public Health Agency of Canada, 2003, Physical Activity for Health.

APPLICABILITY OF THEORETICAL APPROACHES OF URBAN SHRINKAGE TO SMALL TOWNS

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ABSTRACT

Urban shrinkage has become a pathway of development for many cities across the world. It is receiving the increasing attention of scholars, but because of its complexity and multidimensionality, there is still no singular theoretical explanation of this phenomenon. Theoretical understanding of urban shrinkage range from life-cycle theories of urban development, through various explanations of suburbanization, the changing territorial divisions of labour and the second demographic transition to the more recent approaches of the effects of globalization. Seeking to develop broader conceptualization these approaches apply primarily to larger cities, while small towns have been ignored by urban theorists. But their shrinkage is evident, especially in Central and Eastern Europe, including Serbia. They are often considered as losers in the process of globalization and they were not the main focus of shrinking cities research. More recently concept of peripheralization emerged, which places urban shrinkage in a wider spatial and relational context. Also the theory of urban resilience offers a good approach for interpreting shrinkage linking it to certain natural phases in the process of adaptation. Following a critical overview of theoretical approaches of shrinking cities this paper discusses the possibility of their application in the explaining the shrinkage of small towns.

Keywords: urban shrinkage; small towns; urban life-cycle theory; globalization; peripheralization

1. INTRODUCTION

Urban shrinkage has received the increasing attention of scholars worldwide during last decades. It is acknowledged to be a global phenomenon that affects many cities and urban regions. The drivers and effects of urban shrinkage differ considerably depending on the social, economic and political conditions of the given country or region. Therefore there is no single model of shrinking city.

Although shrinking cities are much explored, they still lack a clear theoretical framework. There has not been developed yet a 'grand theory' of urban shrinkage (Haase, et al., 2016). Because of the complexity and

multidimensionality of this phenomenon, academic discourse of urban shrinkage depends on many theoretical frameworks. These theories do not have explicit focus on shrinking cities but they all try to explain urban and regional inequalities. They range from life-cycles theory, through various explanations of changing urban forms, concepts of uneven development, globalization impacts or second demographic transition. More recently there have also appeared concepts of peripheralization and urban resilience. It is also argued that different approaches to urban shrinkage should be brought together into an integrated "multi-theoretical" understanding of shrinkage (Haase, et al., 2016).

The part that has not been much discussed in the literature is if these theoretical approaches apply to all types of shrinking cities. Small towns are not primarily the focus of shrinking cities research, but their shrinkage is evident, especially in Eastern and Central Europe (Ljubenović, et al., 2018). Since the vast majority of theoretical research of urban shrinkage has focused on large cities and on metropolitan regions, the main question in this paper is if these approaches apply also to small shrinking towns. After a review of theoretical approaches of shrinking cities, the possibility of their application in the explaining the shrinkage of small towns is discussed.

2. THEORETICAL APPROACHES OF URBAN SHRINKAGE

2.1. Cyclic theories of urban change

Life cycle approach was developed first at the level of urban neighbourhood by the Chicago school of urban sociology. This theory views the urban change as the natural process where the evolution of neighbourhoods goes from appearing through growth towards inevitable decline related to the loss of property values caused by the arrival of less prosperous populations (Hoyt, 1939). According to (Metzger, 2000) this theory is used by local planners in the United States to encourage the “deliberate dispersal” of urban poor.

Life cycle approach derives from economic cyclic theory. Schumpeter (1939) linked economic cycles with innovation patterns. Strong growth phase occurs through the introduction and expansion of new innovations followed by crisis or depression. Every new cycle brings the process of 'creative destruction' because it destroys technologies that have been replaced. Based on the production cycle theory, each phase of the life cycle of industrial product has its optimal location (Friedrichs, 1993). The development of a city or region can be related accordingly to the development of a particular industry or industrial cluster. The city declines when one of the main factors of production is found at the end of the production. This theory explains the best the urban shrinkage of cities with mono-functional economy or one dominant industry (for example Detroit, Pittsburgh). Over the past decades international and global markets have influenced on local economies and cycles of growth and decline are less dependent on local decisions. Therefore the application of a cyclic model is not always possible.

Theories of cyclic change influenced a range of studies of urban change in Europe during the 1980s and the development of the urban life cycle models. Van den Berg, et al. (1982) presented a model that included four successive phases of urban development: urbanization, suburbanisation, disurbanization and eventually reurbanization. The model is based on centralisation and decentralisation stages of the agglomeration economy. Urban shrinkage is associated with the phase of disurbanization (or counterurbanisation) that occurs due to decentralization of the population and business. There are however some shortcomings of this model. The change between phases is not clear and they do not follow always consecutive order (Cheshire, 1995). Additionally, the model is based on a certain stage of economic development, a Fordist mode of production with mass standardized production and massive employment in large industrial complexes (Bontje, 2004). For this reason it is less relevant to the current urban and economic development that followed the industrial restructuring and not sufficient to comprehend the multidimensional global nature of the shrinking cities (Fol & Cunningham-Sabot, 2010).

2.2. Suburbanization and postmodern urban forms

The North American discourse on shrinking cities dominates the view that urban decline leads primarily from the suburbanization process (Audirac, 2009). According the view of neoclassic economy people's preferences and a balance between land prices, transportation costs and location of housing determine growth or decline of certain area. Population with higher income can afford larger transportation costs and larger parcels on the periphery and low-income population concentrates in urban core due to lower transportation costs and more accessible housing.

Economic restructuring and post-Fordist industrial change caused the development of postmetropolis (Soja, 2000). This author calls urban forms that emerged by these processes "exopolis" order to emphasize the importance of exogenous forces in shaping the city in the era of globalization. The geography of the postmodern society has gained a new spatial-temporal framework determined by the global effects manifested locally (Dear & Flusty, 1998).

2.3. Globalization

Shrinking cities can be seen as spatial manifestations of the process of globalization (Fol & Cunningham-Sabot, 2010). Globalization stimulates the mobility of people across countries and regions. Some communities become magnets for national and international immigration (usually capital cities and regional centres), while others have no inflow which results in a decline. In that way, an international system of "networked" cities and agglomeration emerges, with a growing gap between the cities that integrated into global networks and those that did not (Scott & Storper, 2003). Some places become attractive for investments and high-qualified workers, while others lose their economic base, jobs and population. Bypassed by global networks, shrinking cities are 'unplugged from international engines of growth' (Fol & Cunningham-Sabot, 2010).

The combination of spatial expansion and global integration made new strategic role for big cities (Sassen, 2001). These cities function as high organizational centres in world economy and key financial and production locations. The economy is globalised in very small number of places called 'global cities', with high-level financial and service activities. The relocation of human capital from small and mid-sized cities to these global cities creates numerous social, economic and environmental challenges in them leading to urban shrinkage. Shrinking cities viewed this way are not just a stage in evolutionary cycle, but a lasting symptom of globalization (Fol & Cunningham-Sabot, 2010). Viewed that way, the factors that promote growth in global cities also influence the shrinkage of other areas. Thereby, growth and shrinking can be seen as two aspects of globalization.

2.4. Uneven spatial development

Urban political economy views urban development as the movement of capital which is invested or withdrawn from existing spatial configurations. A spatial network is constructed to enable global financial flows of capital and connect places with surplus capital to areas with a lack of capital (Harvey, 2010). The main objective is to allow free circulation of capital throughout the world market. Urbanization is one of the ways to absorb surplus capital. Physical infrastructure is indispensable for the capitalist mode of production. It serves as a 'spatial fix', specific to the needs for accumulation at that particular time in time, after which it is becomes obsolete and decays (Harvey, 2010).

The concentration of production power in some places has caused the emptying of other areas. The theory of uneven spatial development best describes the characteristics of the specific geography of capitalism. Smith (2008) calls the uneven development a consequence of "seesaw" movement of capital from developed to undeveloped areas and back. Decentralization of capital formed the suburbs and led to underdevelopment of inner cities and the devaluation of its structure.

The shrinkage is according to this view the movement of capital rather than people - some places are successful in attracting investments, while others are not which cause further abandonment, decrease in attractiveness and decrease in population.

2.5. Second demographic transition

Some explanations of urban population decline focus on demographic change, more precisely on the consequences of declining birth rates and increasing life expectancy. Van de Kaa, (1987) calls this new period in demographic history "second demographic transition". Its main characteristic is a fall in fertility rate below the replacement level. This had already influenced population decline in some countries during the 1980s (Austria, Germany, Hungary).

The aging in population, increased number of households and their reduced size have influence on spatial structure (Champion, 2001; Buzar, et al., 2007). It is not clear though if the demographic changes are additional factor along with economic restructuring and technological change in shaping new forms of settlements or changes in settlement schemes influenced by these other factors cause population changes (Champion, 2001). It is therefore hard to isolate the influence of just a demographic factor in urban shrinkage.

Post-industrial society is characterized by the big change in norms and attitudes, with strong individualism. Apart from drop of fertility rates, another contradictory trend appears. The changes in lifestyle influence also migration. Population movement and choice of the destination are influenced by factors of 'quality of life' (Champion, 2001). This is reflected in reurbanisation of some cities (in Western Europe and eastern Germany), which is accompanied by social diversification (Buzar, et al., 2007). The break of traditional family structure, the rise of living alone and delayed child-bearing have increased the concentration of non-traditional households in the urban cores.

2.6. Peripheralization

Certain authors (Bernt, 2016; Lang, 2012) suggest understanding shrinkage as peripheralization, underlining the social and discursive production of peripheries. By this concept localities can have unfavourable location as the outcome of unequal power relations between the centre and the periphery (Bernt, 2016). Diverse social, spatial and political groups determine the development of the city which is characterized by the power in the centre and the absence of power on the periphery. This perspective brings politics and powers closer to the focus of research of shrinking city and enables interscalarity of the approach.

The relationship between the centre and the periphery is the basis of the concept. Therefore, the logic and dynamics of spatial centralization determines the peripheralization of other areas by attracting the population, economic activity and infrastructure functions at the expense of other areas (Keim, 2006). According to the concept of peripheralization, shrinking is seen as relative to the urban growth. The role of periphery can also change in long-term perspective and 'de-peripheralization' or 're-centralization' are possible (Kühn, 2015).

Peripheralisation can be applied to different spatial levels: on a macro-scale to developing countries, on a micro-scale to urban neighbourhoods (Kühn, 2015). On the regional scale, processes of peripheralization can occur in the geographical centre of a country as well as on the remote fringes. On the local scale, peripheries can be found within the central core as 'inner peripheries' or in outskirt of the city. This complements traditional understanding of periphery, based on distance to centre.

The shrinkage of East German regions has already taking a part in discussion of peripheralization (Keim, 2006). Regional policy in Germany, as well as in other countries of Central and East Europe is concentrated on larger and prosperous centres, while other areas lose importance (Ehrlich, et al., 2012). Placing shrinking cities in the concept of peripheralization helps to include the wider processes in society in exploring socio-spatial polarization and unequal spatial development (Lang, 2012).

2.7. Urban resilience

Resilience theory considers urban systems as complex adaptive systems and it introduces a new view on the analysis of the urban structure of cities. It is defined as 'the capacity of the system to absorb disturbance and reorganize while going through a change so it still maintains essentially the same function, structure, identity and feedbacks' (Walker, et al., 2004). Urban resilience represents the ability of cities 'bounce-back' and adjust to shocks and challenges. There are two possible responses to disturbance in resilient systems - adaptation and transformation. Adaptation is the capacity of the system to adjust to changing external and internal processes and thereby allow for development along the current trajectory (Folke, 2006). In the social-economic system (SES), this relates to the capacity of people to manage the resilience (Walker, et al., 2004). Transformation is concerned with the creation of a new development path when environmental, economic or social conditions make the existing system untenable. This is the aspect of resilience that includes the capacity for renewal, reorganization and re-development (Folke, 2006).

The resilience of some systems increases when the disturbance is experienced over and over again. The system can learn to become more resistant and reorganize to prepare to absorb these changes. This quality of system is adaptive capacity, which could be assessed based on certain indicators. Determining factors and indicators that allow adaptive capacity to be converted into adaptation is the essence of resilience - the use of own resources for transformation and response to changes in a flexible way (Maguire & Cartwright, 2008).

The dynamics of SES system can be described by adaptive cycle which includes four phases - exploatation, conservation, release and reorganization (Holling & Gunderson, 2001). In the phase of conservation the system becomes less flexible to external shocks and after that is an inevitable collapse. Urban shrinkage represents a result of response to shocks. This process takes place slowly and can create thresholds that are crucial for future community development. It is important to identify the points where the system is vulnerable.

Resilience is the process that connects resources and adaptive capacity of community to adaptation to altered environment.

3. THE CONTEXT OF SMALL SHRINKING TOWNS

Small towns have different preconditions for urban and economic development compared to large cities. They are less attractive for investors, less developed in the field of research and development and do not draw much attention of politicians (Lang, 2005). On the other hand they are important as small centres of economic, cultural and social life for their hinterland and should not be neglected. Based on analysis of theoretical approaches on shrinking cities certain possibilities, as well as limitations of their application on the small shrinking towns can be derived.

Neighbourhood life cycles theory considers specific ethnic characteristics in cities in United States, based on racial discrimination. Apart from that reason, it is not applicable to small town shrinkage because it describes the suburbanization model of population loss - the exodus of the initial populations to the outer regions or suburbs.

The product cycle theory explains urban shrinkage as the consequence of the ending of production cycle of the main economic activity. Economic networks are usually weaker in small towns and the dependency on few companies or one local industry is greater. When the main economic field comes to the end of its cycle, the effects of it can be more dramatic in small industrial towns than in old industrial agglomerations (Lang, 2005). Therefore, this theory can be applied to some extent on small shrinking towns. Its limitations however are that it explains only urban shrinkage caused by deindustrialisation and it is not sufficient to comprehend this multidimensional phenomena. Additionally, it does not include the role of a national economy that is emphasized in small towns.

Theory of urban life cycles is useful for explaining various phases of urban development, but only for large agglomerations. It explains the shrinkage of inner parts of cities and it is not applicable at all in explaining the shrinking of small towns. Moreover, the disurbanization phase in Western Europe in the 1970s included migration flows from the central and suburban areas to the surrounding settlements and also to the small and medium cities of the region (Kabisch & Haase, 2011). Therefore, this theory may serve for analysing the growth of small towns near agglomerations and not the shrinkage. Accordingly, the same conclusion can be made for various explanations of suburbanization and postmodern development.

Understanding shrinking cities in the discourse of globalization offers more possibilities. Globalization theory applies also on small shrinking towns. They are consider as non-global cites that are not able to attach to global networks. But this approach has some limits. Considering that only little number of global cities exist, it cannot be said that all others are shrinking, especially when it comes to cities in developing countries that have weak economy but growing population because of high fertility rates.

The implication of shrinking at the level of knowledge flows is significant for small towns. In these cities another silent process is embedded - the disappearance of skills, knowledge and innovation as high-qualified and more talented people go to more prosperous cities (Fol & Cunningham-Sabot, 2010). This influence the lack of possibilities to develop knowledge institutions and economic networks in small towns, excluding them from the flows of globalization. This can also relate to explanations of capital flow and uneven development. Small towns are less attractive for investments and they do not have enough developed infrastructure, which is one of the preconditions for capital accumulation. Theories of globalization, capital accumulation and uneven economic development theory can serve as a base for explaining small shrinking towns as one of the spatial consequences of the modern global post-industrial society. However, macroeconomic processes are not the only drivers of urban development. For a more deeper understanding the trajectories of urban shrinkage of small towns, local factors, as well as national context must be included.

Demographic change is certainly applicable to small shrinking towns. Low fertility rates and aging processes are more pronounced in small shrinking towns. For example, in Serbia there is significant decrease in the number and share of the young population (0-14) and almost doubling number and share of the old population (65+) in the period from 1981-2011 (Kokotović Kanazir, 2016). This change in age structure is more pronounced in small towns than on national level. The effects of second demographic transition are enhanced by outmigration of young people and low level of immigration rates. These processes define the existence of small shrinking towns and, as the consequence the whole rural area they serve. But, demographic factors could not be consider apart from other causes of shrinkage.

Peripheralization is interscalar concept focused on dynamic processes through which peripheries emerge. It can explain the shrinkage small towns in relation to growth of larger urban centres. It is significant that it considers not only global context, but also regional and national spatial policies. These policies can be often in favour of larger prosperous urban centres contributing thus to the shrinking of small towns. This is especially pronounced in the countries of Central and Eastern Europe, which show strong polarization trends between the main metropolitan region (usually the capital city) and the rest of the country (Ehrlich, Kriszan, & Lang, 2012). Strong centralization is also emphisized in Serbia (Ljubenović, et al., 2018). The limitations of this theory include some research gaps and open questions that exist, for example a relationship between the spatial and process-related perspective of peripheralization (for more see Kühn, 2015).

The concept of resilience offers a promising analytical tool because it raises the question of why and how some cities are shrinking. The resilience concept is particularly useful concept for analysing the shrinkage of small towns. Small towns are in particularly vulnerable positions and have a reduced capacity to cope with the consequences of disturbing events and processes. They possess fewer resources and receive less political and public attention to help them deal with recovery (Besser, 2013). That is why it is important to identify the adaptive capacity of small towns and points in which they are capable to adapt to new environment. The quality that is especially significant for resilience of small towns is social capital. Social capital refers to the quality and quantity of social interactions that are shaped by institutions, relationships and social norms (Taşan-Kok, Stead, & Lu, 2013). The process of building social capital can help the community to recover from consequences of shrinking.

The summary of the applicability of theoretical approaches on small shrinking town is given in Table 1.

Table 1: The possibility of application of theories to small shrinking towns

Theory	*Possibility of application to small towns*	*Explanation*
Neighbourhood life cycles	*No*	*Applicable only to specific ethnic characteristics in large cities in United States*
Economic production cycles	*Yes, but limited to shrinking caused by deindustrialization*	*Small towns have little diversity of the economic base, the decline of main industry can cause shrinking*
Urban life cycle model	*No*	*It explains development in the core area and hinterland of agglomeration, therefore actually explains the growth of small towns near the large cities*
Suburbanization, postmodern urban forms	*No*	*It explains only the shrinking of large cities*
Globalization, global cities	*Yes, but too wide*	*Human capital moves from small to global cities and small towns are unplugged from global networks*
Uneven economic development (capital accumulation)	*Yes, but too wide*	*Small towns are less attractive for investments*
Demographic change	*Yes*	*The process of negative natural growth and aging is more pronounced in small towns, complemented with selective outmigration*
Peripheralization	*Yes*	*Small towns have less political power and are more economic dependant*
Urban resilience	*Yes*	*Small towns are particularly vulnerable to shocks*

4. CONCLUSION

There is certainly impressive range of theoretical approaches available in the literature that try to explain why certain places lose population. However, the tendency of studies on urban development to focus on larger cities is also reflected in the research on shrinking cities. Small towns are generally neglected in urban research and, accordingly, there is insufficient awareness and understanding of shrinking small towns. For this reason urban shrinkage of small towns has not been much theorized. Nevertheless, it can be observed that some existing theories can explain the shrinkage of small towns.

It must be brought to attention that all of these approaches were developed at different times. Hence, it is not a surprise that they do not apply in particular setting of urban system. The life-cycles of economic and urban change, as well as suburbanization theories were developed to explain decline in the course of a crisis of Fordism. The decline of large cities was more pronounce in that period and also came as surprise after long-term growth during the industrialization. Therefore, there is no wonder why these theories do not apply to the shrinkage of small towns.

If theoretical approaches of shrinking cities are viewed hierarchically by the time of origin, it can be observed that newer theories try to comprehend more factors that currently shape the society and to include various spatial levels. That is the reason why they can also apply to small towns. Theories that explain processes of

globalization, capital flow and uneven development of cities and regions are useful macroexplanations that must be included in theoretical framework for studying urban shrinkage of small towns. However, they are too broad to explain actual trajectories of shrinking small towns. Second demographic transition must be also taken into account in explaining the shrinkage, especially in developing future scenarios, but it cannot be observed without relation to other factors.

Although there are enough theoretical approaches to study the urban shrinkage there is certainly the need to develop more clear theoretical framework specifically designed for small shrinking towns. The concepts of peripheralization and urban resilience offer a good base for this framework, taking into account also the effects of globalization. Relational understanding of spatial inequalities offers a good base for analysis and detection of processes that cause urban shrinkage in small towns. Also, analysing the development of small towns in relation to adaptive cycle can identify thresholds of their vulnerability. These concepts are particularly useful because they consider also a recovery of shrinking cities through de-peripheralization, i.e. adaptation to change.

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REFERENCES

1. Audirac, I., 2009. Urban Shrinkage Amid Fast Metropolitan Growth (Two Faces of Contemporary Urbanism). In: The Future of Shrinking Cities - Problems, Patterns and Strategies of Urban Transformation in a Global Context. University of California Berkley, Institute of Urban and Regional Development, IURD Monograph Series, Berkley, pp. 69-80.
2. Bernt, M., 2016. The Limits of Shrinkage: Conceptual Pitfalls and Alternatives in the Discussion of Urban Population Loss. *International Journal of Urban and Regional Research*, 40(2), pp. 441-450.
3. Besser, T., 2013. Resilient small rural towns and community shocks. *Journal of Rural and Community Development, 8*(1), pp. 117-134.
4. Bontje, M., 2004. Facing the challenge of shrinking cities in East Germany: The case of Leipzig. *GeoJournal*, 61(June), pp. 13-21.
5. Buzar, S. et al., 2007. Splintering Urban Populations: Emergent Landscapes of Reurbanisation in Four European Cities. *Urban Studies*, 44(4), pp. 651-677.
6. Champion, A. G., 2001. A Changing Demographic Regime and Evolving Poly centric Urban Regions: Consequences for the Size, Composition and Distribution of City Populations. *Urban Studies*, 37(4), pp. 657-677.
7. Cheshire, P., 1995. A New Phase of Urban Development in Western Europe? The Evidence for the 1980s. *Urban Studies*, 32(7), pp. 1045-1063.
8. Dear, M. & Flusty, S., 1998. Postmodern urbanism. Annals of the Association of American Geographers, 88(1), pp. 55-72.
9. Ehrlich, K., Kriszan, A. and Lang, T., 2012. Urban development in central and eastern Europe - between peripheralization and centralization?. *disP - The Planning Review*, 48(2), pp. 77-92.
10. Folke, C., 2006. Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, 16(3), p. 253–267.
11. Fol, S. and Cunningham-Sabot, E., 2010. Urban decline and shrinking cities: a critical assessment of approaches to urban shrinkage. *Annales de géographie*, 4(674), pp. 359-383.
12. Friedrichs, J., 1993. A theory of urban decline: economy, demography and political elites. *Urban Studies,* 30(6), p. 907–917.
13. Haase, A. et al., 2016. Varieties of shrinkage in European cities. *European Urban and Regional Studies*, 23(1), pp. 86-102.

14. Haase, A., Nelle, A. & Mallach, A., 2017. Representing urban shrinkage — The importance of discourse as a frame for understanding conditions and policy. *Cities*, 69(September), pp. 95-101.

15. Harvey, D., 2010. The Enigma of Capital and the Crises of Capitalism. Oxford University Press, Oxford, UK

16. Hoyt, H., 1939. The structure and growth of residential neighborhoods in American cities. Federal Housing Administration, Washington, DC

17. Holling, C. S. & Gunderson, L. H., 2001. Resilience and Adaptive Cycles. In: Panarchy: Understanding Transformations in Human and Natural Systems (Eds. L. H. Gunderson & C. S. Holling) Island Press, Washington, DC, pp. 25-63.

18. Kabisch, N. & Haase, D., 2011. Diversifying European Agglomerations: Evidence of Urban Population Trends for the 21st Century. *Population, space and place*, 17, pp. 236-253.

19. Keim, K.-D., 2006. Peripherisierung ländlicher Räume - Essay. *Aus Politik und Zeitgeschichte*, 56(37).

20. Kokotović Kanazir, V. 2016. Mali gradovi - demografski potencijal Srbije. Vols. Posebna izdanja, knjiga 90. Geografski institut "Jovan Cvijić" SANU, Beograd

21. Kühn, M., 2015. Peripheralization: theoretical concepts explaining socio-spatial inequalities. *EuropeanPlanning Studies*, 23(2), pp. 367-78.

22. Lang, T., 2005. Insights in the British debate about urban decline and urban regeneration, Leibniz-Institute for Regional Development and Structural Planning (IRS), Ekner.

23. Lang, T., 2012. Shrinkage, Metropolization and Peripheralization in East Germany. *European Planning Studies*, 20(10), pp. 1747-1754.

24. Ljubenović, M. et al., 2018. Specifics of dynamics of shrinking small towns in Serbia. 5th International Academic Conference on Places and Technologies. University of Belgrade - Faculty of Architecture, Belgrade. pp. 879-888.

25. Maguire, B. & Cartwright, S., 2008. Assessing a community's capacity to manage change: A resilience approach to social assessment*,* s.l. Bureau of Rural Sciences, Australia.

26. Metzger, J. T., 2000. Planned Abandonment: The Neighborhood Life-Cycle Theory and National Urban Policy. *Housing Policy Debate*, 11(1), pp. 7-40.

27. Sassen, S., 2001. The Global City: New York, London, Tokyo. Princeton University Press, New Jersey

28. Schumpeter, J. A., 1939. Business cycles - A Theoretical, Historical and Statistical Analysis of the Capitalist Process. McGraw-Hill Book Company, Inc., New York.

29. Scott, A. and Storper, M., 2003. Regions, Globalization, Development. *Regional Studies*, 37(6/7), p. 579–593.

30. Smith, N., 2008. Uneven development: nature, capital, and the production of space. The University of Georgia Press, Athens

31. Soja, E., 2000. Postmetropolis: critical studies of cities and regions. Blackwell Publishers Ltd, Oxford

32. Taşan-Kok, T., Stead, D. & Lu, P., 2013. Conceptual Overview of Resilience: History and Context. In: Resilient Thinking in Urban Planning (Eds. A. Eraydin & T. Taşan-Kok). Springer, Dordrecht. pp. 39-51.

33. Van de Kaa, D., 1987. Europe's second demographic transition. *Population Bulletin*, 42(1), pp. 1-59.

34. Van den Berg, L. et al., 1982. Urban Europe: A Study of Growth and Decline. Oxford: Pergamon Press.

35. Walker, B., Holling, C. S., Carpenter, S. R. and Kinzig, A., 2004. Resilience, adaptability and transformability in social-ecological systems. *Ecology and Society*, 9(2).

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RAISING CITIZEN AWARENESS THROUGH PROMOTING BENEFITS OF SMALL URBAN STREAMS REVITALIZATION

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ABSTRACT

Revitalization of urban streams is becoming an increasingly prominent topic in Serbia mainly because of the apparent problems with the urban streams – floods, pollution, and neglect of surrounding areas. A number of projects advocating contemporary approach to revitalization of river beds, riparian areas and surrounding zones were proposed but were not entirely successful.

While the expert community is well aware of the problems regarding the urban streams, citizens know very little about it or about the opportunity to turn the streams once thought as a problem into attractive and valuable urban spaces. Therefore, in order to achieve broad citizen participation that is necessary to successfully implement projects of urban stream revitalization, the public needs to be educated and informed about the importance of the streams. Such projects can have many benefits for city life, not only ecological but also social and economic. Promoting the benefits is a good way to gain the interest of the public. However, exactly what benefits are brought to forefront depends on the project, context, local culture, and target groups.

This paper will explore how much are citizens of Belgrade informed about its urban streams. Are they aware of the role and potential benefits of the streams? We will discuss which of the benefits should be emphasized and promoted most in order to achieve the broadest participation of citizens in the projects concerning the revitalization of Belgrade's urban streams.

Keywords: small urban streams; raising awareness citizens; project benefits; Belgrade

1. INTRODUCTION

The citizen participation plays an essential role in the revitalization of small watercourses in city areas. Most river-restoration projects in which the general public was included in the planning processes and execution were successfully implemented and integrated into the environment. (URBEM, 2005). Apart from the successful implementation, the participation in the process of urban revitalization could bring more socially sustainable solutions. (Sun, 2015)

Including citizens in the early phase of the process of small urban stream revitalization presents the most efficient way to reach an overall accepted solution. In order to support involvement at an early stage of the planning process, it is necessary to inform the citizens about the significance of the city's streams, the importance of solving existing problems, as well as about the potentials offered by the streams. (URBEM, 2005) Providing access to that information during the early stages of the project is most commonly achieved by presenting the citizens with all of the benefits they will have from the revitalization of streams. The choice of these benefits is vital because the engagement of the citizens will largely depend on these choices, including to which degree the project will attract them, as well as whether the suggested benefits and/or topics will interest the citizens to participate in further processes.

The research presented in this text is part of a larger one, about the prospect of citizen participation in the revitalization of small watercourses in Belgrade. This text will present a part of the research on the appropriate

topics and benefits that can be used to raise awareness of the importance of streams. The aim of this section is to obtain guidelines for further research on the knowledge of Belgrade's citizens about streams, about their interest in participating, and benefits that will be significant in promoting the stream revitalization projects in Belgrade.

2. THE BENEFITS OF REVITALIZED URBAN STREAMS

Modern projects aim to create sustainable spaces, and the benefits they bring can be classified according to environmental, social and economic sustainability goals. The most important topics are:

- Restoration of historical areas,
- Return to nature,
- Regeneration of industrial heritage,
- Recreation and water sports,
- Walking and socializing,
- Culture and manifestations,
- Entertainment and swimming in the water,
- Raising the real estate value of the area,
- Reduction of pollution, and
- Reduction of flood risks.

Each of these topics brings a number of benefits which can be presented to the citizens in order to spark their interest in projects of the revitalization of small urban watercourses.

The choice of topics and benefits to be used in the project promotion depends on many factors, primarily, the goals of the project, which are closely related to the natural and social context of the project. Considering the she socio-political context, it is viewed in a broader sense, therefore when selecting the possible benefits, a number of factors have to be considered, of which the most important are the level of development of the civil society, the culture of participation and civic activism, topics that were promoted in previous cases, the habits of citizens and cultural attitudes towards streams. Therefore, the choice of benefits will vary from one culture to another.

For example, in Germany, at the centre of the Emscher River Restoration Project were ecological topics of restoring a “dead” river, reducing the pollution in the river, natural channel design, the return of flora and fauna. These topic was followed by four more topics: (2) Emscher Landscape Park and a network of new parks, (3) regeneration of zones used for processing of ore, a project known as "Working in Park", (4) regeneration of industrial heritage buildings and (5) new urban development projects - residential areas and accompanying activities. (Shaw, 2002) In Emscher’s case, ecology was the main thematic unit from which benefits were selected.

Germany is a country with a developed civil society and a long tradition of participation. Participation represents a part of the formal system, while at the same time, forms of informal participation are developed as well. (Heldt & Budryte, 2016) During the Emscher River regeneration, informing citizens began long before the start of a major regional project. Informing the public and raising awareness began with numerous NGOs and social groups, which played a major role in raising awareness about the importance of the environment. At that time, the ecological topics in Germany were very current. (Salian & Anton, 2011)

Although the reduction of the river pollution was a dominant topic throughout the entire project, research showed that this was not the most popular one within the Emscher regions (the project included 81 kilometres of the river’s length). For example, a survey conducted in the town of Dinslaken, where Emscher confluences with River Rhine, showed that the main topic of interest to the citizens was nature-based recreation on the riverbanks, rather than the purification of the river. This was conditioned by the lower level of pollution in that area, so the citizens were more interested in local issues rather than the large revitalization movement of Emscher. (Heldt & Budryte, 2016)

Unlike the European example, in Seoul, South Korea, the main topics selected for promoting the project of the revitalization of the Cheonggyecheon Stream were strengthening national and natural - fostering historical heritage and culture and returning to nature. This was conditioned by Seoul's socio-political context.

South Korea is in a transition process, at the turning point between two influences: the traditional authoritative and the penetration of the Western system of values. Seoul does not have such a developed civil society compared to Germany and, unlike in Emscher, informing the citizens' starts with the promotion of a major project - a top-down approach. The project is part of a political campaign for the election of the mayor of Seoul. The only information that the citizens had about the revitalization of the stream before the beginning of the project, was created on the basis of a successful revitalization of the small Yangjae stream in the elite part of Seoul.

Despite that the Cheonggyecheon River was previously converted into a sewage canal so that cleaning of the stream was the primary goal, the topic of ecology and pollution was not promoted. Citizens of Seoul were more interested in the idea of creating a network of parks (a return to nature), as well as the restoration of cultural heritage through the glorification of the national heritage, since the Cheonggyecheon River is located in the historic central Seoul region and is rich in cultural heritage. (Lah, 2011) Therefore, these were the issues which helped bring the topic closer to the citizens and spark interest in the project.

Even though there were similarities in goals when it comes to the revitalization projects of rivers Emscher and Cheonggyecheon, the choice of various topics and benefits in the promotion demonstrates the relevance and significance of other factors, such as cultural attitudes of citizens, and the topics which are popular among the citizens.

In the following paragraphs, we will present the results of the pilot survey about the Belgrade citizen's knowledge of local streams, and guidelines for the selection of topics and benefits that culturally correspond to the views of Belgrade's citizens.

3. THE CASE OF BELGRADE'S STREAMS

Belgrade is interwoven with a complex web of small rivers and streams. Today, unfortunately, the majority of them are piped underground, and disappeared in the process of rapid urbanization. (Ćorović & Blagojević, 2012) The existing unregulated or inappropriately regulated urban streams in Belgrade are faced with problems of pollution, flooding and sewage overflows, land erosion, and aesthetics. Streams in Belgrade, are often neglected and do not look attractive, therefore influencing their surroundings in a negative way. Most commonly, these are inaccessible areas, so the streams are invisible, hidden within thick and dense unruly vegetation. (Brković, 2014)

The interest in Belgrade's streams has been growing in recent years among experts, and a couple of revitalization projects offering contemporary solutions were proposed. However, it is crucial to inform the public about the significance of Belgrade's streams, so the revitalization projects can be successfully implemented. Keeping in mind that the streams are in inaccessible areas, and essentially invisible, some of Belgrade's population has never heard of them since they've never even seen them. For the moment, there is no research available which would be able to present to what degree Belgrade's population is informed on the small urban watercourses. In the following text, the results of the pilot survey about the knowledge on urban streams in Belgrade and the possibility of their revitalization will be presented, which can serve as an introduction for the preparation of a larger research project, using a representative sample of the citizens.

4. SURVEY ANALYSIS AND CONCLUSION

The territory coverage used for the survey looked at streams in areas in which the respondents reside or stay longer, and coincides with the territory of the official Belgrade General Plan. The research is focused on urban streams and the pilot survey was conducted on a sample of 117 citizens. It was conducted online and all respondents are legal adults (older than 18 years) and have been residing or staying in Belgrade for a long period of time.

The survey is composed of two parts. The first part consists of five questions, where the first three inquire about the knowledge of the respondents on streams in Belgrade, and the other two of the condition these streams are currently in. The aim was to determine how well the citizens are informed about the role of streams in the city. The second part of the survey examines citizens' awareness of the potential benefits of stream revitalization and explores the potentials of future solutions which are most significant to them.

4.1. Understanding streams - analysis of results and discussion

In the first questions, the respondents were asked to mark several stream names in Belgrade which they have heard of. As per the authors of the survey, the fourteen streams that were selected for the survey were the most well-known, all flow on the surface and are, territorially speaking, part of the General Plan of Belgrade. The respondents also had the possibility to add the names of other streams they may have heard of. Out of the total number of respondents, most of them heard of Topčider River, (85.5% of the respondents), while 58.2% of respondents have heard of the Mirijevo stream. Following that, streams such as Slanci, Rakovica, Banjica, and Avala, as well as Ostružnica River were marked by 38-42% of the respondents. The other most frequented streams from the respondents are now flowing streams that were part of the former Belgrade and ran through the city's central zone, for example, Čubura or Bulbuler, but are in the process of urbanization and enclosed in pipes.

Table 1: General data on respondents, part 1

Sample	*Gender*		*Age*							*Education*		
	Male	*Female*	*18-24*	*25-34*	*35-44*	*45-54*	*55-64*	*65-74*	*74+*	*Primary*	*Secondary*	*Higher*
Number	*43*	*70*	*5*	*30*	*52*	*15*	*8*	*3*	*0*	*1*	*11*	*101*
%	***62.1***	***37.9***	***4.3***	***29.1***	***44.4***	***12.8***	***6.8***	***2.6***	***0***	***0.9***	***9.4***	***89.7***

Table 2: General data on respondents, part 2

Sample	*Municipality*									
	Voždovac	*Vračar*	*Zemun*	*Zvezdara*	*Novi Beograd*	*Palilula*	*Rakovica*	*Savski venac*	*Stari grad*	*Čukarica*
Number	*18*	*11*	*3*	*16*	*10*	*5*	*5*	*6*	*2*	*17*
%	***19.35***	***11.8***	***3.22***	***17.2***	***10.7***	***5.4***	***5.4***	***6.4***	***2.15***	***18.3***

The interesting question is what makes these streams familiar to citizens? Topčider River is one of the largest and mostly regulated. It has historical value and was an important element of the old Belgrade, especially during the time of Prince Miloš. Likewise, it is part of the highly visited Topčider Park of the same name, and visible to citizens. In addition, it is often mentioned in the press because of pollution, leakage, and displacement of the flow. The Mirijevo stream flows through a densely populated part of Belgrade and is also often mentioned in the press due to regulations and a large quantity of waste and pollution. Other marked streams, as well as Topčider River, pass along some of Belgrade's sights or public spaces (parks, forests, picnic grounds, monasteries), so citizens have had the opportunity to see them. These streams are also mostly regulated. The interesting question was whether the knowledge of the stream was locally conditioned, i.e. whether the respondents know the streams that flow in the territory of the municipality they live in, but only 42% of the respondents were familiar with the streams from their surroundings. In order to determine what makes a stream known, additional research needs to be carried out.

The second question is related to the number of streams that the respondents had the opportunity to see. The results indicate that this number is significantly different from the number of streams for which the respondent heard of. While 69% of them heard of five to eight streams, only 2.6% of the respondents actually saw more than five streams. The majority of respondents, 61.3% had the opportunity to see up to two streams. This data indicates how many streams are actually invisible and inaccessible. The citizens heard about them, but most did not have the opportunity to access.

In the third question, when the respondents were asked to name the streams they have seen, the number of streams was reduced even further. The streams seen are most often those which are, according to the survey, the most well-known ones. The most frequent is Topčider River, as stated by 41% of the respondents, followed by Mirijevo stream (21%), Rakovica and Banjica (12%), Avala stream (11%), Kumodraž and Slanci (7%).

Frequently throughout the survey, the respondents stated that they had the opportunity to see more streams, but that they do not know their names, which further points to the invisibility of streams in Belgrade.

4.2. Current state of streams-analysis and discussion

The purpose of the fourth question was to investigate to what degree are citizens aware of the problems which the streams are facing, and which are, based on their perception, the most significant. Nearly all of the respondents, 97.41% said that they consider large quantities of waste and water pollution the biggest issue. Subsequently, 64.66% of respondents stated that the zones were unattractive, ugly looking. Inaccessibly to streams was listed by 57.76% of the respondents. Following that, 45.69% list the lack of space for socializing and recreation as a problem, while 39.66% list illegal construction on the banks. Finally, 38.79% list lack of fish due to pollution in the waters, and 28.45% listed water and flood spills as the most significant issue.

Even though pollution and flooding do present problems that jeopardize the lives of the public, flooding was listed as their least concern. In recent years, Topčider River has experienced flooding, while in the last century, the flooding of Mokroluški Creek lead to several deaths. (Cvejić et al., 2002). Based on that, it has been concluded that a large number of the respondents are not aware of the possible dangers of streams, or that they didn't fully understand the question.

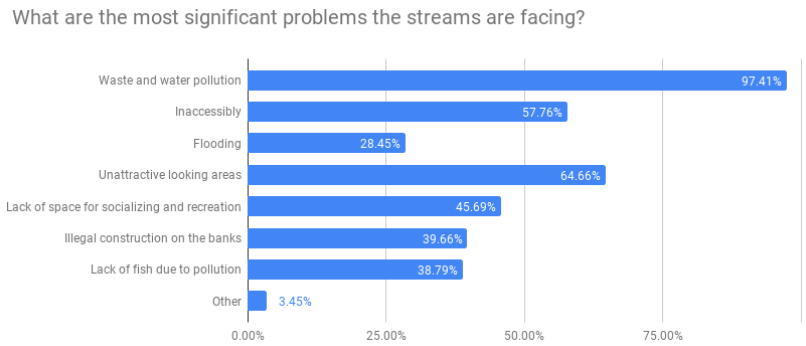

Figure 1: Responses on the fourth question

Aside from the mentioned issues, the respondents had the opportunity to list other problems. All respondents listed various forms of pollution, which demonstrates that according to the people surveyed, the biggest concern when it comes to Belgrade's streams is of an ecological nature. What is interesting is that the streams' unattractiveness is recognized as the next problem, and based on that we concluded that the appearance of the stream is very significant in the perception of the respondents. This is confirmed by the responses to the fifth question, in which the respondents were asked to assess the appearance of the streams on the scale from 1 to 5, one being "unsatisfactory appearance" to five being "nicely landscaped streams" and their general impressions of them. The largest percentage of respondents (47.8%) feel that the streams are unsatisfactory, while 42.5% of the respondents choose two on the 1-5 scale. Only 9.7% consider their appearance to be average (3), while none of the respondents rated the streams 4 or 5. The answers to the previous two questions suggest a selection of benefits that need to be promoted.

4.3. Prospects for stream revitalization and the future look of the streams

In the second part of the survey, the respondents were asked about the potential future look of the streams and the areas by which they are surrounded. We presented the respondents with photos and multiple choice questions illustrating various landscaping solutions and asked which one they consider to be the most attractive. In Serbia, there are very few examples of stream regulation using modern methods, therefore, providing the respondents with photos better explained the suggested landscaping solutions. It is interesting that 98.29% of users have opted for contemporary designs, which until now have not yet had the opportunity to see in Serbia, while only 1.71% of respondents opted for concrete stream embankments that are the most common way of regulating small rivers in Serbia. It is important to emphasize that this question dealt only with the appearance of streams. Based on the photographs, 86.32% stated that it is necessary to combine natural channel design and stream channelization, while 11.97% of the respondents chose the natural channel design. The remaining option, in which it was suggested that the stream is piped and placed underground and the land above was used for the development was not selected by any respondent. However, this mode of regulation is

still the most common when it comes to Belgrade streams. This pilot survey unanimously demonstrated that the respondents of Belgrade want to see and visit streams in their surroundings.

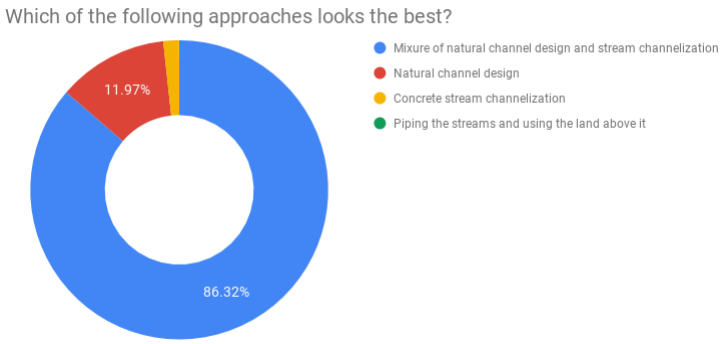

Figure 2: Responses on the sixth question

The seventh and eight question covers what citizens' feel is the most important issue which will be achieved by regulating the streams. These questions were provided to see which of the topics mentioned in the first part of the text are most relevant to the respondents. The choice of topics and benefits is tailored to the case of Belgrade.

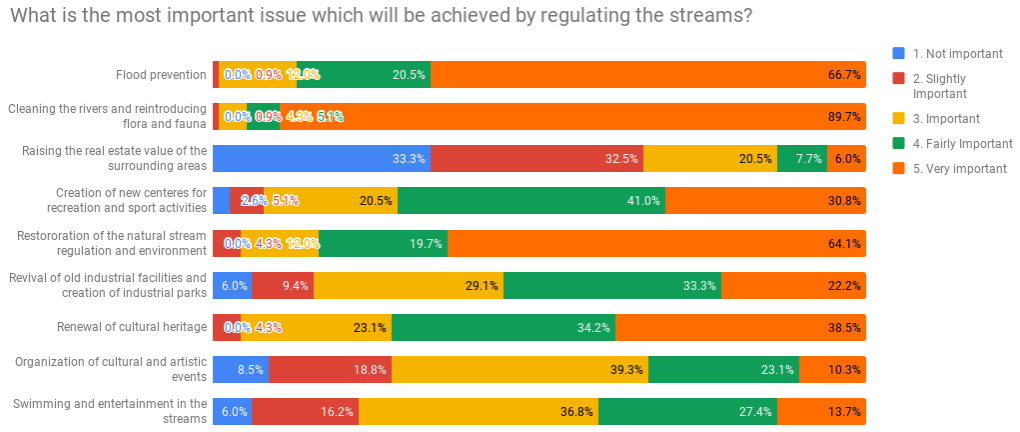

Figure 3: Responses on the seventh question

When asked what is the most important goal to achieve by regulating small watercourses and their banks, most of the respondents chose ecological topics, which are the only ones (from all provided) containing issues that could endanger the lives of the citizens. 89.7% of the respondents think that it is very important to clean the streams of pollution, while other respondents consider it important/of medium importance. When it comes to flood prevention, 66.7% think it is very important, while the rest feels that it is important/of medium importance.

Considering the issues that do not endanger the lives of citizens, in the third place in the poll, another ecological topic was found: restoring the natural regulation of the stream and the natural environment. 64.1% of the respondents said that this is very important, which points to the importance of the natural environment. In the fourth place was the renewal of cultural heritage - the first of the social topics - for which 38.5% think it is very important, followed by sports and recreational activities with 30.8%. The next important topic is the revival of old industrial facilities and transformation into parks and culture, with 22.2% of the respondents that consider it very important. Swimming and entertainment, as well as the organization of cultural and artistic events by the streams, was not considered as very important by the respondents since less than 15% of them choose issues in this category. What the respondents presented as the least important is the economic benefit of raising the real estate value of the environment.

The summarized results of the seventh question point that pollution, which is recognized as the biggest problem in the survey, is the most important topic for Belgrade's surveyed citizens. What is also clear is that

the results of the survey indicate that nature is very important to the citizens of Belgrade and that they seek to return the nature to the city. It can also be noted that the citizens have chosen the benefits of regulating streams based on topics that are traditionally significant in Serbia, such as nature, the restoration of cultural heritage, sport and recreation.

The eighth question was conceived as a complement to the seventh, where the survey respondents were offered photographs of various landscapes that may appear in the small rivers and streams. The idea was to demonstrate and conjure up through the photographs the most significant benefits of revitalizing small urban watercourses. Each picture shows one benefit with a brief description. Respondents were able to mark several responses (at most five). This question excluded the issues that are life-threatening to citizens (such as pollution) and photographs offered some insight about the possible future appearance of the areas.

Most of the respondents (93.2%) selected nature parks, which corresponds to the previous responses. Recreation by the stream, shown in a photo of people bike riding in a natural setting, was in second place, selected by 70.9% of the respondents. In third place is a walkway, selected by 68.4% of the respondents. The fourth and fifth places are split between spaces for socializing and historical parks, selected by 50.4% of the respondents. Public gathering, performances, and open-air concerts, displayed in photographs along with contemporary designed stream banks, was selected by more respondents - 36.8%, followed by two photographs referring to the transformation of the industry into cultural and theme contents. Swimming, water entertainment, and kids' water playgrounds, as in the previous question, were not of interest to the respondents. It is interesting that only 19.7% of the respondents selected restaurants and bars on the coast, which are generally very frequent and popular in Belgrade. We cannot conclude from the survey if this response was because the respondents used in this survey do not like that form of entertainment, or it is difficult to visualize it in the environment of the stream, or the respondents think that there are enough restaurants and bars in Belgrade, but it is an interesting finding.

Figure 4: Responses on the eighth question (Image sources: Historical park-www.tripadvisor.ca/LocationPhotoDirectLink-g294472-d550629-i184567977-Topcider_Park-Belgrade.html; Water entertainment- www.expressnews.com/news/local/article/Wading-yes-but-swimming-no-at-new-downtown-12899078.php; Kids' water playground- https://uk.gofundme.com/super-soaker-summer-shelter-party; Walkway - https://www.visitnorway.it/listings/walk-along-the-river-akerselva/44619/; Public performances - www.publicspace.org/works/-/project/j257-renovation-of-promenada; Nature parks - Photo by Atelier Dreiseitl www.thenatureofcities.com/2015/03/17/daylighting-and-restoring-urban-streams-ponds-and-wetlands-can-provide-huge-ecological-and-social-benefits-are-such-restorations-worth-it-what-are-the-pitfalls-how-can-we-demonstrate-these-ben/; Restaurants and bars - www.edimaps.com/riverside-dining-map/; Social spaces - https://ecoempathyproject.wordpress.com/2017/10/25/animating-hydrology-studio-dreiseitls-ecoempathic-approach-to-on-site-water-management/; Cultural and theme parks - https://www.landschaftspark.de/en/leisure-activities/play-areas/; Recreation by the stream - http://visitoxfordtours.com/oxfordcitycountrysidecycletours.html; Open museum - https://www.summeradventure.de/wordpress/die-schoenste-zeche-der-welt-das-unesco-welterbe-zollverein/)

The results of the eighth question are in line with the results of the seventh question - nature, recreation, walking, socializing, and historical values are what attracts the majority of the citizens the most. It is important

to note that citizens did not have the opportunity to see facilities such as industrial parks or children's playgrounds in this environment, so they may not fully understand the advantages and disadvantages of such spaces.

5. CONCLUSION

The results of the pilot survey show that the respondents are aware that there are streams in Belgrade, but that they've had little opportunity to visit them and get to know them more. The most well-known are those in close proximity to some of Belgrade city-sights, or those mentioned in the press. The problems that were listed as the most pressing were pollution, waste, and unattractive landscaping of the area. Most respondents of the survey feel unsatisfied regarding the attractiveness of the streams. When it comes to benefits that should be addressed, it is conclusive that the benefits are reducing pollution and revival of the streams, followed by the return of nature in the city, recreation, walking, socializing, and finally, the preservation of cultural/historical heritage. Aside from the input about informing the citizens and raising awareness, the results of the pilot survey demonstrate which types of projects would be more likely to spark interest among the citizens, and the type of landscaping that should be sought when it comes to stream revitalization.

Regarding the survey, this pilot survey did not include that participants under 18 years of age due to problems of implementation. In the upcoming period, this age group will be included since they present one of the most important and most complex groups which needs to be informed. It is also worth noting that the largest percentage of surveyed are above average educated. Finally, the survey was filled out online by internet users, which narrowed the selected group even further.

It is also noteworthy to mention the citizens' degree of interest for stream revitalization. If citizens live near a stream or river and are directly exposed to pollution or flooding, or will be relocated due to future project, their interest in stream revitalization will be bigger but also different. This pilot survey was conducted for all small streams and rivers in Belgrade in general, and all of the participants are from various municipalities, so their position of residence in relation to the streams and rivers are unknown. It is necessary to conduct a survey for each stream individually and localizing the citizens that will be informed, as a way to ensure more accurate findings. The results of this survey represent input for organizing another survey on a more accurate sample, which would then provide valid research data on the citizens' awareness of the importance of streams.

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REFERENCES

1. Bae, H., 2011. Urban stream restoration in Korea: Design considerations and residents' willingness to pay. *Urban Forestry & Urban Greening,* 10, pp. 119-126.

2. Cvejić, J., Despotović, J., Obratov-Petković, D. & Tutundžić, A., 2002. Kompatibilnost alternativnih rešenja regulacije poplavnih voda i revitalizacija malih gradskih vodotoka. in Inženjerski rizik i hazard u urbanom sistemu Beograda (Eds. V. Zlatanović-Tomašević and B. Božović). Beograd: Udruženje inženjera Beograda i Skupština grada Beograda, pp. 169-174.

3. Ćorović, D. and Blagojević, L., 2012. Water, Society and Urbanization in the 19th Century Belgrade: Lessons for Adaptation to the Climate Change. *Spatium,* 28, pp. 53-59.

4. Heldt, S. and Budryte, P., 2016. Social pitfalls for river restoration: How public participation uncovers problems with public acceptance. *Environmental Earth Science,* 75(1053), pp. 1-16.

5. Lah, T., 2011. The Huge Success of the Cheonggyecheon Restoration Project:What's Left?. in Citizen Participation: Innovative and Alternative Modes for Engaging Citizens. Cases from the United States and South Korea (Eds. M. Holzer, D. Kong and D. Bromberg). Newark: National Center for Public Performance, pp. 97-118.

6. The URBEM project., 2005. URBEM-Best Practise Guidance for Citizen Involvement for River Restoration. New Castle: City Council.

7. Salian, P. and Anton, B., 2011. The Emscher Region - the opportunities of economic transition for leapfrogging urban water management. Freiburg: ICLEI European Secretariat.

8. Shaw, R., 2002. The International Building Exibition (IBA) Emscher Park, Germany: A Model for Sustainable Restructuring?. *European Planning Studies,* 10(1), pp. 77-97.

9. Sretović Brković, V., 2014. Revitalization of Small Urban Rivers and Streams as a Placemaking Potential. in DAAD Fachkurs Werzeuge und Methoden fuer die urbane Wasserfrontentwicklung (Eds. M. Devetaković & H. Haass).DAAD, pp. 48-53.

10. Sun, L., 2015. Public Participation in the Urban Regeneration Process. Liverpool: Thesis at the University of Liverpool.

THE DOT-TO-DOT© COMMUNITY STATION: REPLICATION FOR SOCIAL INNOVATION & URBAN REACTIVATION IN EUROPEAN CITIES

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ABSTRACT

This study reflects on the implementation of pop-up architecture and sensory design made with waste reuse to reanimate brownfields. The selected experiment DOT TO DOT© is a community-led design framework established in Glasgow. It applies waste reuse creatively as pop-up reactivation in gap sites. It explores constructive sensibilities embedded in material sensory by interlinking tangible place-making, sensory gardens, eco-design, and self-build solutions in public spaces. Trials apply the principles of temporariness, portability, and sensory of waste as social value and material culture in cities. Live projects explore constructional and somatic sensibilities and critically investigate the cultural embodiment of material sensory by remaking.

Studio Pop is the lead group of DOT TO DOT© project. They work with fragile communities to improve the spatial perception of citizens as active place-makers. DOT TO DOT experimental site is situated in Kelvin Constituency and Maryhill area of great Glasgow. Our consortium connects eco-schools, social enterprises, young designers, housing associations, community gardens, municipality and local stakeholders to jointly create live projects and remake derelict gap sites into vibrant community places. The design principles of DOT TO DOT© are open to inspire future projects beyond Scotland. Researchers have selected an intervention area for the reconstruction and revitalization of poorly maintained open spaces in blocks 45 and 70 in New Belgrade, Serbia.

Keywords: urban reactivation; waste reuse; social innovation; community project; perceptual and somatic learning; remake station; sensory gardens

1. PREFACE

This study reflects on the implementation of pop-up architecture and sensory gardens made with waste reuse in Glaswegian brownfields. The selected live experiment is DOT TO DOT© (2017-2018) investigate pop-up and sensory reactivation of gap sites in the city of Glasgow through waste reuse. The case study of New Belgrade explores the potential replication of DOT TO DOT in Serbia via licensing.

Trials apply the principles of Temporariness, Portability and Sensory of waste as social value and material culture in cities. They explore perceptual and somatic sensibilities and critically investigates the cultural embodiment of material sensory.

Authors approaches architecture from the everyday production of temporary self-build structures –buildings and landscapes. Key questions inspire authors are: How does the act of self-build contribute to future place

making in urban voids? How waste reuse will change people's perceptions in cities? Remaking provides a sense of joy, identity, and placeness by filling gap sites, changing people's perceptions of their everyday life in cities.

This study reviews the perceptual and somatic experiences involved in the self-building of sensory landscapes a number of projects led by Studio Pop where waste reuse advocates a participatory and user-centred design approaches based on the cradle-to-cradle (C2C) design principles and appropriate technologies. It encourages consuming less energy by engaging in do-it-yourself live projects either repurposing the given materials or changing the quality of artefacts produced locally. These experiments commonly pursue design through full-scale fabrication, assembly and installation; critical exploration of design and co-production; and study of the potential of waste as structural frames in buildings, furniture, playgrounds and sensory gardens in public spaces. In trials, *"architecture without architects"* (Rudofsky, 1964) is consistently tested through remaking together.

2. PLACE-MAKING VS. PLACE-LEARNING

Our planet is a fragile organism, so our cities. Our habitats are being urbanised, furnished and restructured and, in this process, they are being radically altered both ecological and socially. Today the Neoliberal model applied in urban economies (Brenner, Peck & Theodore, 2012) is promulgating a "*new geography of centrality and marginality"* (Sassen, 1997) not only between countries or regions but within cities. This phenomenon is characterised by motion, contestation, internal asymmetries, and discontinuous transgressions between territories in friction. Border conditions are connected with the establishment of socio-economic forces that rule the production and occupancy of everyday spaces generating discontinuities and voids in cities. Like borderlands, brownfields are heterotopic places that construct transitory, intermittent or spontaneous living conditions, away from any conventional planning (Suau, 2015).

People's perceptions of cities are influenced by the built environment and sensorial body activities. In this context, temporariness, portability and sensory are essential components for the transformation of the built environment. The culture of building is grounded in the material object, through the use of construction materials, tectonic articulations and structural and climatic technologies. Architecture is placed in wider societal context, in which material uses and meanings are usually attributed to the "built object" regarding spatial, social, economic and cultural factors. As a living concept, the act of building connects users and building processes through design. It comprises both tangible and symbolic features.

In present building cultures, there is a correlation between social form, architecture and appropriate building material, suggesting that although nature provides resources in Europe, social asymmetry is the new urban question (Secchi, 2013), which is convoyed by the abrupt inequity of income distribution; environmental disasters; demographic shrinkage; inner displacement of urban communities; rising of informal cities; and the proliferation of urban voids. They define the "new imprint" of our everyday life. This subaltern urbanism is defined by stigmatised, residual and contaminated spaces (Suau, 2014). Citizens demand the-right-to-the-city and the democratic occupancy of public spaces. They demand greener, healthier, safer and more enjoyable common places, changing the perceptions of gap sites, waste and their daily life in cities.

Nowadays we live the culture of waste, where everything is discarded. We throw away many of the things we buy when we no longer want them. Anything that we intentionally dispose is known as "waste", visually stigmatised either as useless or as priceless cultural material. However, waste does not hold meaning per se. In Cradle to Cradle (C2C) theory (Braungart & McDonough, 2002), junk does not exist. It is viewed as "food", either biological or technical nutrients. Waste value is given through the power of design (Papanek, 1971), which develops inventive solutions using less. Therefore, when focusing on the social aspects of material culture, it is crucial to keep in mind that our interpretations of waste and interactions with it are the ones that evoke meanings and opportunities or, on contrary, construct stigmas and constraints. The choice of ecological building materials and their application in architecture can be considered social and environmental practice codes and even ideology. Architecture, therefore, becomes the metaphor for human engagement, sensory and semantic communication. What should we remake instead? In order to implement alternative urban game plans, we have to think, play and make collaboratively towards an "Architecture of Enjoyment" (Lefebvre, 1973).

On one hand, the act of remaking is the product of self-building cultures, complex systems of people, relationships, building types, techniques, and habits in which design and building are anchored with waste reuse. In this study, author employs the term *"remake"*, which refers to *"make again something different"* or

anew, something with a special value. In material culture, the social value of waste includes the social behaviour around it, the way waste is used, shared, talked about or remade. The act of remaking is multi-sensorial due to it connects material as cultural value, reuse technique and haptic perception. It is about repurposing local and available disused materials with ecological sound design solutions. Low-tech is the cultural knowhow manifestation, expressed mainly through Do-It-Yourself (DIY) or *bricolage* methods intuitively made of systemic design, environmental and life cycle thinking.

Figure 1: DOT TO DOT©: Outdoor remaking activities (2017-18). Source: Studio Pop archive, 2018

On another hand, the act of remaking encompasses the amalgamation of senses, especially somatic ones, including the sense of touch and haptic perceptions in hand-on activities (Bloomer & Moore, 1977). Like spatial perceptions gained by movement or other sensibilities, touch is used as haptic communication and corporeal experience (O'Neill, 2001). Etymologically the term "sense, sensory" derived from the new Latin *sensorius* (late Latin *"sensorium"*), from Latin *sensus (feeling; sense), sentire ("to feel").* How are sensory and perceptual experiences involved in the act of remaking? Remaking explores constructive sensibilities. We critically investigate how our waste culture is deeply embedded in material sensory. Material somatic research is applied in terms of positive affect (social inclusion), playfulness (interaction), and task-related (instrumental).

3. SENSORY APPROACHES TO LANDSCAPE REACTIVATION

Brownfields, abandoned buildings and vacant lands are unresolved environmental and social problems in many European and Scottish cities. Urban deprived areas demand innovative design and affordable solutions. These ruins are both the physical materialisation of industrialisation and the cultural heritage in *Grand Paysage,* our current industrial landscape. Nonetheless, how can the European Grand Paysage become an instrument of memory whilst open to changes and inventions? Post-industrial obsolete areas can perfectly be transformed and filled in with temporary urbanism (Suau, 2013). The repurposing of these gaps could contribute to the regeneration of deprived neighbourhoods into co-productive landscapes of sharing economies. Regenerating brownfields or urban voids can positively change people's perceptions of the urban landscape and their living environment.

The European Landscape Convention promotes the protection, management and planning of European landscapes and co-operation on landscape issues (Florence, 2000). It is a viable framework to support regenerative design strategies in large brownfields or vacant lands. What should we repair instead, mass or

void? The design strategies for remaking brownfields is to fill gaps by (a) revealing the memory of the place and (b) reinventing it. The aim is to protect the destruction (Beard, 1996) by reactivating brownfield sites whilst preserving their uniqueness of structures and types. Regarding ecological design, the study explores the Cradle to Cradle (C2C) model as a regenerative design approach, where inorganic materials used in industrial processes are categorised as technical nutrients. The selected cases reuse synthetic materials that have no detrimental effects on the experimental sites. They are reused in continuous cycles as the same product without changing their qualities.

Public spaces are dynamic laboratories for place-making and place-learning that construct transformative social forms. The reactivation of public spaces is at the core of his actions tackling poverty reduction (social innovation); health (biophilic design); co-production (circular economy); and education (somatic learning). Citizens can be active designers integrating social technologies and waste reuse through design. To achieve impact locally, they usually build social networks with local communities, governments, social enterprises, agencies and other stakeholders. Their common goal is to promote the *right-to-the-city* and the enhancement of public spaces by co-creation (Andersson, 2016) as user-centred, participatory and self-management design. This remaking process applied in cities is twofold, from place-making to place-learning and vice versa. Generally, the principles of the New Urban Agenda Habitat III (Quito, 2016) offers a generic urban framework to implement actions to resolve urban problems in public spaces. However, regarding the site-specific reactivation of vacant lands into liveable public spaces, the author applies radical design theories of collective forms (Maki, 1964) and the *Open Society* manifesto (Bakema, 1975).

The chosen experimental sites are commonly the result of co-creation in cities, both analogic and digitalised, which incorporates social networks and innovative processes of participatory design innovation, mainly knowledge sharing and social innovation, in which urban experimenters, users and communities jointly collaborate using digital and manual technologies to remake with waste for a wide range of environmental and social needs (URBACT Programme, 2015). For instance, the case of DOT TO DOT© is a cross-disciplinary ecosystem that enables creative social entrepreneurs, researchers, educators, and youth to remake our cities by connecting waste to design for society through live projects.

4. THE (RE)MAKING PROCESS

Since 2014, Studio Pop directory has been involved in remaking leading various community-led garden experiments in Scotland. This study is part of the ongoing practice-led research forum coined “Remaking the City” that connects practice with academic/research groups through social channels about eco-design, social technology and urban sustainability. It enables the exchange of methods; experimentation of proof-of-concepts; and the celebration of living labs in other contexts throughout the implementation of agile greenery, polyvalent architectures and adaptive uses.

Glasgow is the city of voids. In Glasgow urban area, 98.1% of people live within 500m of vacant lands or derelict buildings. For instance, according to the Glasgow Centre for Population Health, the level of income deprivation in Glasgow North West is 24% whilst the figure for Maryhill reaches 25% (Scottish Index of Multiple Deprivation, 2017). The poor urban quality of vacant spaces is still an unresolved environmental and social problem. Environmentally, Glaswegians still perceive waste as a valueless material, and creative industry is far to offset, reuse or repurpose urban waste at local level and hence build ecologically sound sustainable design solutions for communities. Economically, the public budget is limited to remediate brownfields and gap sites, mainly in poor and disadvantaged areas.

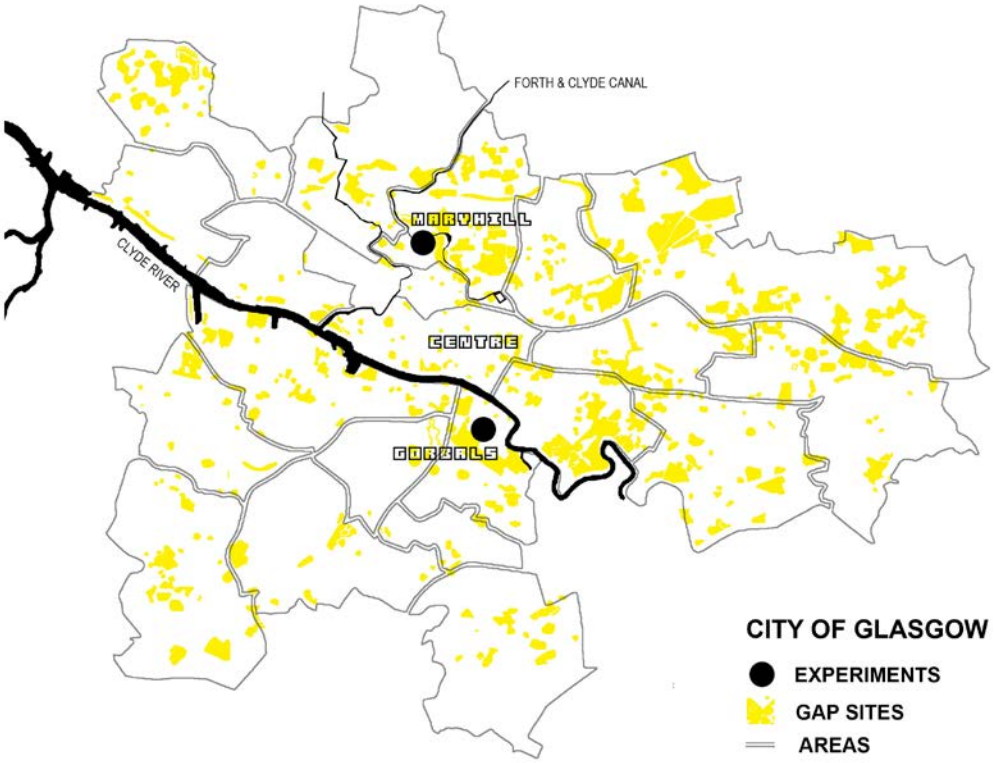

Figure 2: Glasgow, City of Voids. Loctaion of MOBILELAND and DOT TO DOT experimental sites. Source: Studio Pop archive, 2018

The research objectives are:

a. Connect sensory landscapes with waste and local communities to reactivate urban voids by boosting social inclusion in vulnerable groups, youth and children.

b. Enable social innovation between social enterprises, academia and local communities through innovative design solutions and sensory-response live projects

c. Test/pilot craft technologies and digital co-creation in live projects, sensory gardens and portable stations.

5. METHODS

This study employs a combination of design research and didactic learning methods in selected experiments. Studio Pop applies systemic design thinking, user-centred design and participatory design. This study covers the fields of Systemic Architectural Design (pop up architecture), Building Technologies (material research, remaking technologies, and self-build solutions), Adaptive Urbanism (reactivation of public spaces), and Transformative Landscape (sensory gardens in brownfields). DOT TO DOT© is designed, tested and piloted by Studio Pop to stimulate people's perceptions creatively throughout building ecological projects, envisioning sustainable habitats and helping disadvantaged communities. As community developers, Studio Pop assists communities in deprived areas to initiate civic-responsive and locally-led projects in a bottom-up manner. For instance, the experimental site is equipped with a portable remake station and sensory garden operating as living lab with open demonstrations made to enrich environmental perceptions and build somatic design capacities among experimenters. Studio Pop applies the following methods:

5.1. Research methods and tools

Experiments utilize research by design. Methods used are critical literature review on sense-making, place-learning and remaking; precedent studies of temporary, portable and sensory structures made of reused waste; data collection, including clinics, co-creation design charrettes, group discussion and interviews, and community consultations with participants -members and volunteers- from local communities, wards, municipality planners, housing associations, art collectives, social enterprises, students, researchers, remakers and local stakeholders; public engagement activities; site-specific experiments –proof of concepts and live

projects- in brownfield sites, including legal lease agreements; design entry competition awards; urban mapping and digitalized city maps; satellite imagery analysis; geo-mapping; pictorial inventory of historical maps and photography; factsheets, sketches and notes made by main authors and research assistants; and 3D CAD design modelling. Regarding analogical research tests, sensory gardens were tested in reclaimed tyres and organized within a sensory grid pathway, with one-meter spacing between pots, to allow users accessibility in all directions. DOT TO DOT© www.dots.scot digital development comprises the following features: User registration, map display (Google), project details, user messaging and user display.

5.2. Learning methods and tools

The THINK2PLAY4MAKE (TPM) framework is a kinaesthetic pedagogic model developed by Studio Pop to be applied in community development and urban reactivation projects drawn on contemporary models of spatial perception as well as on body-kinaesthetic theory. It amalgams both sense-making and place-learning. Pedagogically, it interconnects THINK, PLAY and MAKE sequentially and circularly. Authors employed both research-led teaching and student-centred experiential learning methods to trigger critical and comprehensive contributions by students, academics, artists, architects, eco-designers, urban activists and residents to reflect upon new concepts of perceived spaces and thus access new definitions and perspectives, strategies and processes of perception of remaking in architecture. During live experiments, experimenters mainly used conversations, games and self-build methods to interplay at personal and group levels. Leads of Studio Pop argue for a return of the body to its proper place in the architectural equation. Sensory learning abilities are:

a) Visual-spatial. Spatial ability is one of the three factors beneath g-factor (general mental ability or general intelligence factor) in the model of intelligence. It refers to visual-spatial judgments.

b) Bodily-kinaesthetic. The constructional capacity to handle self-build skilfully with a clear sense of the goal of a physical action, along with responsive training outside the classroom.

c) Interpersonal-Intrapersonal. Learners are characterized by their sensitivity to others' moods, feelings, temperaments, motivations, emotions and the interaction between their social abilities and self-reflective capacities to cooperate in order to work individually and as part of a group.

d) Naturalistic. It deals with relating biophilic connections to one's natural and outdoor environs.

Each TPM learning activity is structured as follows: a. attachment (perceptive learning tasks); b. unfolding (activating pre-existing knowledge); c. making (bodily-kinaesthetic experience); d. sharing (sensory knowledge transfer); and e. self-evaluation. Its application in selected cases question the professional reliance on visual or computational two-dimensional representational drawings in conventional architectural education, which often understands design as a highly specialized model made with a set of prescribed technical tools and media rather than a multi-sensorial manifestation of the human body's perception.

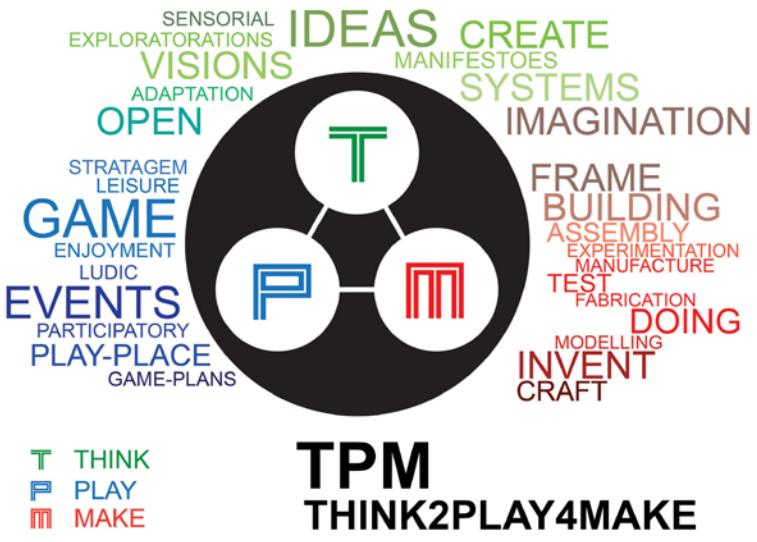

Figure 3: The THINK2PLAY4MAKE (TPM) pedagogic framework. Source: Cristian Suau, 2018

How are perceptual experiences involved in the remaking of stalled spaces? Regarding public engagement, local communities, civic enablers and community developers contribute - sensorily and perceptively - to co-produce collaborative design solutions and live projects through experiential learning (active perceptive-learners) and experimental research (sensory remakers). This dynamic cross-disciplinary ecosystem connects waste and society through:

- Design thinking, user-centred and participatory design
- Theory and practice of design research
- Remaking technologies

During concept design phase, DOT TO DOT© Glasgow was driven by user-centred and participatory designs. Regarding local participation, it is driven by community-led organisations, two social enterprises and one eco-school community. In terms of participants, DOT TO DOT consortium is both community of interest and geographic community. Remakers are talented graduates, academics and researchers from the fields of architecture, art, engineering, social health and humanities that join forces to take on the environmental problems in Glasgow city by using their creativity to connect waste to design for an ecologically sound society, in a creative, inclusive and multidisciplinary manner.

After the successful earlier trials, the DOT TO DOT© remake station demonstrated being the optimal way to pilot/test sensory technologies and live projects by reusing waste and fostering place-learning, sense-making and remaking initiatives, empowering communities to experiment agile design solutions with “real users in real time” and to reactive derelict sites by deploying portable remake stations and temporary sensory gardens.

DOT TO DOT experiment site has developed a long-lasting community agreement to deploy an ecological transformation of two site gaps along Maryhill and the Forth and Clyde Canal areas, as part of urban enhancement programmes led by Stalled Spaces Scotland and Scottish Canals. Throughout a process of co-creation, the DOT TO DOT Maryhill Community, along with Dunard eco-school, approved the implementation of sensory gardens through creative, meaningful and sensorial solutions for local societal challenges, waste management and remaking. The remake station and landscape design is being reviewed for planning permission.

6. TOWARDS POLYVALENT AND POLYMORPHOUS PLACES

Athe ectres rary Press FoodEnjoymentrden terrace made of pallets and portable planers made of . que ya he adquirido en 25 anos llotments, orchard and urban gardens are deeply embedded in the European cultural heritage. They are evolutionary landscapes. The phenomenon of urban shrinkage has generated many derelict urban voids, which offer opportunities to test/pilot sensory landscapes. In this context, community gardens are adaptive systems both culturally and physically. They are the proletarian manifestation of our post-industrial cultural legacy. Being part of a major ecosystem called bio-urbanism or urban naturalism (Tafuri, 1978), they adopt restorative and regenerative social forms at local level. Rather than picturesque formalised urban types, community gardens are viewed as self-structured and experimental land-forms.

Sensory gardens are perceived as a vivid manifestations of open learning spaces in cities. They are polymorphous and differ from types, forms and sizes. These gardens are small productive and recreational landscapes ruled by self-organisation, bottom-up management and DIY gardening techniques. As agile landscapes, they also offer great opportunities to restore, reactivate and retrofit rundown urban voids, from brownfields to green fields, recovering them into healthy and edible citizen touchpoints.

Sensory gardens enhance the act of collective memory, perceptions and sense-making to help us move around in public spaces. Sensory gardens are usually design to provide a range of sensory experiences to visitors. They provide learning a social opportunity for people of all ages and abilities. They also can stimulate therapeutic activities with people with sensory impairments and a range of disabilities. Sensory gardens are self-contained spaces that concentrates a broad range of sensorial and perceptual experiences, mainly regarding educational, health and recreational uses. Walkscape (Long, 2009) is usually a form of sensory solitary trail, with a range of sensations provided along a route or grid. It can provide orientation and animation in different spatial configurations, picking up themes that interlink them. Regarding site choice, it is important to consider the needs of people who will use and enjoy them.

Regarding landscape features, design should use different colours applied in flora, bio-texture and ground materials (stones or pebbles, timber, leaves, straw, bark chips or sawdust), interactive materials and structures,

shading areas, artistry and randomised routes to enrich user experience too. Introducing nest boxes and feeders for birds or establishing nectar-rich plants will enable insect pollinations. Water points, outdoor furniture, temporary shelters, storage spaces and equipment for creative making and play are also key components.

Sensory gardens gather naturalists, highly kinaesthetic individuals, who are readily able to recognise and celebrate flora and fauna and to use sensory abilities productively. The main characteristics of the chosen community gardens are: (a) Sensory, (b) Temporariness and (c) Portability. These gardens are sensory because they employ body-kinaesthetic perception to move around and dwell sensuously spaces. They are temporary gardens because they occupy under-utilised public or private plots on temporary basis. Finally, portable structures are mainly constructed with available junk materials like pallets, bulky bags, etc. They are made of reused packaging waste through the design principles of remaking, repurposing and self build.

7. DOT TO DOT©: SENSORY, TEMPORARY AND PORTABLE COMMUNITY STATION

Awarded design and ongoing experiment in Maryhill, Glasgow (2017-2018)

Maryhill is a post-industrial area with a profound historical heritage in risk. The Forth and Clyde Canal flows through Maryhill North Kelvinside, forming a vital part of the local economy. It was for many years polluted and largely unused after the decline of heavy industry but recent efforts to regenerate the waterway for navigation and recreation have gradually seen it rejuvenated. DOT TO DOT is both a civic network and digital community in development, which aims to improve the perception of citizens through sensory experiences along the gap sites of the biological corridor of Forth and Clyde Canal. It represents an innovative social and environmental model that enables creative people to connect gaps, design and local communities through real societal challenges like food or waste. How will this experiment contribute to local sustainable development? The DOT TO DOT© project is an experimental initiative aligned with the socio-economic sectors prioritised by the Scotland's Economic Strategy that connects Creative Industries (eco-design), Environment (waste reuse) and ITC (social technologies). The experiment is situated in 636 Maryhill Road site, Glasgow. It obtained site permissions for trials from Glasgow City Council and Scottish Canals. As part of the community-led regeneration programme led the Scottish Government, DOT TO DOT© has recently been granted with the European Social Fund (Aspiring Communities Programme) to develop and deliver long-term local solutions that address local priorities and needs; increase active inclusion; and build on the assets of local communities to reduce poverty and to enable inclusive growth. It has two phases, phase 1 (six month) for piloting/testing and phase 2 (twelve months) for development.

How will it enhance the future place-making of urban voids? The DOT TO DOT© Maryhill station is a creative cross-disciplinary ecosystem that connects ecology and people through design. This experiment counts with the support of the Glasgow City Council, Scottish Canals, Architectural Design Scotland and several local stakeholders. Since mid-2017, our community partners are carrying out civic consultations with local school, residential groups and stakeholders. As result of the Stalled Spaces awards 2017 and 2018, community signed a land lease agreement in a derelict site owned by the Council. During summertime, it is being didactically co-designed to accommodate temporary structures made entirely from reclaimed materials like shipping containers, timber pallet boards, etc. They will create a distinctive community-place with adaptive activities such as workshops, art-science events, and horticulture where public in general share, make and celebrate together.

DOT TO DOT© offers an agile solution -on a temporary basis- to reanimate ecologically empty sites along the Canal through remaking with waste, public artistry and time-banking exchange. It connects eco-schools, social enterprises, young designers, wards, university students, municipalities and stakeholders locally to think, design and remake projects to transform waste and gaps sensorially. It is being tested and piloted in Maryhill area firstly.

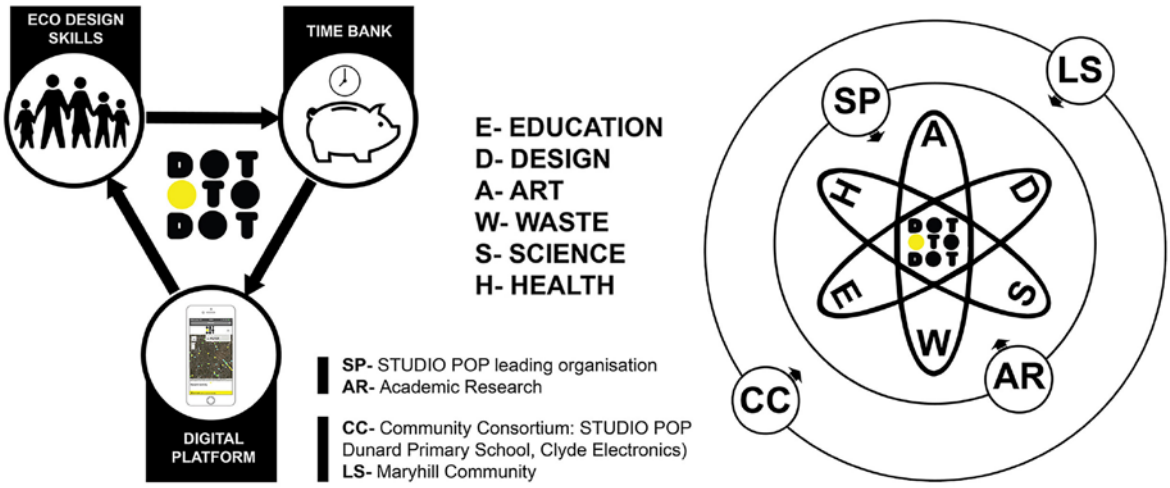

Figure 4: DOT TO DOT© Trash-to-Cash, social business model (right) and organisational structure. Source: Laura Petruskeviciute & Cristian Suau, 2018

7.1. DOT TO DOT landscape design (pilot phase)

In order to change the negative perception of vacant lands, this experiment started to test/pilot an innovative participatory design and site management in order to plan a long-term route map for community-led regeneration. The initial phase was to develop an adaptive master plan. It consists of four distinctive sensory areas: (a) Remake Station, portable design hub; (b) Heritage Food Dome, sensory edible garden; (c) Wild Green Bags, outdoor sensory garden; and (d) Sensory Woodland. After consultations, design charrettes and site-specific activities during summer, community partners agreed to co-develop the following spaces for learning:

1. Remake Station. It will be as a portable hub that provides digital and manual skills. The Remake Station consists in modular units made of shipping containers (20-feet cabin hire type) to accommodate community café, social club and remake workshops, including tool storage. The central outdoor space is called *Àite A Dhèanamh* (Place for Making in Scot Gaelic). It is a communal place for gathering, sharing and exchanging ideas.

2. Heritage Food Garden, is a sensory garden. It is used to plant heritage vegetables and teach horticultural skills, primarily to School children and residents of Maryhill. We plan to grow heritage vegetables and other varieties rarely found in supermarkets or groceries. This food will be served during community events.

3. Wild Green Tyres is an outdoor sensory garden project that grows diverse native flora in bulky bags. It will be focused only on growing edible, medicinal and aromatic local wild plants within a selection of shrubs, small fruits and herbs (Milliken, & Bridgewater, 2013). To avoid any potential toxicity from contaminated ground, the bulk bags will be detached and elevated from ground and filled in with high-quality soil, which allow growing, picking and eating any native plants without getting toxics. This didactic experiment will demonstrate how certain plants prefer rich soils whilst others thrive off poor soil. The reuse of organic nutrients such as domestic compost, tea bags or natural fertilizer could help specific plants like nuts and fruit shrubs to grow. The community expects that the experiment informs new ways of developing DIY gardening and environmental art locally by transforming other brownfield sites. Environmentally, it engages school children and families to germinate seeds domestically and then place them in portable planters. Volunteers participate in the phases of soil preparation; planting; caring; picking; and eating. The landscape layout has defined a zone that houses distinctive native edible plants grouped in (a) large shrubs: hazel, blackthorn, bog myrtle and heather; (b) small fruits: raspberries and blackcurrants; and (c) herbs: mint, milk thistle, chamomile, yarrow, red valerian, dandelion and woodruff.

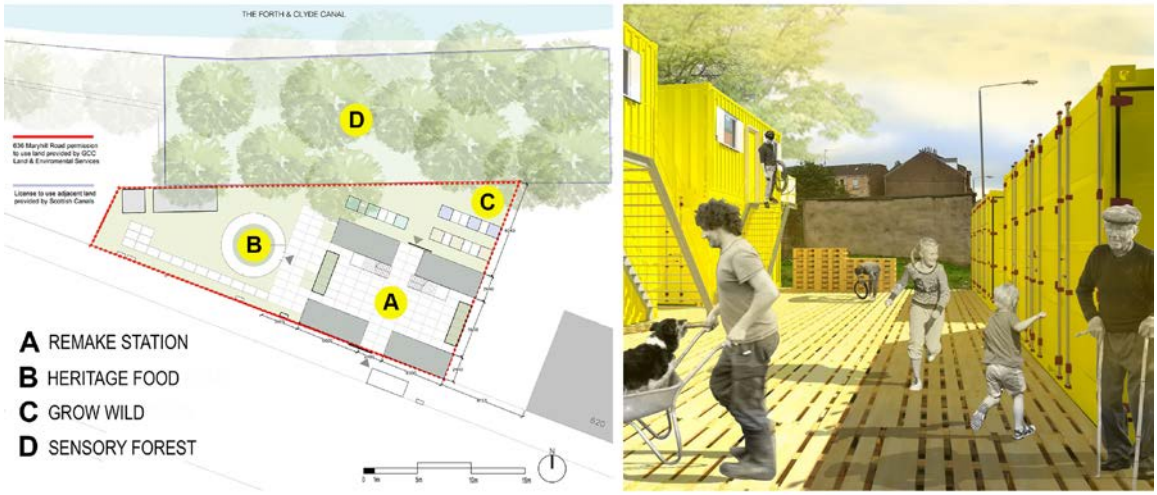

Figure 5: DOT TO DOT© Community Garden. Maryhill Remake Station. Source: Laura Petruskeviciute & Cristian Suau, 2018

4. Sensory Woodland (phase 2) will be the natural laboratory for kids from local eco-school, which combines analogic and digital sensory experiences via an agile technology under developed. It is a land concession given by the Scottish Canals to co-develop outdoor educational activities. This site is planned as experiential place-learning environment, where children, educators, researchers and wider community can get multi-sensorial experiences and test nature-based solutions as well. The DOT TO DOT© community came with the concept of changing the perception of an existing forest site into a learning touchpoint. Trees will be adopted and tagged, so everyone can identify and track them during excursions. For instance, they will sample the mean temperature, amount of daylight, soil moisture, relative humidity with camera traps, insect and motion sensors. Due to the slope condition, this sensory forest will be structured with a sensory trail parallel to the Canal pathway where, for instance, learners might identify which flora grow better.

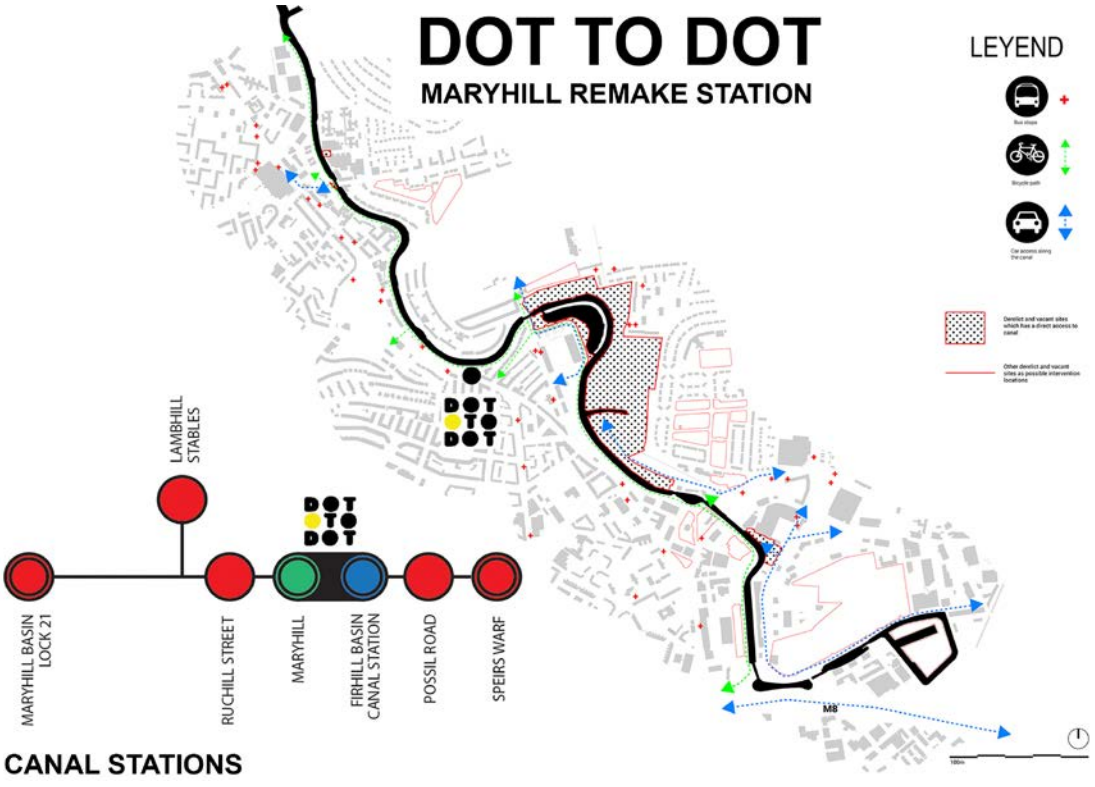

Figure 6: DOT TO DOT© Maryhill/Canal stations, Glasgow. Source: Laura Petruskeviciute & Cristian Suau, 2018

7.2. DOT TO DOT© digital community (pilot phase)

Basically it is a social technology [app/mobile-friendly website: www.dots.scot] that map, monitor and connect people's perceptions of waste through sensory designs. It is in Alpha development serving community partners in retrieving data and identifying new functionalities and features. This tools helps the implementation of land uses and live projects, clinics and site events. In phase two, it will assist community with eco-design services, workshops, online tutorials and DIY library. As social network, DOT TO DOT© will be self-financed with membership fees, crowdfunding and donations. Remakers as members, backers and volunteers will contribute with materials in-kind or time to get free materials, services and reskilling activities as rewards.

The beneficiary groups are not only children but intergenerational groups in general, including youth, workless households, immigrants, lone parent households, and people experiencing other forms of disadvantage or inequality like disabled people. The general perception from community, local citizens and future users on DOT TO DOT© community garden is highly positive. Sensory gardens allow children with additional needs to get a space to go for quiet reflection time and undertake kinaesthetic activities on site.

Figure 7: DOT TO DOT© experimental site, clean-up day (May 2017). Source: Laura Petruskeviciute & Cristian Suau, 2018

DOT TO DOT© offers open source architecture using perception and senses as learning experience to co-create ecologically. This experiment has increased the number of local supporting organisations, including the recruitment of English, Scottish and European academic/research organisations, researchers and consultants. The current challenge is to retain specific target groups as regular members in thematic activities. This project is a community-led initiative, powered by a children school and two social enterprises, with a well-diversified sustainable agenda. Remakers will strengthen the sense of community cohesion, sensory capacity and civic reactivation. This is a unique combination of ecological design, social technology and community-led initiatives to transform waste into a social value and reactivate urban voids throughout community empowerment.

8. DOT TO DOT©: POTENTIAL FOR REPLICATION IN NEW BELGRADE, SERBIA

8.1. Background of the flat blocks of New Belgrade

The first sketches for the urban plan of New Belgrade were proposed after the end of World War II by architect Nikola Dobrović. In less than 20 years, the general urban plan of New Belgrade was finished and the new part of the city began to emerge on the left coast of Sava river. As Belgrade became ready for a new start, many architectural-urban projects were formed on the newly-claimed territory. Amidst others, we find blocks 45 and 70 – mainly residential areas with accompanying green and recreational content. New Belgrade became a symbol of the future and the forming of a new world. New Belgrade blocks, in particular blocks 45 and 70 which gradually attained the name The Sunny Community, became new meetings points, centers of activity and places where families found their roots.

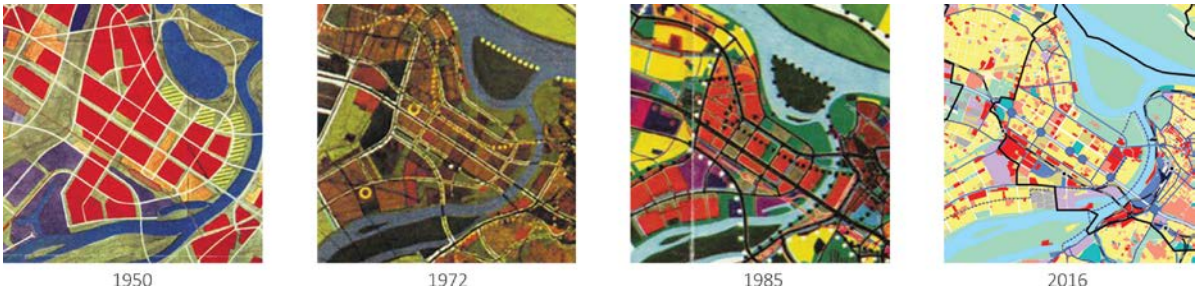

Figure 8. The development of the General Urban Plans of New Belgrade. Source: A. Til (2018)

Gradually building towards the river, the foundations of Savski blokovi (Sava blocks) were made by building blocks 45 and 70. Approximately 4300 apartments were created per block in roughly four years' time, and very soon they all found their owners. People from different backgrounds, some former inhabitants of Bežanija village, of different ages and different lifestyles gave life to the blocks. Solitaires and semi-open blocks soon become the symbol and identity of each block, implying the large number of citizens for which they were made. Residential buildings dominated the area, with green and recreational spaces spreading between the built structures.

8.2. Problem: Public spacing in the blocks of New Belgrade

The green and recreational spaces of blocks 45 and 70 today have succumbed to time. Open spaces within the semi-open blocks are slowly aging, the poor maintenance leading to the decay of the original equipment. Although the existing open spaces are poorly maintained, a strong sense of belonging is apparent within the community of the inhabitants as they perceive the green spaces are their very own backyard. There is a lack of space designed and maintained for recreational purposes, even though the house density is high and the population offers a large variety of users of a potential public space.

It is the general public's opinion that the existing public space should be recreated, modelled by the wants and needs of the inhabitants. Several attempts at shaping public space can be found while taking a stroll in between the buildings of blocks 45 and 70, such as potted plants, private gardens and landscaped balconies, but are limited to miniature segments of the area.

8.3. Goals: Activating the public spaces in New Belgrade

Although public space in New Belgrade has become a nuisance, rather than a place of relaxation, the need for recreational spaces and centers of human activity still exists. The interpolation of living and recreational space in the first plans of New Belgrade suggests harmony between these functions and that both are essential for what this part of the city can provide and offer to its inhabitants: green and open space, large boulevards and recreational space which cannot be so easily found in the older part of Belgrade. By revitalizing and activating the public space, the quality of life in New Belgrade itself will be immensely improved.

8.4. Action: Scaling DOT TO DOT© design framework

In order to achieve higher quality of public spaces in New Belgrade, by activating the community, the DOT TO DOT© project focuses on smaller areas of blocks 45 and 70. As they are semi-open blocks, each block has its inner garden. The gardens differ from case to case in the stadium of their degradation and are yet to become part of the everyday of its closest inhabitants. The new form of the public space comes from the needs of the local community which strives to have more recreational space, community gardens and green areas.

The population of the blocks strives to re-create the existing public space so that is fulfils its needs – a new, improved version of the open space they have grown used to. While designing and providing the needed equipment for recreational spaces is an action which needs the support of the city, re-vitalizing the existing public/green and open space is something the community itself can achieve. Activating the community by providing the needed methods and knowledge on how to recreate open space is what the DOT TO DOT© project strives for.

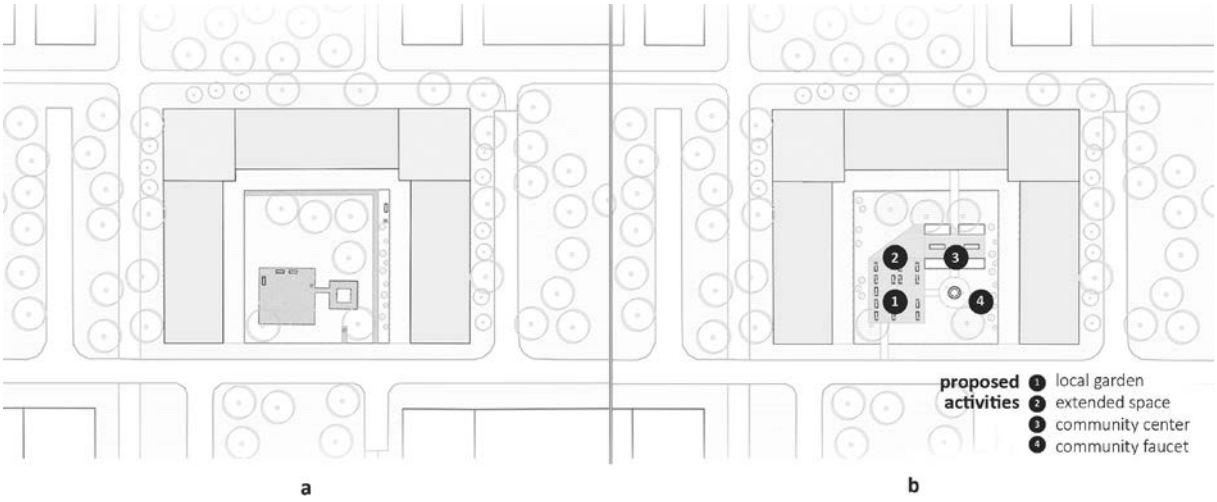

Figure 9. (a) Existing space and (b) What can be achieved. Source: A. Til (2018)

8.5. What can we play instead?

Residents of these collective dwellings perceive the central courtyard (common open area) as “private domains” rather that commons. Due they do not act collectively, this space remains rundown and untreated. While DOT TO DOT© provides the basis for a reactivation game plan, the need for upgrading this underused space must come from the community itself. By testing sensory bands or patches of public uses per block, a polycentric network of public space can be achieved on the residential area. Step by step, by improving each individual segment of a larger network of recreational and open spaces, a polycentric network of active public space is achieved. Such a network becomes the foundation of the overall improvement of public space in New Belgrade, which improves the all-together quality of living.

9. FINALE: DOT TO DOT AS POP-UP AND SENSORY DESIGN

Pop up Architecture is a temporary, portable and sensory manifestation of self building. It is an architecture of peripety, which uses the land without owning it. It is the expression of a heterotopic space (Foucault, 1984), the other architecture. In term of remaking culture, Pop up Architecture is made from scratch. Paraphrasing Bernard Rudofsky, these elementary forms are self-build structures of temporary occupation. In terms of sense-making, Pop up Architecture means animal architecture (Frisch, 1983), an instinctive way of dwelling.[1] It is often associated with remaking. Like any organism, Pop up Architecture architecture is highly resilient. It is an architecture with the people, by the people and for the people. Main design features are (a) people are natural self builders, (b) build with waste as reusable material, (c) make temporary structures, and (d) produce building with low-calories.

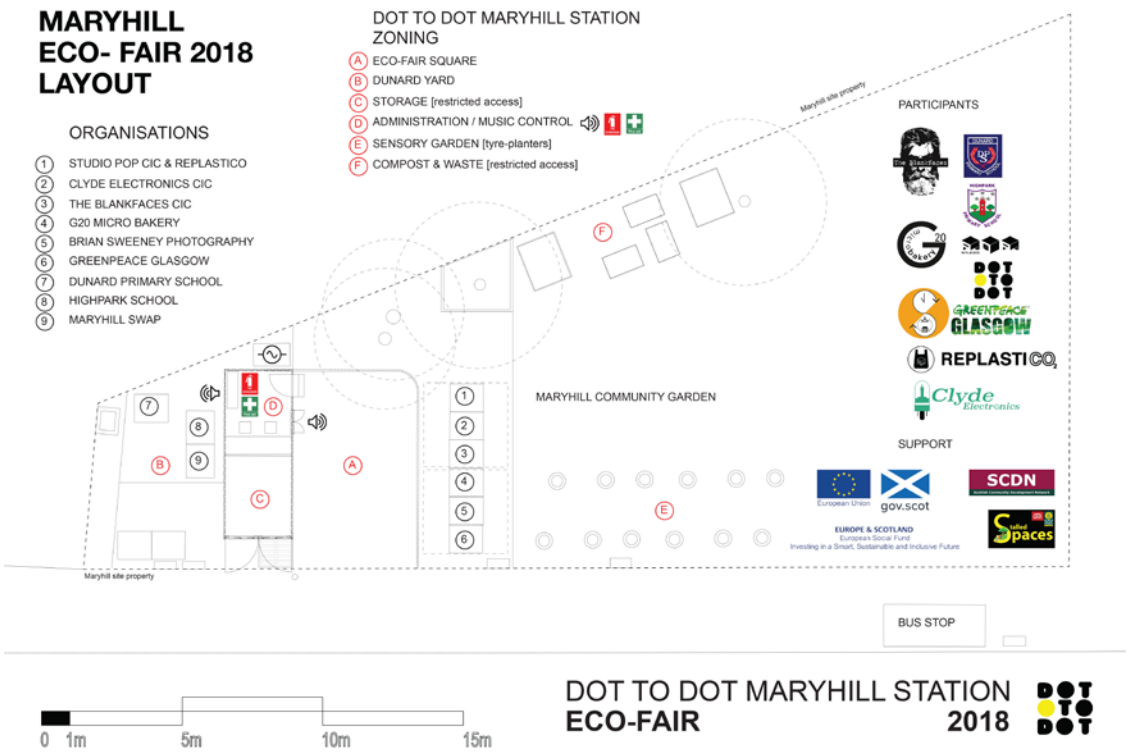

Figure 10: DOT TO DOT© layout for eco-fair 2018 designed by community consultation. Source: Laura Petruskeviciute & Cristian Suau, 2018

In the DOT TO DOT© experimental site, users experience space as remakers through multi-sensory experiences, perceptions and memories. The more senses people use, the richer the perceptual experience and the more we remember. As sensory landscapes, community gardens are dynamic learning spaces that represents the organic expression of evolutionary urban forms. They are often perceived as picturesque structures and rarely perceived as sense-forms. Sensory gardens are both restorative and regenerative spaces, mainly characterised by polyvalent -flexible and adaptive- patterns, geometries and forms. They concentrate a wide range of sensory experiences and sensibilities, which many of them are unselfconsciously experienced.

It is proven that people with high bodily-kinaesthetic intelligence are usually good at physical activities such making stuffs. Somatic experiences increase the sense of place-appropriation. In the case study of DOT TO DOT© in Glasgow, learners experienced an advanced phase of sense-making learning through self-build, including perception-in-action (Gibson, 2002), somatic, kinesthetic and constructional skills. In remakers with rural/natural backgrounds, the memory of haptic experiences in childhood and adolescence formed high sense of placeness and attachments to craftwork in workshop station and gardening in sunflower grow. For instance, one of the challenge in DOT TO DOT© Glasgow as outdoor learning activity was to implement sensory blended learning, which supported the development of subject knowledge and understanding, independent learning, sensory design, live experiments and digital fluency. Face-to-face teaching was facilitated by author in a practical and collaborative manner, clearly linked to learning activity outside the classroom. Opportunities were provided for students to develop autonomy, ecological, building and sensorial skills. Experiments empowered university students to investigate and assert place-learning experiences in an intuitive personal and collective way, allowing them to become active mappers of place-making and active remakers of sense-making in topological and perceptual terms. Learners built on their own knowledge, developed their own understanding and articulated this in different ways. An important lesson of this learning trail was that theoretical design projects –design without testing- are not the best medium for learning to design meaningful places. Instead architecture students require multi-sensory learning experiences with real project, real people and real sites. Author suggests to deploy TPM learning method to encourage multiple learner-centered interactions between learner-tutor, learner-learner and learner-content interactions, supported by face-to face (University-based and outside classroom) and online channels of group discussion like forums, blogs, wikis or emails.

In DOT TO DOT© Glasgow, users gain topologic and sensory knowledge through ludic and somatosensory perceptions, which are mainly participatory, didactic and kinaesthetic, in which visual perception and pre-existent academic media did not play a predominant factor.

What is a sensory design plan? Intelligent Evolution (Wallace, 1912) offers a model of common lineage, which follows the principle of survival. By applying this principle of natural selection, sensory design pops as new species or proto-forms that gradually gains adaptability among other existing forms. Like organisms, material culture, place-learning and place-making evolve through a combination of individual and collective experiences, which is manifested in active public engagement, live projects, story-telling, and conversations. Nowadays citizens are active designers rather than mere consumers. Sensory design is made with all senses to co-create an evolutionary sensuous form. In order to implement sensory structures in cities, we reconnect design and people's sensibilities in a transformative manner by changing people's perceptions of their everyday life. Following the example of the DOT TO DOT© portal, social technologies help to increase the enhancement of citizen perceptions in temporary public spaces at local level. As sensory tool, it encourages new somatic experiences by reusing creatively waste as social design via experiments, clinics, live projects and design products with social value.

Figure 11: DOT TO DOT Remake Station (phase 2), street view. Source: Laura Petruskeviciute & Cristian Suau, 2018

What are the pedagogical effects? Environmental learning and environmental perceptions are mainly intuitive and culturally driven. Perception-in-action has significant implication in spatial and sensory design education. The transfer of kinaesthetic experiences (Gardner, 1983)., present challenges in the way conventional design-related studio, media and learning curricula are run. DOT TO DOT© opens an alternative gateway to integrate sensory-spatial, bodily-kinaesthetic, inter-intrapersonal, and naturalistic new abilities into design cultures.

Rather than computational or pictorial outputs in design research, the selected experiments commonly employ research by doing methods, mainly highlighting haptic experiences involved in self-build. The DOT TO DOT© project combines both analogical and digital experiences in live projects, using a portable station with sensory garden supported by geo-spatially mapping and sensing technologies. Both cases demonstrate the validation of the THINK2PLAY4MAKE (TPM) as viable pedagogical kinaesthetic framework to develop sense-making and place-learning in creative communities, informing participatory remaking and enhancing stalled spaces locally.

Both pop-up and sensory design translate the idioms of cultural perception and learning codes given by creative remakers in a particular site. The DOT TO DOT© station is supported by live clinics to assist young designers, architects, planners and environmentalists to acquire a better understanding of what is necessary for them as local makers and users; who feel a better connection to their immediate surrounding; and how perceive sense-making abilities by examining sensuous aspects of material culture and place-learning trends and patterns in site-specific contexts, from primary school to university groups. Provided with TPM learning method, community developers, experimenters and ultimately users are better equipped to experience perceptive and sensorial qualities of restored or remade landscapes and buildings. Through trans-disciplinary environmental design, eco-designers and remakers will pop with deep-rooted understanding of an architecture of sense-making.

ACKNOWLEDGEMENT

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REFERENCES

1. Andersson, C. (2016). Public Space and the New Urban Agenda. The Journal of Public Space, Vol.1 (1), pp. 5-10
2. Architecture & Design Scotland (2017). Stalled Spaces Scotland Toolkit [PDF document]. Retrieved from: http://www.ads.org.uk/stalled-spaces-scotland-toolkit/
3. Sassen, S. (1997). The New Centrality. Peter, D. (ed.) Intelligent Environments: Spatial Aspects of the Information Revolution. New York: Elsevier publishers, pp 19-27
4. Beard, P. (1996). Peter Latz, Poet of Pollution: London, Blueprint 130, p 35
5. Bloomer, K. & Moore, C. (1977). Body, Memory, and Architecture. New Haven: Yale University Press, pp. 33, 49
6. Braungart, M. & McDonough, W. (2002). Cradle to Cradle. Remaking the Way We Make Things. New York: North Point Press, pp. 92-117
7. Brenner, N., Peck, J. & Theodore, N. (2012). Afterlives of Neoliberalism, London: Bedford Press, pp. 56-62
8. CivicWise (2017). Civic Practice Book, MOBILELAND [PDF document]. Retrieved from: https://civicwise.org/civicpractices/
9. Eco-schools (2016). Maryhill Canal Classroom [PDF document]. Retrieved from: https://issuu.com/scottimage/docs/maryhill_canal_classroom
10. Foucault, M. (1984). Des Espace Autres. Architecture, Mouvement, Continuité Journal, pp 46-49
11. Frisch, K. (1983). Animal Architecture. New York: Van Nostrand Reinhold Co, pp. 6, 48
12. Gibson, James J. (2002). A Theory of Direct Visual Perception. Alva Noë & Evan Thompson (eds.). Vision and Mind. Selected Readings in the Philosophy of Perception. Cambridge: MIT Press, pp. 77–89
13. Gardner, H. (1983). Frames of Mind: The Theory of Multiple Intelligences. New York: Basic Books, pp. 205-236
14. Glasersfeld, Ernst von (1991). Key Words in Radical Constructivism. Rotterdam: Sense Publishers, pp. 21-30
15. Hauvel, D. & Jaap Bakema Study Centre (2017). Jaap Bakema and the Open Society. Retrieved from TU Berlin lecture notes & online web site: http://www.cud.tu-berlin.de/topics/bakema-the-open-society-a-talk-about-democracy-architecture-welfare-state-ideals-cold-war-rhetorics/

16. International Society of Biourbanism (2017). Bio-urbanism [PDF document]. Retrieved from: http://www.biourbanism.org
17. Lefebvre, H. (1973). Towards an Architecture of Enjoyment. Minneapolis: University of Minnesota Press, pp. 136-145
18. Long, R. (2009). Heaven and Earth. London: Tate Britain ed. pp. 6-42
19. Maki, F. (1964). Investigation in Collective Form. St. Louis: Washington University Press (special publication 2), pp 1-24
20. O'Neill, M. (2001). Corporeal Experience: A Haptic Way of Knowing. Journal of Architectural Education, 55/1, pp. 3–12
21. Papanek, V. (1971). Design for the Real World: Human Ecology and Social Change. New York: Pantheon Books, pp 3-27
22. Rudofsky, B. (1964). Architecture Without Architects. Albuquerque: University New Mexico Press. pp 5-12
23. Milliken, W. and Bridgewater, S. (2013) Flora Celtica. Edinburgh: Birlinn Ltd. pp. 13, 230, 333.
24. Petruskeviciute, L., Suau, C. & Ball, D. (2018). DOT TO DOT alpha development (Version 1.1) [Software]. Available from https://project--1058925460034076790.firebaseapp.com
25. Petruskeviciute, L. & Suau, C. (2018, October 5). DOT TO DOT community [PDF document & web log]. Retrieved from https://www.studiopop.net/dottodot
26. Petruskeviciute, L. & Suau, C. (2018, October 5). Studio Pop Remaking the City [Web log]. Retrieved from: https://www.studiopop.net/remaking-the-city-1
27. Petruskeviciute, L. & Suau, C. (2018, October 5). DOT TO DOT, community garden design: site plan, layout and cross section [PDF document]. Retrieved from: https://www.studiopop.net/dottodot
28. Secchi, B. (2013). La Città dei Ricchi e la Città dei Poveri. Roma: Laterza ed, pp. 35-44
29. Scottish Government (2018). Scottish Index of Multiple Deprivation [Map document]. Retrieved from: http://ukdataexplorer.com/simd/
30. Suau, C. (2015, August 30). MOBILELAND community [web log & PDF documents]. Retrieved from: https://mobilelandglasgow.wordpress.com
31. Suau, C. & Davidson. R. (2010, July 30). Nomadic Allotments [web log & PDF documents]. Retrieved from: https://nomadicallotments.wordpress.com
32. Suau, C. (2015). The Pan-American Highway. Informality Urbanism in Border Cities. Kite, S. Odgers, J. & McVicar, M. (ed.) Economy and Architecture. New York: Routledge, pp.175-186.
33. Suau, C. & Davidson. R. (2011). DIY: Do It Yourself. In Lascelles, M. (eds.) The Union Street Urban Orchard: A Case Study of Creative Interim Use. London: The Architectural Foundation, pp. 79–80
34. Suau, C. (2012). The Power of Less. de Vos, Els (eds.) Theory by Design. Antwerp, Artesis University College, p. 353–362
35. Suau, C. (2013a). Grand Paysage: Transformations between Memory and Invention in Europe. MADE Journal 8, pp. 66–67
36. Suau, C. (2013b). The Power of Remaking: Lessons of Innovative Eco-Design in Design Studios. MADE Journal 7, pp. 52-63
37. Suau, C., Fikfak, A. & Zappulla, C. (2014). Pattern Making of Mega-Slums on Semantics in Slum Urban Cultures. Journal of Architecture and Urbanism. Volume 38, Issue 4, Routledge, pp. 247–264
38. Suau, C. (2015). The MOBILELAND Garden: A Radical Landscape Game. Theory and Practice of Spatial Planning Journal 3, pp. 106-113
39. Tafuri, M. (1976). Architecture and Utopia Design and Capitalist Development. Massachussets: MIT edition, pp. 1-40

40. URBACT Programme (2015). Social Innovation in Cities. URBACT II Capitalisation [PDF document]. Retrieved from: http://urbact.eu/sites/default/files/03_socialinn-web.pdf

41. Waldram, H. (Interviewer) & Suau, C. (Interviewee). (2010, 1 July) Nomadic Allotments [Interview transcript]. Retrieved from The Guardian:

42. Wallace, A. Russel (1912). Influence of Natural Selection upon Sterility and Fertility. Darwinsim: An Exposition of the Theory of Natural Selection with Some of Its Applications (3rd ed.). London: Macmillan, pp. 173–9

43. Živković, J. & Cvetković, M. (2017) Group of students 1st year of Master Studies, module urbanism, school year 2016/17. Analiza profila bloka 45 (Analysis of block 45). Published by the students of University of Belgrade, Faculty of Architecture, 2017

44. Živković, J. (2017) New Belgrade's open spaces'' Lecture. Ekološki urbani dizajn 2017/18 – seminar (Ecological urban design 2017/18- seminar). University of Belgrade Faculty of Architecture. Belgrade. November 24, 2017

GREEN ROOFS AS A MODEL OF RE-USING FLAT ROOFS

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ABSTRACT

Flat roofs on existing buildings are often forgotten and unused open spaces. They can be transformed into open spaces for different types of activities, while reducing heat accumulation, representing noise absorber as well as one of the tehnical elements in stormwater menagment. How to approach the revitalization of existing buildings without endangering the already declining resources of our environment, requires a wider and different analysis of the design and reconstruction approaches of flat roofs. Modern trends in building design, based on the sustainability and energy efficiency, as well as environmental protection, have had an impact on technological development and the ever-increasing use of green roofs on a flat roof as one of the technical and functional elements. Green roofs are primarily promoted due to their ecological and energy benefits as elements that should return important environmental functions to infrastructure and city maintenance. As an element that connects people to nature in function of open space, green roof can be a functional, aesthetic and visual benefit of building in urban, concrete environments. The advantages of green roofs contribute to the recognition of this system, not only as an element on the building but also as one of the elements of sustainable urban ecology and urban agriculture. The paper presents general determinations of green roofs systems and the examples of good practice across Europe in their aplication as an element of open space in revitalization of flat roofs.

Keywords: flat roofs; green roofs; open space; revitalization

1. INTRODUCTION

Flat roofs are modern complex structures whose role is to protect building, completely and permanently, from different weather condition, to protect indoor space from overheating and heat loss as well as to provide roof structure and building from other adverse impacts (Todorović et al., 2012). If flat roof is observed as the fifth façade of the building, it could be clearly seen as an additional open space. In the past, during the design of the buildings, importance of designing flat roofs was not given in neither functional nor shaping sense. The significance and role of flat roof in the context of building design has become more pronounced in contemporary architectural and structural design (Watts, 2010). Flat roofs on buildings of different purposes can serve as roof terraces, gardens, squares (above underground garages), parking spaces...

The efficiency and durability of flat roofs depend primarily on proper design and construction. The flat roof as an element of building envelope that is most exposed to weather conditions is very often necessary to repair or perform a complete reconstruction. Damages to a flat roof in addition to weather influences are also a result of their lack of maintenance which is directly related to purpose and ownership of the building. Flat roof repair is one of most delicate jobs given diversity of their design solutions. In the early stages of transition in Serbia, most often on residential multi-storey buildings, the extension of apartments in the form of additional storeys or lofts (Vranic et al., 2015), or the construction of sloping roofs was highlighted model of their reconstruction.

However, question of rationality of superstructures in reconstruction of flat roofs is raised from aspect of living quality due to the renunciation of tenants from their private open space-flat roof, which is a consequence not recognizing its possible role.

Open spaces are the one of the main element of sustainability in urban areas in a social, economic and environmental development perspective. Given the fact that a lot of time is spent indoors and that in the overcrowded city core there are ever less green areas that significantly influence the maintenance of physical and mental health of the inhabitants, the green roof as an open space (private, semi-private, and public) could be a solution in order to improve the quality of life and work of people, but also the quality of the buildings themselves and their value.

How to design and construct building but also how to approach revitalization of existing buildings without endangering already declining resources of our environment, requires a wider and different analysis of design and reconstruction approaches of buildings and their envelope among which is often flat roofs. The application of green roofs can represent appropriate models of reconstruction and repair of flat roofs in function as open spaces, which is a focus in this research. By analysing contemporary literature in the paper, the general determinants of green roofs (definition, importance, and typology) are presented as well as function of green roofs as open spaces. Observations of the example of good practice and deduction resulted in concluding observations.

2. GENERAL DETERMINATIONS OF GREEN ROOFS

2.1. Definition

The term green roof in the present time is often used as a term for sustainable system built over the slab and representing an integral part of the roof (Weiler and Scholz-Barth, 2009). Green roofs or a vegetation roofing systems is a general term used for all types of vegetation on the roofs and implies open spaces that are partly or completely covered by a different plant species, planted in the substrate layer not only on the roof but on any elevation (Crnčević and Sekulić, 2012).

The generic term "green roof" has already become a recognized expression in the jargon of the green movement and for the purpose of a more clear description of specific applications of different green roof systems, the following terms have been highlighted in contemporary research: 1) *Green roof system* - used as an overarching description of the ecologically, culturally and economically sustainable use of the roof at any elevation; 2) *Living green roof* - describes a system whose primary use is to effectively satisfy stormwater management instead of conventional engineering methods; 3) *Landscape over structure* - a system based on functional and programmatic requirements, and could be designed as a useful, affordable open space (Weiler and Scholz-Barth, 2009).

As a specific type of urban habitat, green roofs are mainly treated as engineering or horticultural challenges, rather than as an element of the ecological system (Oberndorfer et al., 2017). Advantages of green roof contribute to the recognition of this system not only as an element on the building, but also as one of the elements of sustainable urban ecology and agriculture.

With technological advances in the production of materials and components of the green roofs, these roof systems can now be successfully applied in different climatic conditions, providing an attractive design, especially in urban areas where land for parks and green areas is limited (Liu and Baskaran, 2005).

2.2. Importance

As an element that connects people to nature in function of open space, green roofs can represent a functional, ecological, economical, aesthetic, and visual benefit of building in the urban, concrete environment. The application and development of the green roof system, as we know it today, is consequence of understanding and researching motives for the use of green roofs in the past that go back thousands of years through different civilizations and cultures. Development of the technologies of every age contributes developing ability to live more effectively and productively. As architects long before our era used the technology of that time to build roof gardens, our contemporaries use technology, knowledge, and materials of our time in design and construction of today's buildings and the necessary space for daily activities (Weiler and Scholz-Barth, 2009).

The most analysed benefits of the green roof system as a passive technical element in today's research could be grouped into: 1) ecological and environmental, 2) energy, and 3) social. Classic green roofs, without functional purposes as an open useful space, are most often used as passive elements in the context of environmental and energy benefits.

Ecological and environmental benefits - Roofs, when they are not optimized to respond too two ecological phenomena: the heat islands effects and the rainfall and stormwater runoff, that are directly related to them, can aggravate these phenomena. In the context of urban sustainability, in response to these two phenomena, green roofs are one of the technical measures to discuss these problems; they moderate heat urban island effects and improve stormwater management. Additionally, the green roofs contribute to the reduction of smog and air pollution as well as to the preservation of biodiversity.

Energy benefits – As a passive element, green roofs offer many advantages for the buildings: reduction of the necessary cooling energy, improvement of the insulation characteristics of the roof, and as one of the benefits on the roof construction itself is the longer existence of the waterproofing membranes.

Social benefits - The social benefits of green roofs are multiples depending on the purpose of a building. In function as open space, green roofs are increasing the living quality of inhabitants and their social interaction. The focus in further research is on the re-using of flat roofs by implementing green roofs system in the function of open spaces in buildings.

Despite all the benefits of green roofs it is necessary to mention their downsides like as cost, weight, and maintenance. Green roofs do tend to be slightly more expensive than the traditional flat or sloping roofs. Their own weight represents an extra permanent load for the structure and depending on the type of green roof their maintenance may be more demanding. Proper planning and construction of green roofs can reduce attended disadvantages that can occur.

2.3. Typology

As one of the leading elements of green infrastructure the green roofs are considering applicable on the buildings with different purposes, number of floors, dimensions..., and with multiple impacts on the living environment. The most common typology of green roofs that was developed in Europe and accepted throughout the world is a typology that depends on vegetation and depth of growing medium, which directly conditioned the need for maintenance of green roofs, but also their purpose and accessibility. Depending on the thickness of a substrate or vegetation, the green roofs are *extensive* or *intensive* (Table 1).

Table 1: Typology and basic characteristics of green roof (Source: Liu and Baskaran, 2005)

Typology	Typical weight of system	Typical thickness of substrate	Features and functions	Level of maintenance	Accessibility
Extensive 	**<300kg/m^2**	**<200mm**	**Provides ecologically beneficial setting, can be viewed from above or surrounding buildings**	**Low maintenance – little or no irrigation needed when plants have been established**	**Limited – seldom entered except for maintenance purposes**
Intensive 	**>300kg/m^2**	**>200mm**	**Provides complete garden or park – like features**	**High maintenance – irrigation and regular garden maintenance required**	**Accessible – provides green spaces for occupants**

In modern developmental and scientific research of the system of green roofs, in addition to extensive and intensive green roofs, new modern types also appear: *modular* and *brown/eco-roofs* (Magill et al., 2011).

Modular green roofs are made from small units (Fig. 1A). Each unit for itself represents a green roof in a small one. Varying the thickness of a substrate thus the weight of each unit allows control of loads on every part of

the structure, as well as the possibility of placing deeper units with woody plants. A wide spectrum of the roof terraces design could be developed by applying this type of green roof. The advantage is the quick and easy installation of the module with an already developed vegetation layer as well as easier remediation if damaged. The modular system offers the same benefits as the classic green roof.

Brown roofs are constructed in the same way as classic green roofs, the difference between them is that the last layer in the brown roof is a substrate. The roof's set with the substrate is left to the natural colonization of plants and insects for the formation of the vegetation layer (Figure 1B). This approach to the design of green roofs contributes to the increase in the biodiversity of the living environment and therefore is often called *Eco-roofs*.

Figure 1: A) Modular green roof, and B) Brown roof

3. GREEN ROOFS AS MODEL OF RE-USING FLAT ROOFS

Function of green roofs from the aspects of social interaction is first recognized in public buildings (administrative buildings, schools, hospitals ...). Staying or just looking at the green roof can contribute to the greater effect of employed in administrative buildings (Figure 2A) as well as the faster recovery of patients in health facilities (Figure 2B). Thanks to the view and possibility of staying in nature, as well as access to the outside specialized therapeutic roof gardens in hospital, provide an emotional respite for patients (Reeve et al., 2017). On social security facilities, the green roof as a public open space contributes to the feeling of belonging to society for socially disadvantaged persons. In order to provide a more comfortable residential environment in multi-storey residential buildings as well as socialization in the neighbourhood that indirectly improves the emotional well-being of inhabitants, it is necessary to offer common spaces in their "vertical neighbourhood" and the use of a green roof or roof garden as private or semi-private open space is one of the alternatives for solving this problem (Zuriea et al., 2015).

In the second half of the twentieth century, due to civil disinvestment, rising costs of living and food and environmental degradation, the development of the direction called Urban Agriculture or Urban Farming was developed. Urban agriculture is an integral part of urban areas and local economic and ecological systems, which is completely different from rural agriculture (Mougeot, 2000). By activating unused areas for urban agriculture, community investment also increase, but also leads to a reduction in crime rates in the neighbourhoods itself and to social equity (Mougeot, 2006). The green roofs are recognized as one of the potential elements of urban agriculture. In urban agriculture, green roofs can be in function of reproducing vegetables, fruits or herbs and they are called Rooftop farming (Figure 2C).

Figure 2: A) Playground on rooftop of the hospital paediatric department with elements of green roofs, Madrid, Spain; B) Elements of green roof as space for rest on administrative building, Dortmund, Germany; C) First rooftop farming in Europe, Rotterdam, Netherlands

As the earlier chapter explains the basic typology of green roofs on extensive and intensive, we can notice that from the aspect of availability, intensive green roofs can be analysed to a greater extent in functional terms as open spaces which used for rest, socializing, recreation, urban farming... On the other hand, intensive green roofs that are not intended to be physically accessible as open spaces can be combined with roof terraces designed for active use with a clear separation between these two parts.

3.1. Examples of good practice

In order to recognize the importance of the green roof as open space, the paper analyses good practice examples from Europe. Examples are selected by the following criteria: 1) the green roof is an element applied in the reconstruction of a flat roof, and 2) the green roof is in the function of open space.

Sargfabrik (Vienna, Austria) – The neighbourhood is located in the western part of Vienna in the region with a high density, at the place where the former chest factory was and named after it. Dissatisfied with the expensive housing market, in the eighties of the last century, a group of tenants gathered around the initiative to form a housing association for collective housing in order to achieve flexible housing and various cultural opportunities and founded the *Association for Integrative Lifestyle (ger. Verein für Integrative Lebensgestaltung – VIL)* (Ref. 14). After ten years of community initiative, the association started the project in 1987 with the architects of the BKK project bureau and set the following goals: to create a housing scheme of heterogeneous structure, flexible housing with various activities, an ecologically and energy acceptable project, a cultural centre that would spur social spirit (Ref. 15) representing an example of urban renewal. The project was finally completed in 1996 and the vision of an open and self-defined common life became a reality, a social experiment turned into a pulsating urban alternative with advanced cultural policy. The residential complex is consists of three blocks interconnected with a total of 75 residential units of 45sqm oriented towards the inner courtyard for residents of different ages and lifestyle. On existing flat roof are either installed solar panels or green roof in the form of a roof garden and represents one of the elements of a fulfilment of the set ecological goal. The roof garden is an intensive green roof with a various vegetation, design as a playground and a place for rest. A roof garden represents the private open space of all tenants and together with a series of common open spaces creates a landscape of communication and satisfaction (Figure 3).

Figure 3: Roof gardens over Sargfabrik multi-story residential buildings

Augustenborg (Malmo, Sweden) - The residential mass housing area was built in 1948 and was one of the first social housing settlements in Sweden, initially regarded as a very successful example of a combination of multi-story housing, business and social services. Economic difficulties at the city level also reflected in Augustenborg, so the period after 1970 marked the population and economic stagnation of the area, as well as other development problems, including the annual flooding of the area. In 1996, the city of Malmo decided to build an eco-district, which includes the Augustenborg residential area and industrial brownfield in its immediate vicinity, and in 1997, the urban regeneration project *Augustenborg Eco-District Renewal* project started. The project focused on innovative models for improving the quality of the environment. With its realization, it was completed in 2002 and in 2010 the project was awarded the UN's World Habitat Award. In eco-district was realized 30 green roofs with a total area of 2100sqm, not counting the roof of the Botanical Garden, which was built in the period from 1999 to 2001 at industrial brownfield. With an area of 9500sqm, the green roof of the Botanical Garden represents the largest green roof in Scandinavia. The Botanical Garden is a public open space and through this "demonstration project" for educational purposes, it is possible to promote the use of green roofs among residents and visitors (Figure 4). Botanical garden consists of twenty different parts with different systems for urban agriculture and biodiversity, and their visual appearance is regularly changed (Ref. 16).

Figure 4: The green roofs of the Botanical Garden

DakAkker (Rotterdam, Netherlands) - On the top of the Schieblock business centre in the city centre of Rotterdam, this green roof is the largest roof farm in Europe of about 1,000sqm. As a part of the International Biennial of Architecture 2012 in Rotterdam, the ZUS project bureau experimented with the concept of urban agriculture on the roof of an old business building, proposing new alternatives for old city buildings. The concept was developed in cooperation with Rotterdams Milieucentrum (Environmental Centre Rotterdam). A roof farm is focused on the production of vegetables, fruits and herbs, and in some parts of the farm are beehives (Figure 5). The roof farm is cultivated by volunteers and all final products are distributed to local restaurants and shops. The realization of this concept of the revitalization of old buildings is not so complicated. Roof farms as an alternative solution, in the part of Rotterdam well-known for its architecture and shops with consumer goods, has become a source of fresh products for the city. This kind of concept has shown that the city's success does not only develop on technology and infrastructure. Rotterdam focused on alternative ways in food production and on the development of a sustainable green city environmental system. DakAkkar Urban Farm also represents a point on the tourist map of Rotterdam, so benefits are multiple (Ref.17).

Figure 5: Roof farm on Schieblock business centre

4. CONCLUSIONS

Looking at the cities and their urban landscapes, we notice that most of the flat roofs are abandoned and forgotten, without any functional purpose. Due to the increased urbanization and density of population, and therefore the high value of land in cities, as well as the vertical growth of the city, the treatment of a flat roof without any functional purpose can seriously affect people, the economy and the environment (Kalantari et al., 2016). The increasing occupancy of green areas has led to the creation of an unhealthy urban environment. Green roofs represent one of the key elements in urban planning and architectural design with the potential for creating more desirable buildings, cities with high living standards, all in order to respond to the challenges of the future, primarily to the climate change.

Revitalization of flat roofs is not a remedy from a constructive aspect due to deterioration and damage to waterproofing membrane, but also from the aspect of sustainability. Increasingly present focus on sustainability and environmental protection in contemporary lifestyle affects the need for reviewing other models of transformation, rationalization and revitalization of existing flat roofs. Identification of the problems of the influence of flat roofs on the environment (heat islands, heavy load of the sewerage network due to rainfall and stormwater runoff...) is the initial parameter for considering an adequate model of their revitalization in the function of sustainability and environmental protection. Measures and elements could be grouped into 1) ecological, 2) energy, and 3) social interaction and living quality, and 4) economic. From the aspects of social interaction and living quality, using a green roof, the usefulness of the flat roof space could be increased, that is, the good value of transforming the flat roofs into useful spaces, such as roof gardens/terraces, urban farms or simply useful green open space. Their application can decrease the feeling of overpopulation and high density in cities and contribute to the impression of privacy, especially in multi-story apartments buildings.

When planning a green roof as an open space, attention must be given to the safety and security of that space. Depending on the purpose of open space, additional elements as solar shading, protection from wind and other weather conditions should be foreseen. With existing flat roofs, the installation of these elements, as well as the entire green roof system, must be analysed from the constructive aspect and bearing capacity of the existing structure. However, this should not be a reason for abandoning the implementation of the green roof, but a reason to contribute to its adequate solution.

REFERENCES

1. Crnčević, T. and Sekulić, M., 2012. Zeleni krovovi u kontekstu klimatskih promena-pregled novih iskustava. *Arhitektura i urbanizam,* 36/2012. pp 57- 67.
2. Kalantari, M., Ghezelbash, S. and Yaghmaei, B., 2016. People and Green Roofs: Expectations and Perceptions of Citizens about Green Roofs Development, an Iranian Case Study. *Mediterranean Journal of Social Sciences*, 7(2, S2). pp 137-147.
3. Liu, K.Y. and Baskaran, A., 2005. Using Garden Roof Systems to Achieve Sustainable Building Envelopes. *Construction Technology Update*, 65. National Research Council of Canada.
4. Magill, J., Midden, K., Groninger J. and Therrell, M., 2011. A History and Definition of Green Roof Technology with Recommendations for Future Research. *OpenSIUC, Research Papers,* Paper 91.
5. Mougeot, L. J. A., 2000. Urban Agriculture: Definition, Presence and Potentials and Risks - Thematic Paper 1. International Development Research Centre (IDRC), Ottawa, Canada.
6. Mougeot, L. J. A., 2006. Growing better cities: Urban agriculture for sustainable development. International Development Research Centre (IDRC), Ottawa, Canada.
7. Oberndorfer, E. et al., 2007. Green Roofs as Urban Ecosystems: Ecological Structures, Functions, and Services. *BioScience,* 57(10). pp 823-833.
8. Reeve, A., Nieberler-Walker, K. and Desha, C., 2017. Healing gardens in children's hospitals: Reflections on benefits, preferences and design from visitors' books. *Urban Forestry & Urban Greening,* 26. pp 48–56.
9. Todorović, M., Bogner, M. and Denić, N., 2012. O izolaciji. First edition. ETA, Beograd, Serbia.
10. Vranic, P., Vasilevska, Lj. and Haas, T., 2015. Hybrid spatialities: Multi-storey extensions of socialist blocks of flats under post-socialist transition in Serbia, the case of Nis. *Urban Studies*. pp 1-17.

11. Watts, A., 2010. Modern Construction Handbook. Second edition. Springer Wien, New York, USA.

12. Weiler, S. and Scholz-Barth K., 2009. Green Roof Systems – A Guide to the Planning, Design, and Construction of Landscapes over Structure. John Wiley & Sons, Inc., New Jersey, USA.

13. Zuriea, W., Ismail W., Ariff, N.R.M., Ahmad, Sh.S. and Kamarudin, H., 2015. Green Roof Maintenance towards Sustaining Neighbourhood Spaces of High-Rise Residential Developments in Malaysia. *Advanced Science Letters*, American Scientific Publishers.

14. https://www.sargfabrik.at/Home/Die-Sargfabrik/Verein [Accessed: 11th September 2018].

15. https://issuu.com/nushratj/docs/sargfabrik-_booklet [Accessed: 11th September 2018].

16. Augustenborg´s Botanical Roof Garden, Scandinavian Green Roof Association. http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=ROOF_GreenRoofs09.pdf

17. https://citiesintransition.eu/place/dakakker [Accessed: 12th September 2018].

SOURCES OF ALL ILLUSTRATIONS

Figure 1A: https://www.pinterest.com/pin/535083999463225904/?lp=true

Figure 1B: https://www.specifiedby.com/eco-green-roofs/bio-diverse-brown-roofs

Figure 2A: https://www.interiordesign.net/articles/12138-moneo-brock-transforms-an-underutilized-hospital-rooftop-in-madrid-into-a-playground-for-pediatric-patients/

Figure 2B: http://img.archiexpo.com/images_ae/projects/images-g/photo-4-administration-building-dortmunder-u-dortmund-37458-10641606.jpg

Figure 2C: https://www.optigreen.com/fileadmin/_processed_/csm_UF_1-1_d373de6dd3.jpg

Figure 3: https://www.sargfabrik.at/Home/Die-Sargfabrik/Verein

http://www.zfbk.de/portfolio/filmhaeuserfuermenschen/

https://www.shareable.net/blog/public-housing-works-lessons-from-vienna-and-singapore

Figure 4: https://greenroof.se/augustenborgs-botaniska-taktradgard/

https://livingroofs.org/green-infrastructure-sweden/

https://inhabitat.com/augustenborg-botanical-garden-is-a-red-yellow-and-green-roof-bursting-with-color/austenborg-botanical-garden-5

Figure 5: https://citiesintransition.eu/place/dakakker

http://www.ecologyandfarming.com/wp-content/uploads/2014/05/dakakker-1.jpg

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ROLE OF LOCAL AUTHORITIES AND CITIZENS IN URBAN PLANNING OF MICRO PUBLIC SPACES

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ABSTRACT

Planning and design strategies for building with nature in urban areas, today also includes urban planning of micro public spaces. In it, the local government has an important role, which derives from the legal framework governing urban development. However, today's local authorities should listen to the citizens needs. Particularly in this area, relation and communication between local authorities and citizens, as well as other stakeholders, is crucial. In this paper, special attention will be focused on determining the concept of micro public spaces. Also, examples of good practice some of city authorities in planning and micro public spaces development strategies will be covered. Finally, we will point out the role of citizens and other stakeholders in urban planning micro public spaces.

Keywords: Micro Public Spaces (MPS), Local self government, local authorities, citizens, legal framework, urban politics.

1. INTRODUCTION

Planning and creating strategies for construction in urban environments involve today another important problem - regulation of *micro public space* (hereinafter: MPS). Many metropolises are paying more attention not only to arrangement, but also to clear definition of the term, as well as to the criteria included. In contemporary conditions of urban life, MPS becomes a real natural oasis in today's urban areas. The issue of MPS arrangement therefore becomes an important topic in the creation of urban policies. Certainly, in this process, at least as far as public space is concerned, local government has the most significant stake. Simply as their role is derived from the law and other regulations. Therefore, in the work of the local government, experts and professionals participate as public officials in many fields, including urbanization, urban planning and urban development. However, in this area both citizens and the public can be drivers and active participants in the process. And this leads to the question of civil participation.

In social and especially political science, civil participation is the subject of numerous scientific and expert analyzes. On the other hand, public administration in general, including municipal/city administration in modern conditions is an administration that "... listens the voice of the users", ..., and which is "exposed to the user's court", above all the citizens.[1]

Civil participation creates crucial cohesion between citizens and public administration, which contributes to the development and improvement of a local, national and wider human community, and at the same time opens the issue of solidarity. This is also pointed out by one of the most famous contemporary theoreticians in the field of social sciences Jürgen Habermas: "**In complex societies, a deliberative education of thought and will, based on the principles of the sovereigns of the people and human rights, forms the ultimate instrument for the abstract and legally established, through political participation, the reproduced form of solidarity**".[2]

[1] Milenković, D., 2013. Javna uprava – odabrane teme, Fakultet političkih nauka, Univerzitet u Beogradu-Čigoja štampa, Beograd, Srbija.,p. 298.

[2] Habermans, J., 2002. Postnacionalna konstelacija, Otkrovljenje, Beograd, Srbija, p. 81.

Policies of urban planning and MPSs are definitely fields where the interests and will of citizens and local government are overlapping. Living in harmony with nature and the natural environment in urban areas has become the main issue of the 21st century. On the other hand, through the relationship between the city administration and the citizens in this area, at the same time, it's been pointed to the necessity of including (and participation) between citizens and local authorities. At the same time, there is a good example that this cooperation can significantly contribute to the improvement of living conditions in modern, urban areas, especially in case of MPSs.

Urban development planning, especially in megalopolises and large urban areas, must be led by professionals, with as less as possible interference of the political factor. As policy interference is higher, it seems that success is less guaranteed. However, if together with local government professionals, citizens and other stakeholders are going to be involved, then urban planning begins to include their needs and priorities, as those who live and work in urban megalopolis have better insight into problems of a micro environment. In that sense, civil participation improves quality of urban planning and urban development in general, as well as regulation of the MPS.

2. PUBLIC OPEN SPACES

Urban built environment refers to the features in urban environment made by human, ranging from buildings, parks, playgrounds, streets, infrastructure etc. Public open space is merely one aspect of this complex urban environment, yet play an important role within the urban context.[3]

Public open spaces accommodate a large number of everyday activities which emphasize the importance and attractiveness of the city public spaces. [4]

"Public spaces are a vital ingredient of successful cities. They help build a sense of community, civic identity and culture. Public spaces facilitate social capital, economic development and community revitalization. This is as true in the Global South as it is elsewhere in the world".[5]

As the quality of life in urban environments deteriorated with time, streets, residential homes and other public areas have become less and less a place where citizens gather, and became more of an alien space without any social content. A new understanding of citizen interest in the role of a public space customer, then, a new understanding of the cultural context and finally, a new understanding of social inclusion and the complex connection between the physical-urban environment and society as a whole, was necessary.

Urban political science is an intricate matter. It has sociological, political, archaeological, psychological and other markings. Today, urban political science is increasingly focusing on Theories of the relationship between space and society in urban environments, and specifically, public space and the connection between space and urban life.

Many famous authors, including Ghel 1987; Jacobs, 1992; Lynch 1990; Whyte, have given a significant contribution to changing the sociological relationship and physical environment. The complex relationship between space and society as a basic framework for the use of neighborhood public spaces and social activities related to space can be interpreted by Structuration theory of Anthony Giddens, 1984; and the Space Syntax Theory of Bill Hillier and Julian Henson, 1084. According to these theories, the society is structured and established through space.[6]

Lately, especially through United Nations projects, the question of multidimensional usage of public space is being popularized. Project for public spaces, realized by UN HABITAT (United Nations Human Settlements Programme) points to 10 basic possibilities to improve public space usage in today's urban environment:

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[3] Jayakody, R.R.J.C., Amarathunga, D., Haigh, R., 2016. The use of Public Open Spaces for Disaster Resilient Urban Cities, 12th International Conference of the International Institute for Infrastructure Resilience and Reconstruction, 05th – 08th August, 2016, University of Peradeniya, Kandy, Sri Lanka

[4] Gehl, J. 2011. Life between Buildings: Using Public Space. Island Press, Washington-Covelo-London.

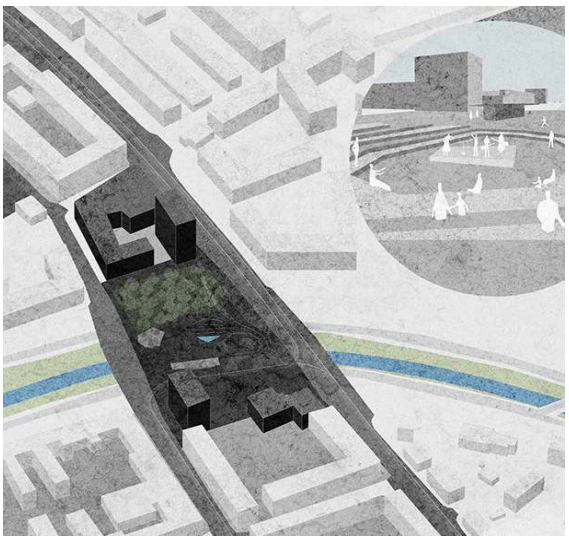
[5] Placemaking and the Future of Cities, 2012. *Project for Public Spaces*, UN HABITAT Sustainable Urban Development Network (SUD-Net), https://www.pps.org/article/placemaking-and-the-future-of-cities [Accessed 20 rd September 2018].

[6] Vujadinović, M., A Tipological 2016, Classification of neighborhood public open spaces: A Case Study of Novi grad – Podogorica, *Facta Universitatis*, Series*: Architecture and Civil Engineering*, Vol. 14, pp. 111-121.

- Improve Streets as Public Spaces
- Create Squares and Parks as Multi-Use Destinations
- Build Local Economies through Markets
- Design Buildings to Support Places
- Link a Public Health Agenda to a Public Space Agenda
- Reinvent Community Planning
- Power of 10
- Create a Comprehensive Public Space Agenda
- Lighter, Quicker, Cheaper: Start Small, Experiment
- Restructure Government to Support Public Spaces

At the end, many cities around the world have already conducted research and developed studies related to the potential use of public space in urban areas.[7]

Multiplied square
a new public structure on Marktplatz
CAESAR ZUMTHOR ARCHITEKTEN



NEW HOC HBERGERPLATZ
A comm.unal space above the Viese River
FOCKETYN DEL RIO STUDIO

Figure 1: Potential appearance of parts of the public space of the city Basel[8]

The broadest frame of public space definition contains even spatially narrower categories. That pertains to Micro public Spaces.

3. MICRO PUBLIC SPACES

The term Micro Public Spaces (hereinafter: MPS) is still insufficiently determined. In any case, it's tightly connected with the before mentioned theories on the relationship between space and society.

What's to be labeled as a MPS is, therefore dependent of many factors. This concept can be interpreted in various ways by urbanization or architecture professionals, NGOs, politicians and more or less rigid legal norms, and even citizens themselves.

[7] Analysis Public Spaces – City of Adelaide, 2011.

https://www.cityofadelaide.com.au/assets/documents/ACC_edited_Adelaide_PSPL2011_02_Public_Spaces.pdf [Accessed 17th September 2018]; Gathering Basel – Six strategies for public space, 2017. SaM Schweizerisches Architekturmuseum, *Forum Basel Exhibition, 20.05.17-18.06.17*, Basel, Switzerland

https://static1.squarespace.com/static/5703f93b9f72661a35f2f9be/t/5967dcbed2b857b20e830403/1499978989756/GATHERING-BASEL-BOOKLET-difusion.compressed.pdf [Accessed 15th September 2018].

[8] Image: Gathering Basel – Six strategies, p. 2. [Accessed 15th September 2018].

Form the architectural viewpoint, MPS concept could be compared to what Hiller calls impermeable public open space: “The impermeable public open spaces belong to spaces that do not have access value as they do not connect the open and the closed spaces and they are not on every day used paths in terms of easier socialization, unless they have a specific function that will gather more users in one place. These are usually spaces that are not arranged or that are just treated by soft landscaping. Hillier defined them as "trivial islands" – they are out of pedestrian movement lines and they are not defined as islands in a spatial sense. If these places do not have a clearly defined purpose (children's playground, recreation, rest), they should be arranged so to give users a reason to stop or to spend some time in those spaces.”[9]

The term MPS, observed from this angle is, however, slightly one-sided. That’s why there’s a need for it’s broader, multidisciplinary definition, which includes the viewpoints of all the elements urban political science recognizes. Since this concept is not sufficiently determined, neither in scientific, not in professional literature, and not even in regulation in national legal systems, there’s a need for its broader definition. That’s why, perhaps, we should start from its negative determination – what, in fact, MSP isn’t?

Figure 2**:** Public and private - View of the central tourist streets in Zagreb - Tkaličićeva Street Vineyard, public staircase and courtyards as the center of touristic events[10]

1. Firstly, it definitely isn’t a yard in a private property of individual households in the residential parts of the city.

There’s a clear distinction between public and private, although even this question can be a bit polemical. [11]

2. MPS definitely isn’t a space in any rural environment.
3. MPS also isn’t the urban parts proclaimed as city parks as already existing city parks, not are they bigger squares as already arranged multipurpose units and spaces with public purpose.

[9] Vujadinović, M., 2016. A Typological Classification of neighborhood public open spaces: A Case Study of Novi grad – Podogorica, *Facta Universitatis*, Series: *Architecture and Civil Engineering*, Vol. 14, p. 119.

[10] Photos by author. Zagreb, Gornji grad – Medveščak, Tkalčićeva Street, 24.9.2018.

[11] A good example for this argument is the city of Zagreb. A part of the city center, more precisely the city quarter Gornji grad – Medvečak, is the oasis of the MPS. The whole part of the Gornji grad is a very original example of state care, as well as the care of local authorities and the city district about the preservation of the traditional urban and architectural of this part of the city and of Zagreb as a whole, whose origin is related to the XI century. How important is the public interest the old core of Zagreb, and how it’s much more significant than the private interest of the owners of the property, show private properties that still house vineyards. How important this urban oasis is, shows the creation of a relatively new, specific cultural and tourist event called “Dvorišta”, which has allowed citizens of Zagreb and tourists, for several years now, to visit these private estates, enjoy good music, drink and socialize, which is a good example of linking public and private interests. The goal of this event is that citizens, whenever they meet in Gornji grad, find entertainment and enjoyment in this micro-urban paradise, as well as a unique natural atmosphere in the vineyards. This manifestation is supported by both the private and public sector, and among others the Tourism Organization of the City of Zagreb and the city of Zagreb itself. After just a few years, this event is already considered as one of most successful manifestation held in the city of Zagreb. More information: Oživljena zagrebačka dvorišta: Nove zvijezde kulturne I turističke ponude grada Zagreba, Novi list, 22.7.2016.

http://www.novilist.hr/Kultura/Ostalo/Ozivljena-zagrebacka-dvorista-Nove-zvijezde-kulturne-i-turisticke-ponude-grada-Zagreba?meta_refresh=true [Accessed 26th September 2018].

4. MPS can only be spaces with a clearly defined purpose (playgrounds, places for recreation and relaxation which are abandoned and underutilized), and which can have not just one, but multiple different purposes.

Therefore, **MPS can be determined as a urban, mostly public space, with a possible multi-practice usage for entertainment, rest, recreation, fun, satisfying citizens need for culture, or more specifically, socializing citizens with their urban environment. Those can be spaces between residential household, left behind green areas, small squares and playground with no special content, as well as various other spaces which hold a possibility of multidimensional public usage, which work to create a symbiosis between people and the space they live in, and which can, as such, be closely determined with regulation.**

Here is a good example of a micro public space, which would be covered by the previous definition, and comes from one city in the United States. The City of West Hollywood has launched the latest of its new micro-parks 2017. Two Tiny Park spaces have been installed on the City's Eastside.[12] Another example is from the municipality of Gornji grad - Medveška, Zagreb. A small monument and park on one of the small squares that keeps the authentic features of this city district is an excellent example of arranging a micro public space.

Figure 3: Photo by Garen Gary Srapyan Courtesy of the City of West Hollywood.[13]

Figure 4: Municipality Gornji grad – Medveščak, City of Zagreb[14]

A space defined as such, mostly targets a relatively small number of citizens and other stakeholders, and can thus bring its own implications to the shape of citizen participation.

4. CIVIL PARTICIPATION AND MPS: Basic for Urban Contract

"Participation is the right to participate in community governance, a process allowing participation, influence and control of decision-making, but also learning about how to perceive, recognize, and accept different opinions, feelings, values and knowledge. Citizens' participation contributes to creation of an active citizenship, affects the development of skills and social awareness, and contributes to establishing new relationships and relocation of power and resources in management of local and urban development. An approach based on participation means an involvement of different stakeholders so their attitudes, opinions and problems are considered and included in the planning process. "[15]

Civil participation implies participation in the process of formulation, adoption and implementation of public policy. Civil participation is been accomplished through the development of awareness for what are the concrete needs of citizens and how to meet these needs, through ensuring citizens' influence on the future of the local community, developing mutual trust between citizens and local authorities, providing support for

[12] City Thinks Outside the Box with Two "Tiny Park" Public Spaces, City of West Hollywood, 10.5.2017. https://www.weho.org/Home/Components/News/News/6771/ [Accessed 27th September 2018].

[13] Ibid., https://www.weho.org/Home/Components/News/News/6771/[Accessed 27th September 2018].

[14] Photos by author. Zagreb, Gornji grad – Medveščak 24.09.2018.

[15] Čolić, R., Mojović, Đ., Petković, M., Čolić, N., 2013. Vodič za participaciju u planiranju urbanog razvoja, Ambero Consulting, Beograd, Srbija. p. 18.

local activities and investments, as well as by increasing the participation of citizens in the implementation of joint projects. [16]

Contemporary urban planning practice includes different practice of participation within the overall planning process. There are two basic forms of civil participation: official/formal (defined by law, local government statute or other legal acts); and informal forms of consultation and negotiation, which are not explicitly prescribed, which can be applied by authorities depending on their needs and situation. Therefore, participation can be marked as a formal (compulsory) and informal (alternative).[17]

Nowadays, as standard forms of formal participation we can identify public insight and public debate. These instruments of participation are normatively prescribed as binding forms in the field of urban planning. In addition, this is been indicated by the general regulation in the field of environmental protection, which established an integral environmental protection system in the Republic of Serbia.[18] The law also includes citizens' participation in adoption of all planning documents and programs, including those related to spatial and urban planning. Spatial and urban plans, i.e. other plans and programs must be subject of public insight. The public has a right, in accordance to the law, to participate in the decision-making process on the strategic assessment of the impacts of spatial and urban plans, i.e. the assessment of the impact of projects on the environment while public presentation of projects and public discussion. [19]

Informal participation includes civil participation that is not legally binding, but express possibility and aspiration of broader circle of actors to get involved in the decision-making process. Some of these forms, especially important for the organization of the micro public space, are informal collective actions, neighborhood initiatives, neighborhood councils etc. In addition to obligation of informing citizens on the initiatives of local authorities and citizens' right to submit petitions, these forms can be crucial when it comes to the use and different purposes of MPS.

Therefore, citizens' participation, as well as information and good communication of local authorities with citizens and other stakeholders can be crucial for the regulation of micro public space.

Stakeholders are able, via informal participation, to take an active part in decision-making related to use of MPS, through dialogue with local authorities, especially joint meetings, round tables, as well as self-organizing of larger neighborhood buildings, streets, city districts etc.

Urban art movements, non-governmental organizations, specific art studios are also important actors having an influence for the purpose of the micro-public space. They are increasingly trying to design and implement projects that define the possible purpose and use of MPS.

One of such projects is Urban Living Room. Eddy Kaiser, one of the artists behind the infamous Flying Grass Carpet, has launched a new project, before few years - The Urban Living Room. The Urban Living Room is a small living room in public space. Completely painted blue, the projects aim to give people a more homely experience in public space as well as stimulating spontaneous meetings and conversations. The aim of the Project is to support dialogue and connection in public realm. The Urban Living Room is collaboration between Kaiser's Studio ID Eddy and the Powerboat Theater collective. Powerboat will organize small events and happenings when the small blue living room pops up at a spot.[20]

[16] Milosavljević,B., 2006. Građansko učešće na lokalnom nivou, Stalna konferencija gradova I opština - SKGO, Beograd, Srbija, pp. 3-18.

[17] Čolić, R., Mojović, Đ., Petković, M., Čolić, N., 2013. Vodič za participaciju u planiranju urbanog razvoja, p. 21.

[18] Milenković, D.,2006. Pravo zaštite životne sredine, Viša politiehnička škola u Beogradu, Beograd, Srbija pp. 59-132.

[19] Zakon o zaštiti životne sredine, „Službeni glasnik RS" br. 135/04, 36/09, 72/09, 43/11, 14/16, par. Art. 81.

[20] The Urban Living Room. PoP Up City, 2012. https://popupcity.net/the-urban-living-room/ [Accessed 30th September 2018].

Figure 5**:** Eddy Kaiser – Project Urban living room: Small living room in public space, Rotterdam 2012.[21]

However, the most important of all is to understand the role of local authorities and local public administration. In the essence and according to legal framework, it is a key player in this process.

That's why local authorities must understand the need to revive MPS. Following, local authorities must provide relevant information for the organization of the MPS. Local authorities need to listen to the needs of citizens including creation of micro-social environment as part of public space, having an importance for local community. Last but not least, the local authorities must follow the artistic, cultural and modern tendencies in the urban planning of the MPS.

Dialogue between local authorities and different actors, in any form, is crucial. However, it can also depend on the characteristics of the MPS. When it comes to MPS where there is open access to a large number of citizens, local authorities are more interested in creating, financing and realizing the process of space socialization. When this is not the case, there is a less impact of politics, but then problems of financing and realization are possible.

Any case, local authorities must engage in a dialogue with citizens and other actors, making a form of "urban contract", in order to improve urban planning and find new ways of using the MPS. That’s why MPS today becomes an important issue of urban politicology.

5. MPS – Short Case Study at the City of Belgrade

The organisation of the MPS in the city of Belgrade has been lasting for several years now. It seems, however, there is no planned way to resolve the use of MPS. It often happens that the MPS arrangement is result of single actions of particular city municipalities or city itself, i.e. municipal and city administrations, rather than the systematic way of resolving the socialization of public space in the city. However, a short survey shows that things are changing now.

It also happens that municipal/city authorities do not enter into considerable dialogue with citizens. It happens that individual, sometimes hasty solutions also cause negative reactions among citizens. It comes even to formal or informal connection of citizens leading to local protests of tenants in particular streets or city districts, or making petitions and proposals to administration.

However, this should not be reduced to the negative examples there is definitely. These examples can be considered as positive forms of civil participation, which later lead to numerous good examples in where local city authorities, in cooperation with citizens, have significantly improved use of MPS in their communities.
It is certain that open micro-public spaces take more attention of citizens. In this respect, city authorities should take into account that the arrangement and specification of the purpose of such spaces cause a general public reaction, and therefore require a wider participation of citizens and other actors rather than unilateral decisions.

In addition, any action in the central city area provokes greater sensitivity of citizens, meaning that wider participation and consultation with different actors become necessary.

[21] Ibid.

A good example of the symbiosis of citizen participation and city authorities in Belgrade is the arrangement of MPS in Macvanska Street and the renaming of a part of the street into the street of the famous Belgradian writer and painter Momo Kapor. The arranging of MPS was completed after a strong initiative by the citizens, especially the famous water polo player Slobodan Soro, one of the tenants in this street. Process began with a protest and petition of tenants in August 2015, demanding relocation of an old and neglected gas station and surrounding barracks, and bringing this space into a new purpose. After the modification of the detailed regulation plan, the project bureau Zelenila Beograd made a preliminary solution for this urban pocket based on the results of neighboring workshop. That's how Momo Kapor Square is been emerged, which was completed and solemnly opened on December 28, 2016. [22]

Figure 6: Start and the end: Conceptual three-dimensional solution and photos from opening Momo Kapor Square 28.12.2016[23]

There are also many other examples where initial conflict or misunderstanding led to cooperation between citizens and local authorities. At this point, we enter into the field of contemporary social theories, above all Jürgen Habermas, Niklas Luhmann and Manuel Castells on the relations of conflict and cooperation in society, that is, the relation of interaction.[24] It seems this relationship is very present when it comes to urban politicology, characterized by mentioned sociological and psychological features. It also concerns local authorities and its relationship with the citizens. According to the information issued in September 2017 by then city manager and current Deputy Mayor of the city of Belgrade, Mr. Goran Vesic, in 2017 the city of Belgrade has allocated 600,000 RSD for the organization of parks and small urban pockets, and from 2014 to September 2017, 20 projects were realized, while additional 17 projects should been realized by the end of 2017. [25]

Shortly in October 2017, then Mayor of Belgrade and current Minister of Finance Mr. Mali announced that the budget of the city of Belgrade would provide around 200 millions RSD in 2018 for inclusion of citizens in proposal and realization of ideas and projects for the arrangement of small parks, districts and street. [26]

At the level of urban municipalities that are part of central city zone, similar projects have been implemented more often, but even deserving, not always under scrutiny of general public. One example is

[22]Stanari mačvanske traže park a ne pumpu i barake. Večernje novosti, 10.08.2015. http://www.novosti.rs/vesti/beograd.74.html:562768-Stanari-Macvanske-traze-park-a-ne-pumpu-i-barake [Accessed 2nd October 2018]; Idejno rešenje Skvera Mome Kapora prema sugestijama građana – realizacija na proleće 2016, E-kapija, 21.12.2015 ,https://www.ekapija.com/news/1316243/idejno-resenje-skvera-mome-kapora-prema-sugestijama-gradjana-realizacija-na-prolece-2016 [Accessed 3rd October 2018]; Otvoren skver Moma Kapora, Politika, 29.12.2016. http://www.politika.rs/sr/clanak/371095/Otvoren-Skver-Mome-Kapora [Accessed 3rd October 2018].

[23] Photos and images: Otvoren skver Moma Kapora, Politika, 29.12.2016. http://www.politika.rs/sr/clanak/371095/Otvoren-Skver-Mome-Kapora [Accessed 3rd October 2018]; Sećanja, crteži i priče – ovako će izgledati skver Mome Kapora, Blic, 21.12.2015.

https://www.blic.rs/vesti/beograd/secanja-crtezi-i-price-ovako-ce-izgledati-skver-mome-kapora/86tr4p2 [Accessed 4rd October 2018].

[24] Pusić, E., 2007. Javna uprava I društvena teorija, Društveno veleučilište u Zagrebu – Pravni fakultet Sveučilišta u Zagrebu, Zagreb, Hrvatska. pp. 1-17.

[25] I Vračar dobija novi izgled, Mondo/Tanjug, 6.9.2017. http://mondo.rs/a1038643/Info/Beograd/I-Vracar-dobija-novi-izgled.html [Accessed 4rd October 2018].

[26] Poziv beograđanima – konkuriši za uređenje parka, kvarta, ulice, Večernje novosti, 22.9.2017

.http://www.novosti.rs/vesti/beograd.74.html:687044-Poziv-Beogradjanima-Konkurisi-za-uredjenje-parka-kvarta-ulice [Accessed 4October 2018].

reconstructed park in Braće Jerković area in Vozdovac municipality in 2017. Public green space inside the housing block between Mestroviceva, Jovan Bjelić and Braće Jerković streets, thanks to the employees of JKP "Zelenilo - Beograd", received a completely new look in May 2017, and afterwards became again meeting place for tenants and children of this quarter.[27]

Figure 7: Braće Jerković –Small Park between buildings in the city residential area[28]

Any case, city of Belgrade is increasingly following new trends in arranging and improving the purposes and content of the MPS. This process must continue in the future and get a systemic character.

6. CONCLUSION

Although the issue of arrangement of MPS is the subject of numerous scientific fields and expert discussions, urban politicology is able through its multidisciplinary approach to unify urban, architectural, legal, sociological and psychological elements. Therefore, numerous future studies of the relationship between urban life and urban development, especially in urban areas, depends on the very development of this approach.

A short study has shown that the city of Belgrade as a mega polis, in the last fifteen years also participated in specific sociological experiment of adaptation of urban areas to the needs of citizens, and reduction of so-called “urban alienation” that follows their development.

This is increasingly reflected in the renewal and adjustment of MPS purpose to the everyday needs of citizens for socializing, meeting, reducing the sense of alienation and satisfying various cultural, sports, recreational and other contents.

However, from all above mentioned, we could draw a few conclusions.

The first would be that systemic solution is necessity. Some *ad hoc* attempts have significantly reduced lack of system and structure in this area, but such measures are unsustainable in the long term. Meaning, method of determination the priorities of reconstruction and renovation, raising awareness of the need for public participation, budget planning for the costs of MPS regulation, ways of collecting and sending information on the needs of citizens etc., seeks an establishing of clear system for arranging small urban spaces. It is also necessary to significantly improve the legal framework, especially when it comes to further definition of the concept of MPS.

Citizens' consultations and participation are crucial for the socialization of MPS. Citizens know best what their needs in the public space are, especially in their streets, quarters or neighborhood. Dialogue in local city and municipality administration is necessary and should not lead to hasty urban solutions, without respecting true needs of citizens for different contents in the MPS. In any case, this is a relationship that can have, from a theoretical standpoint, different outcomes: conflict with local administration; cooperation with local administration; as well as a relationship of permanent conflict and cooperation that will lead to a new higher value - socialization of the MPS.

In the concrete case of the city of Belgrade, we can notice that it is necessary to encourage cooperation with actors, and this should have a special priority in the future. For example, architectural studies are not

[27] Novi kutak za mališane u Braće Jerković, Blic, 16.5.2017.https://www.blic.rs/vesti/beograd/nov-kutak-za-malisane-u-naselju-brace-jerkovic/qpedhfc [Accessed 4rd October 2018].

[28]Author of photos: Gradsko zelenilo – promo 2017. https://www.blic.rs/vesti/beograd/nov-kutak-za-malisane-u-naselju-brace-jerkovic/qpedhfc [Accessed 4rd October 2018].

significantly recognized as potential partners of the City of Belgrade in this process. Realized projects mostly arise from urban and architectural solutions of Gradsko Zelenilo; so a significant stimulus would be if other architects would be involved in the planning of architectural solutions. There is not enough knowledge about the possible participation of private sector in financing and reconstruction of the MPS through financial support. Citizens' associations, especially when it comes to the needs of children and the elderly, could also participate more significantly, especially in creating conceptual designs for organization of MPS. Finally, some forms of public-private partnership in the organization and socialization of MPS could also come into consideration in the future.

Self-sustainability is a special problem. It is still common that renovated MPSs soon become abandoned and no enough utilized places. One of the reasons is there are no other contents that would follow the significant use of MPS. For example, renovated small parks between buildings become quickly filled with garbage because there is no coordination for utility services. Momo Kapor Square and other renovated small squares, especially in the summer months, could be a gathering places for painters and writers, classic music performance etc., but this requires connecting associations and citizens, professional associations of writers and musicians as well as new urban incentives. Frequently renovated public spaces are an easy target for vandals, and for better prevention of such phenomena, better cooperation between police and local community is necessary. In the long term, renovated MPSs become what they used to be: neglected and ugly places even more frightening to citizens, which stop being places of their urban socialization.

The role of local authorities and citizens in the process of urban planning of micro public space, as been proved, is crucial. However, there are still many open questions to be answered. In any case, in the city of Belgrade, the process that been started, should be continued in the future.

REFERENCES

1. Čolić, R., Mojović, Đ., Petković, M., Čolić, N., 2013. Vodič za participaciju u planiranju urbanog razvoja, Ambero Consulting, Beograd, Srbija.
2. Gehl, J. 2011. Life between Buildings: Using Public Space. Island Press, Washington-Covelo-London.
3. Habermans, J., 2002, Postnacionalna konstelacija, Otkrovljenje, Beograd, Srbija.
4. Jayakody, R.R.J.C., Amarathunga, D., Haigh, R., 2016. The use of Public Open Spaces for Disaster Resilient Urban Cities, *12th International Conference of the International Institute for Infrastructure Resilience and Reconstruction, 05th – 08th August*, 2016, University of Peradeniya, Kandy, Sri Lanka
5. Milosavljević,B., 2006. Građansko učešće na lokalnom nivou, Stalna konferencija gradova I opština - SKGO, Beograd, Srbija
6. Milenković, D., 2013. Javna uprava – odabrane teme, Fakultet političkih nauka, Univerzitet u Beogradu -Čigoja štampa, Beograd, Srbija.
7. Milenković, D.,2006. Pravo zaštite životne sredine, Viša politiehnička škola u Beogradu, Beograd, Srbija.
8. Pusić, E., 2007. Javna uprava I društvena teorija, Društveno veleučilište u Zagrebu – Pravni fakultet Sveučilišta u Zagrebu, Zagreb, Hrvatska.
9. Vujadinović, M., 2016. A Typological Classification of neighborhood public open spaces: A Case Study of Novi grad – Podogorica, *Facta Universitatis*, Series: *Architecture and Civil Engineering*, Vol. 14, pp. 111-121.
10. Zakon o zaštiti životne sredine, „Službeni glasnik RS“ br. 135/04, 36/09, 72/09, 43/11, 14/16.

INTERNET SOURCES

1. Analysis Public Spaces – City of Adelaide, 2011.

   https://www.cityofadelaide.com.au/assets/documents/ACC_edited_Adelaide_PSPL2011_02_Public_Spaces.pdf [Accessed 17th September 2018].
2. City Thinks Outside the Box with Two “Tiny Park” Public Spaces, City of West Hollywood, 10.05.2017. https://www.weho.org/Home/Components/News/News/6771/ [Accessed 27th September 2018].

3. Gathering Basel – Six strategies for public space, 2017. SaM Schweizerisches Architekturmuseum, *Forum Basel Exhibition, 20.05.17-18.06.17*, Basel, Switzerland

https://static1.squarespace.com/static/5703f93b9f72661a35f2f9be/t/5967dcbed2b857b20e830403/1499978989756/GATHERING-BASEL-BOOKLET-difusion.compressed.pdf [Accessed 15th September 2018].

4. I Vračar dobija novi izgled, Mondo/Tanjug, 6.9.2017. http://mondo.rs/a1038643/Info/Beograd/I-Vracar-dobija-novi-izgled.html [Accessed 4rd October 2018].

5. Idejno rešenje Skvera Mome Kapora prema sugestijama građana – realizacija na proleće 2016, E-kapija, 21.12.2015,https://www.ekapija.com/news/1316243/idejno-resenje-skvera-mome-kapora-prema-sugestijama-gradjana-realizacija-na-prolece-2016 [Accessed 3rd October 2018].

6. Novi kutak za mališane u Braće Jerković, Blic, 16.5.2017.https://www.blic.rs/vesti/beograd/nov-kutak-za-malisane-u-naselju-brace-jerkovic/qpedhfc [Accessed 4rd October 2018].

7. Otvoren skver Moma Kapora, Politika, 29.12.2016. http://www.politika.rs/sr/clanak/371095/Otvoren-Skver-Mome-Kapora [Accessed 3rd October 2018].

8. Oživljena zagrebačka dvorišta: Nove zvijezde kulturne I turističke ponude grada Zagreba, Novi list, 22.7.2016.

http://www.novilist.hr/Kultura/Ostalo/Ozivljena-zagrebacka-dvorista-Nove-zvijezde-kulturne-i-turisticke-ponude-grada-Zagreba?meta_refresh=true . [Accessed 26th September 2018].

9. Placemaking and the Future of Cities, 2012. Project for Public Spaces, UN HABITAT Sustainable Urban Development Network (SUD-Net), https://www.pps.org/article/placemaking-and-the-future-of-cities [Accessed 20rd September 2018].

10 . Poziv beograđanima – konkuriši za uređenje parka, kvarta, ulice, Večernje novosti, 22.9.2017. http://www.novosti.rs/vesti/beograd.74.html:687044-Poziv-Beogradjanima-Konkurisi-za-uredjenje-parka-kvarta-ulice [Accessed 4rd October 2018].

11. Sećanja, crteži i priče – ovako će izgledati skver Mome Kapora, Blic, 21.12.2015.

https://www.blic.rs/vesti/beograd/secanja-crtezi-i-price-ovako-ce-izgledati-skver-mome-kapora/86tr4p2 [Accessed 4rd October 2018].

12. Stanari mačvanske traže park a ne pumpu i barake. Večernje novosti, 10.08.2015.

http://www.novosti.rs/vesti/beograd.74.html:562768-Stanari-Macvanske-traze-park-a-ne-pumpu-i-barake [Accessed 2nd October 2018].

13. The Urban Living Room. PoP Up City, 2012. https://popupcity.net/the-urban-living-room/ [Accessed 30th September 2018].

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CONCEPTUALISING MULTIFUNCTIONALITY OF PUBLIC OPEN SPACES FOR SUSTAINABLE URBAN DEVELOPMENT

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ABSTRACT

Multifunctionality of urban green and civic spaces has widely been recognised as important for achieving urban sustainability and resilience, and for linking nature and culture. In literature, as well as in urban planning and design strategies, it is assumed that multifunctional open spaces will bring wider spectrum of environmental, social and economic benefits to urban areas. And yet, different academic disciplines understand and use this concept in different ways. This makes the application of the concept difficult to assess and manage in relation to different aspects of sustainable urban development. Through literature review, this paper analyse and compare how the concept of multifunctionality is used in various spatial disciplines (urban planning and design, landscape architecture, architecture) in order to better understand and relate its different dimensions, applications and expected benefits for urban sustainability. Based on this, a new, relational and multidimensional conceptualisation of multifunctionality of public open spaces is proposed for analysis and assessment of urban design solutions. It was further applied and discussed in relation to students projects from "Ecological urban design studio" from University of Belgrade Faculty of Architecture, as visions for development of multifunctional public open spaces in modernist mass housing area of "Sava Bloks" in New Belgrade, Serbia.

Keywords: multifunctionality, urban open space, sustainable urban development, urban planning and design

1. INTRODUCTION

How we understand shapes how we apply theoretical concepts in practice. The concept of *multifunctional space* is not new, but is nowadays widely used and promoted in different areas of spatial development (urban and landscape planning and design, agriculture, forestry, water management…). It is strongly related to sustainable spatial development, assuming that multifunctional spaces may bring wider spectrum of environmental, social and economic benefits to urban areas. At the same time, there is an on-going debate of what multifunctionality is, and how it can be best related to spatial development (Wilde 2002; Hoppenbrouwer & Louw 2005; Herndon 2011; Kajtazi 2007; Batty et al. 2004; Vreeker, DeGroot & Verhoef 2004; Majoor 2003; Haccou et al., 2007; Wiggering et al., 2006). It has been recognised that the concept is not uniquely defined, and that it is prone to different interpretations. Different academic disciplines understand and use the idea of

multifunctionality in different ways, which makes its application difficult to assess and manage in relation to different aspects of sustainable urban development (OECD1998, 2001, 2003).

At the same time, the idea of what (urban) functions are changes as well. New integrated approaches to spatial development developed in urban planning and design, recognise new dimensions of functionality, and affirm the wider meaning of this term. For example, in her theory of integral urbanism, Nan Elin postulates the realization of *new functionalities* of an urban space that supports urban vitality. In this approach, functionality refers not only to classical urban functions - activities and use of space - but also ecological, emotional, symbolic and spiritual functions of space (Elin 2006). Moreover, in the field of landscape planning and architecture, the concept of ecosystem services is gaining much attention as new way of perceiving relation between nature and culture, attributing to Nature different values for spatial development (Fish et al. 2016).

This paper aims to contribute to the debate on meaning and use of concept of multifunctionality for sustainable spatial development, by specifically focusing on public open spaces in urban contexts. In seeking for *how to conceptualise multifunctionality of public open spaces to best support urban sustainability*, it offers a *conceptual and theoretical analysis* of the meaning and scope of the concept of multifunctionality of spaces in different spatial disciplines (urban planning and design, landscape planning and architecture). The aim of the analysis is to derive and determine various dimensions and different interpretations of the notion of functionality of spaces (on the basis of which this concept has acquired a different interpretation and application in the analysed discipline), and to relate them to sustainable urban development.

Based on findings, in the second part of the paper, we develop a new relational and multidimensional analytical framework for reading and evaluating multifunctionality of public open spaces in relation to ecological, socio-cultural and economic aspects of sustainable urban development, and showcase its application in the context of modernist mass housing area, through visionary students projects from “Ecological urban design studio” from University of Belgrade Faculty of Architecture.

2. UNDERSTANDING (MULTI)FUNCTIONALITY IN SPATIAL DISCIPLINES

2.1. What is multifunctionality?

While functionality refers to the *ability to perform a task* or a function, multifunctionality is *a feature* of space, artefact or activity that means having or fulfilling several functions and, consequently, achieving multiple outputs, purposes or goals at once. This meaning is relative and depends on which medium is considered as the carrier of a function - space, object, or activity (or even process). In addition, multifunctionality can also be understood as a *value* that contributes to the simultaneous solution of multiple problems or the achievement of multiple benefits. But it is not value per se; it becomes value only when related to specific purpose and goals (OECD 2001).

Based on this, the analysis of multifunctionality is possible on two grounds: on the *supply side* and *on the demand side* (OECD 1998). The multifunctionality, viewed from the side of the offer, can be seen as a characteristic (of object or process) that enables realisation of the activities that achieve desired effects, which can be intentionally or consequently realised. Observed from the demand side, multifunctionality is viewed as a social goal. Such a perspective starts from social expectations in relation to activity (use) and is related to a particular territory (Huylenbroeck et al. 2007).

2.2. Multifunctionality in SPACE and TIME

Conceptualized as a characteristic of space, multifunctionality refers to "*the possibility of having more than one activity or function in the same SPACE and / or at the same TIME*" (Batty et al. 2003). In that sense, it is seen as a characteristic of the space that enables *synchronic or diachronic* realization of various economic, social and environmental benefits.

Multifunctionality of space is a *relative concept* that depends on the spatial coverage that is the subject of the analysis (SCALE), or the spatial situation in which multifunctionality is considered. For example, in the size of the whole city it is always possible to identify multifunctionality, but it can be a set of fragments of mono-functional areas (Majoor 2003). In addition, whether a site has one or more purposes or activities, also depends on its capacity to host activities with specific space requirements (Batty et al. 2003). The concept of multifunctionality of space is an important topic not only in urban planning and design, but also in other spatial disciplines such as landscape planning and architecture, forestry, agriculture. However different scientific

disciplines have different understandings and interpretations of this concept that we will further consider in more detail.

2.3. Multifunctionality in urban planning and design: multifunctional USE of space

The multifunctionality came into focus of urban planning and design theory and practice due to problems of spatial fragmentation, social segregation and traffic congestion, perceived as indicators of the decline in the ecological, social and economic quality of modern cities. Functional-segregation doctrine of modern urbanism has been perceived as a key cause of the mentioned problems (Jacobs 1961).

Opposed to that, the concepts of *mixed use of space* and *multifunctional land use* were offered as a way to achieve better land utilization and greater vitality of the city. These concepts may be applied at different spatial scales and to both buildings and open spaces (Majoor 2003). While mixed use of space is related to enabling residential, commercial, cultural, institutional, or entertainment activities to take place in certain area, multifunctional land use is understood as combination of different socio-economic functions in the same area, where the focus is on achieving social and economic benefits from the USE OF SPACE (Vreeker, DeGroot & Verhoef 2004). Several different planning and design approaches to mixed land use were developed, such as "new urbanism", "smart growth", "compact city", etc. They differ in the purpose of multiplying functions in space, and in spatial scale they are applied, but in all these approaches use of urban land stands at the core (Živković at al. 2012). Based on literature review (Wilde 2002; Hoppenbrouwer & Louw 2005; Herndon 2011; Kajtazi 2007; Batty et al., 2004; Vreeker, Groot & Verhoef 2004; Majoor 2003; Haccou et al., 2007; Wiggering et al., 2006), the following types of multifunctional land use can be identified in relation to space and time:

- *Mixed use of the land* - means that the different functions are interconnected in a certain area;
- *Multiple use of the land* - different functions exist within the site, not necessarily integrated;
- *Multifunctional use* - includes both horizontal and vertical combining of functions in order to achieve synergies;
- *Multifunctional use over time* - space can have different functions at different moments.

In urban planning and design, multifunctionality of urban open spaces refers to use of both civic (build) and green spaces. Different types of urban open spaces, such as parks, gardens, edges, playgrounds, squares, pedestrian zones, wildlife habitats in urban areas can have variety of functions and be used for different activities: recreation, play, movement, education, wildlife habitat setting, landscaping, agriculture, community development (Waters & Smith 2002). Although the application of the concept has historically been linked to central locations, it has, over time, extended to other parts of the city. But, until recently, functionality of land per se (ex. ecological value of undeveloped areas) was not taken fully into account in evaluation of urban areas. Besides that, in practice, multiplying and increasing use of some urban green open spaces, caused their degradation and undermined their ecological sustainability.

2.4. Multifunctionality in landscape architecture and planning: landscape and ecosystem SERVICES

Within the disciplines of landscape planning and landscape architecture, the concept of multifunctionality of space uses *ecology* as a starting point, and is based on the understanding of relationships and processes in nature. The landscape is understood as "*an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors"* (European Landscape Convention 2000) and landscape functions are the benefits it brings to human well-being (Willemen 2010). In this approach the function of space is understood as *landscape function-service* and denotes the capacity of the area to provide goods and services to society. Goods and services that *various types of landscapes* provide include: production of food and timber, water purification and climate regulation, biodiversity, aesthetics values and opportunities for recreation (Hine et al. 2008). The provision of these services is based upon the performance of *ecological structures, processes and functions* (De Groot & Willemen 2010)

Multifunctionality in that sense, relates to the phenomenon that the landscape can provide multiple tangible and intangible goods and services that meet social needs or respond to social or economic requirements (Wiggering et al., 2008). From this perspective, urban open spaces are perceived as part of urban landscape, and their functionality is perceived as landscape functions based on (natural and cultural) *ecosystem services*. Landscapes themselves have various dimensions of quality that can be linked to various options of socio-spatial development. But, in practice, due to traditionally favouring nature over culture, there is a tendency in landscape disciplines to apply too conservative attitude towards natural elements in urban areas without fully taking into account social and economic issues; to maximise *quantity* of green spaces in urban areas without

considering economic sustainability, and to underestimate (or even perceive as negative) the value of *built* open spaces for urban life and development. This restricts full use of the concept of multifunctionality of landscapes and urban open spaces for sustainable urban development.

2.5. Meanings and dimensions of multifunctionality of space

Our analysis reveals that conceptualisation of multifunctionality of space is possible on several grounds. It can be understood from spatial and temporal, as well as from the use and service perspective. At the same time, multifunctionality of space has being differently understood and interpreted in different spatial disciplines. Each of these perspectives stresses one aspect of relation to urban development. Seen individually and disciplinary, they don't fully use the potential of urban spaces for sustainable urban development.

Possibility to understand multifunctionality as a feature (of space), but also as a value that contributes to the simultaneous solution of multiple problems or the achievement of multiple benefits, forms the basis for linking multifunctionality and sustainable development. Based on this, multifunctionality can be understood as *a tool* for urban ecological, social and economic sustainability, as well as a normative concept that evaluates the quality of sustainable development policies. However, although multifunctionality *can support* sustainable development, it doesn't guarantee sustainability (OECD, 2001).

This is especially important for planning and designing public open spaces, as urban spaces that are generally open and accessible to variety of people, and where their sustainability depends on how they are perceived and valued by people. Therefore, based on results of our literature review, in the next section we will focus on the relation between public open spaces and sustainable urban development, and draft a basic conceptualisation of multifunctionality of public open spaces for better achievement and harmonisation of different aspects of sustainability.

3. CONCEPTUALISING MULTIFUNCTIONALITY OF PUBLIC OPEN SPACES FOR SUSTAINABLE URBAN DEVELOPMENT

3.1. Sustainability

Sustainability is value-based, resource and goal-oriented concept and refers to the use of resources, human, natural and man-made, in ways that allow current generations to satisfy their needs without jeopardising the capacity of future generations to meet theirs. The concept of sustainable development tends to *balance and integrate environmental issues and socio-economic development* in order to equitably meet developmental and environmental needs of present and future generations, improve quality of life standards for everyone, and better protect and manage ecosystems. Anthropocentric and focused on human well-being, this approach involves taking care of the overall living and non-living environment, understanding that people depend on healthy ecosystems as much as they depend on other people. Such a perspective gives great importance to human life, but also accepts that human culture owes its existence to nature. In this sense, sustainability is a requirement for long-term social, cultural, economic and environmental health and vitality (Živković 2000).

In urban planning and management, this approach represents a breakthrough in relation to the traditional movements of environmental protection and improvement, focused primarily on the quality of the natural environment and its protection. It presupposes the possibility that destructive behaviours are transformed towards a more productive and healthier environment and "represents a process of social transformation in which all vital functions of the community are maintained indefinitely and without jeopardizing the basis on which they are based" (Bajić Brković 2000). Understood in this way, the key to sustainable development is harmonisation of ecological, socio-cultural and economic values and goals.

3.2. Why are public open spaces important for sustainable urban development?

In the broadest sense, urban open spaces are all physically un-built spaces within the city's territory (Vesnic Neđeral 1990). They represent integral parts of the urban structure and have their own values through which they contribute to the quality of life in cities. In this sense, open spaces can be planned, and designed to *perform various functions,* such as: movement and traffic, recreation, gathering, trade, utilities, water management ..., but also "non-urban activities" such as agricultural production, forestry and conservation of nature's area in the city. Their basic purpose is closely related to their position in the city structure (center, built area, periphery) and to urban activities in surrounding areas (Živković & Vasiljević 2010).

The function of urban open spaces is conditioned by their materiality and enabled by their physical structure. In this sense, they differ in relation to the presence and level of change of natural features of space. They exist in wide range of forms as built (civic) and green open spaces. Taking into account the specifics of urban needs, the pluralism of interest and the complexity of life in the city, all the categories of open spaces are equally important for the quality of life in the city (Živković 2000).

Public open spaces (POS) are simultaneously part of urban open space system and part of public sphere. They are *social spaces* that are open and accessible to people. Besides their aesthetic and functional qualities, public spaces have different social functions and contribute to urban identity. They operate as the arenas for social interaction and places for cultural exchange (Đukanović & Živković 2015). Publicness of space is related to its vitality, activity and awareness (Jacobs, 1961) and to spatial rights of: access, freedom of action, change and ownership (Low, 2002). Public spaces can be shared or contested; abandoned or used; on permanent or temporary basis. These places are also "*containers of collective memory and desire... and places for geographic and social imagination to extend new relationships and sets of possibility*." (Corner 2006: 32). As such, they can serve as integrative element of urban structure and contribute to urban sustainability based on their ecological, socio-cultural and economic values (Kaufmann-Hayoy et al 2007):

- THE ECOLOGICAL VALUE of urban open space is based on its bio-physical characteristics that support natural systems and biodiversity. All components of urban green infrastructure have ecological value per se, but built open spaces can contribute to ecological sustainability of urban areas too. If well located, planned and designed based on ecological and bio-climatic principles, they can enhance environmental quality of urban space by effecting urban climate, water and air quality.
- THE SOCIO-CULTURAL VALUE of urban open space is many-fold. First, they can function as community meeting places for different levels of social interaction and engagement: places where people meet, communicate or collaborate in different community activities, thus contributing to social sustainability of the area. At the same time they can function as places where strangers encounter and mix up in pleasurable or contesting events, expressing the “right” to the city, contributing to sustainable urban development by nurturing democratic culture. Public open spaces also have a cultural dimension, since through symbolic representation and everyday practices they contribute to the formation of local cultures and identities.
- THE ECONOMIC VALUE of urban open space is based on their capacity to function *as resource* for various economic sectors: agriculture, forestry, leisure and tourism…In addition, high quality and convivial public open spaces make cities and urban areas attractive for tourists and new inhabitants, by providing positive image of place that is desirable for living and visiting.

Besides contributing to urban sustainability by bringing new *values* to urban areas, public spaces can also be perceived as *indicators* of urban sustainability. Negative phenomena in the urban areas, such as ecological degradation, economic weakening of the area, vandalism, un-safety, neglect, under-use and devastation of space, are manifestation of unsustainable life patterns and urban development policies. Sustainable spatial development implies that the one-dimensional economic or biological understanding of the urban open space as a resource, which is used and managed for that purpose, is enriched by the perception of the open space as a result, the expression of complex interactions between different factors and as a social construct, or living space that can be promoted by human activity. Conceptualised as part of urban landscape, public open spaces are social and biophysical expression of the society and indicator of sustainable development - "*a constant living test for spatial planning, a set of signs that reflect the history of the territory and the suitability or inconsistency of human practices in the living space*" (Naranjo 2006, pp. 64).

3.3. Multifunctionality of public open spaces for sustainable urban development

Based on previous discussions,iIn order to fully use the potential of the concept of multifunctionality in developing public open spaces, we propose a matrix as an analytical model that relates different dimensions of multifunctionality of public open spaces to the ecological, socio-cultural and economic aspects of sustainability. In this framework multifunctionality of public open space is understood as feature, characteristics that becomes value only when *related to* certain set of development goals in specific context. At the same time, multifunctionality of public open space is perceived as *multidimensional* in order to better relate to various aspects of sustainable development (ecological, socio-cultural, economic) and thus contribute to their balance. Dimensions of multifunctionality are defined in relation to: space, time, use and services provided by land:

- SPACE dimension of multifunctionality refers to how different functions are distributed in space horizontally and vertically, as well as in relation to scale (location, area, …). Mixed, multiple and multifunctional use may be considered.
- TIME dimension of multifunctionality refers to how different functions are distributed in time – synchronic and diachronic multifunctionality is possible. "Diachrony" refers to the disposition(s) of functions across time. "Synchrony" refers to the disposition of different functions at one specific moment in time.
- USE dimension of multifunctionality refers to provision of posibillities for people (and other living beings) to use space in different ways, realised through design that enables certain activities and/or through organisation of events in space and time.
- SERVICE dimension of multifunctionality refers to capacity of land (natural or built) to provide various tangible and intangible goods, services and amenities (comfort, aesthetic…) to people and nature

Different dimensions are related to different aspects of sustainability in order to reveal possible positive and negative impacts (Table 1).

Table 1 – Public open space multifunctionality and aspects of sustainability

DIMENSIONS OF MULTI-FUNCTIONALITY	ASPECTS OF SUSTAINABILITY		
	Ecological	Socio-cultural	Economic
SPACE	Increase of activities in space may diminish its ecological value. At the same time ecological value of space can be protected by revealing it to users through various activities.	Increase of possible different uses in space attracts more people and thus supports sociability. Level of sociability depends on how activities are distributed as dispersed, concentrated and how are they linked and combined.	Increase of activities in space increase attractiveness for different user groups and supports local economies, investments and rents in surrounding areas. However, harmonisation between financing management of public open spaces and their overall size is necessary.
TIME	Increase of intensity of use of space in time, may diminish its ecological value. Natural, vulnerable spaces may be especially endeared. Controle of intensity of multifunctional use is paramount.	Increase of possible different uses of space in time affects socio-cultural values of area depending on its synchronicity (that helps concentration of people) or diachronic organisation – that supports continuity of socialisation in space for different user groups.	Increase of activities in time increase attractiveness for different user groups and supports local economies, investments and rents in surrounding areas.
USE	Not only increase of number and diversity of activities in space and time but also type and character of activities is important for increase or reduction of ecological values.	Increase of possible different uses space attracts more people and contribute to chances for people to meet. Level of sociability depends on type of activities provided or enabled and how are they linked and combined.	Increase of use is related to increase of attractiveness of space and supports investments and rents in surrounding areas.
SERVICE	Multiplication of land functions and services for people help revealing different values of Nature and in that way protect natural features in urban environment.33	Increase of environmental comfort and aesthetics through land and ecosystem services increases social usage of space and helps construction of positive identity of the area.	Increase of environmental comfort and aesthetics through land and ecosystem services increases economic value of urban area.

4. MULTIFUNCTIONAL PUBLIC OPEN SPACES FOR SUSTAINABLE DEVELOPMENT OF MODERNIST MASS HOUSING: CASE OF SAVA BLOCKS IN NEW BELGRADE, SERBIA

In this section conceptual model for analysing and evaluting multifunctional public open spaces is applied on visionary students urban design projects. The aim is to determine how various dimensions of multifunctionality contribute to sustainable development of public promenade in modernist mass housing

area. Examples have been selected to showcase *different approaches to multifunctionality of public open* spaces addresing the same problem of underuse of green public promenade and gathered arround *water* as natural element in urban space and common theme that leads urban design visions.

4.1. Context and purpose of developing multifunctional public open spaces

"Sava Blocks" in New Belgrade, Serbia is a modernist mass housing area that comprises several super blocks (45,44,70) that are inter connected with two parallel green promenades: centrally located "Lazaro Kardenasa Promenade" and "Sava river Promenade". These promenades form a part of well developed public open space system of super-blocks, characterised with high quantity of green public open spaces, but also with the problem of their underuse and neglect, especially in Lazaro Kardenasa promenade and inner areas. Therefore, the purpose was to investigate possibilities for developing multifunctional public open spaces, as a places where nature and culture connect, overlap and permeate, in order to contribute to sustainable development of "Sava Blocks". Projects that will be presented have element of *water* at nature-culture nexus.

4.2. Case 1 – "Water leads to water"

The concept of the project relates to the location of Block 45 on the Sava riverfront and the identity of Block is based on presence of water. Moreover, the entire block lies in groundwater, and is often threatened by flooding. What does water mean to users and how is it possible to use water in urban design so that it contribute to the adaptation of cities to climate change? The idea is that through the multifunctionality of public spaces and adaptation measures to climate change (at area, system and local level), it is possible to create an environmentally sustainable spaces, which simultaneously protect Block 45 of floods and control drainage, and are attractive, useful and comfortable spaces for variety of users (Figure 1, Table 2).

Figure 1 - Case 1- "Water leads to water"- Milica Pavić

Table 2 – Assessing sustainability of multifunctional public open space – case 1

DIMENSIONS OF MULTI-FUNCTIONALITY	ASPECTS OF SUSTAINABILITY		
	Ecological	Socio-cultural	Economic
SPACE	Nature is recognised as mentor and metaphor and integrated in design at all spatial levels. Forms and activities that water as element in design brings, reveals values of nature,thus contributing to its protection and appreciation	Provison of different functions of water (as material or metaphor for design) at different spatial levels through authentic and designed space contributes to creation of positive identity and increase of use by different user groups.	Increase of number of activities at both system, area and location level enhances attractiveness of space for people and may contribute to investments and rent.
TIME	Time dimension is related to changes in use of water basins in relation to seasons or flooding levels. Intensity of different uses is well planned in relation to location and size of natural elements in area, thus protecting their ecological value.	Seasonal and flood-related changes of water plazas contribute to variety of uses and to positive identity. Increase in different uses of space by different user groups at synchronic or diachronic level, may contribute to sociability of area	Increase of number of different activities that may simultaneously take place increase attractiveness and economic value of space

USE	Introduction of water features supports both use of space as well asits overall ecological value by providing contact with nature.	Increase of possible uses of space by different user groups contribute to greater sociability of area. Water based design brings positive local identity.	Increase of use increase attractiveness and supports investments and rent increase in area
SERVICE	Introduction of ecosystem - water services are the leading idea of the project	Introduction of natural features -water and its services (retention, regulation of microclimate) into design brings positive identity and attracts people.	Natural services are provided in space that may decrease the costs of combating flooding. Good balance of natural and areas in need for special management is achieved

4.3. Case 2 – "Vital space – water path"

The theme of the project is the activation of the area of the promenade Lazaro Cardensa to become a vibrant place after the intervention. Spatial concept is based on the idea to treat the promenade as a whole. This is accomplished by designing multifunctional spaces for different purposes related both to culture and nature. Focal activity points are located on central position in promenade, providing different necessary and thematic uses of space. They are combined with natural areas in order to support biodiversity and contact with nature. By their interconnection, public open and closed spaces would be defined as community meeting places of different character. These natural and cultural sites on the promenade would be supported and well connected with variety of activities provided in surrounding areas. (Figure 2, Table 3).

Figure 2 - Case 2 -"Vital space – water path" – Tamara Radić and Bogdan Popović

Table 3 – Assessing sustainability of multifunctional public open space – Case 2

DIMENSIONS OF MULTI-FUNCTIONALITY	ASPECTS OF SUSTAINABILITY		
	Ecological	Socio-cultural	Economic
SPACE	Natural features of space were recognised as value to protect and support by revealing its importance to people through planning of different activities and uses on various locations	Provison for different functions at different spatial levels through authentic and designed space contributes to creation of positive identity and increase of use by different user groups.	Increase of number of activities at both system, area and location level enhances attractiveness of space for people and may contribute to investments and rent.
TIME	Intensity of different uses in time is well planned in relation to location and size of natural elements in area, thus protecting their ecological value.	Increase of possible different uses of space by different user groups at synchronic or diachronic level, may contribute to sociability of area	Increase of number of different activities that may simultaneously take place increase attractiveness and economic value of space
USE	Introduction of water features supports both use of space as well asits overall ecological value by	Increase of possible uses of space by different user groups was a main goal of the project in order to contribute to	Increase of use increase attractiveness and supports investments and rent increase

	providing contact with nature.	greater sociability of area	in area
SERVICE	Although mostly built open space it improves ecological value of space through integration of water retentionand purification measures.	Introduction of natural features -water and its services (retention, regulation of microclimate) into design brings positive identity and attracts people.	Comercial as well as natural services are provided in space that increase economic value.

4.4. Discussion

Although projects differ in starting point (nature vs culture) and have different emphasis (to make nature visible and in service to people(1) and to enlarge and diversify possible uses of public space(2) both provide systemic view and manage to contribute to all 3 aspects of urban sustainability. However, the main objectives are different and that is reflected in design at both area and detailed level, as well as in expected performance.

The new multidimensional analytical model enables critical review of different design approaches by simultaneously relating different dimensions of their functionality to various aspects of sustainable development. In that sense, it can be used for evaluation of design alternatives or for discussions on possible alternative futures between different stakeholders in planning process, by revealing potential environmental, socio-cultural and economic benefits as well as costs of their application.

5. CONCLUSIONS

Our analysis revealed that multifunctionality is a complex concept that can be understood and applied based on its spatial, temporal, use and service dimensions, and be understood from both demand and supply side. It is important concept for sustainable urban development that has being differently understood and interpreted in different spatial disciplines, and this makde the application of the concept difficult to assess and manage in relation to different aspects of sustainable urban development.

In order to better balance ecological, socio-cultural and economic development goals and, at the same time, enable creative and context specific approach to design of urban space, the concept of multifunctionality needs to be integrated into the planning and design of public open spaces in a relational and multidimensional way. For that, multifunctionality should be understood as feature that becomes value only when *related to* certain set of development goals in specific context. At the same time, multifunctionality of public open space should be perceived as *multidimensional* in order to better relate to various aspects of sustainable development (ecological, socio-cultural, economic) and to contribute to their balance. These principles were integrated into new analytical framework outlined in this paper. Two presented examples of multifunctional public open spaces showcased usefulness of this new analytical framework for reading and evaluating their contribution to sustainable development. Based on this, we suppose that this draft of the relational and multidimensional approach can be also used as a basis for future public open space planning and design solutions, that aims to balance cultural and natural values in urban space. We hope, that understood in this way, planning and design of multifunctional public open spaces can more fully contribute to the quality of life in cities and be a factor of urban sustainability and resilience.

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REFERENCES

1. Bajić Brković M., 2000., Održivi razvoj i nove tendencije u urbanističkom planiranju u knjizi : Ogledi o planiranju i održivom razvoju grada, Arhitektonski fakultet, Beograd, interno izdanje
2. Batty, M., Besussi, E., Maat ,K. & Hars, J., 2004. Representing Multifunctional Cities: Density and Diversity in Space and Time. Built Environment, 30(4), pp. 324–337.
3. Đukanović, Z.,& Živković, J. (2015). Public Art & Public Space Program: Learning, But Doing! *ANNALES-Anali za istrske in mediteranske studije-Series historia et sociologia.* Vol. 25/1, 49-65.
4. Elin, N., 2006.Integral Urbanism, Routledge, NY.
5. Fish,R., Church,A. &Winter,M. 2016. Conceptualising cultural ecosystem services: A novel framework for research and critical engagement, Ecosystem Services 21 (2016), pp.208-217.

6. Haccou, H. et al, 2007. MILU Guide: practicioners handbook for multifunctional intensive land use, MILU net - The Habiforum Fondation, Gouda.
7. Herndon, J., 2011. Mixed-Use Development in Theory and Practice: Learning from Atlantas Mixed Experiences. www.smartech.gatech.edu/handle/1853/40790, [Accessed: 11th June 2012].
8. Hine, R., Peacock ,J. & Pretty, J., 2008. Green Spaces – Measuring the Benefits, Report for the National Trust , University of Essex www.essex.ac.uk [Accessed: 2nd July 2012].
9. Hoppenbrouwer, E., Louw E. , 2005.Mixed-use Development: Theory and Practice in Amsterdam's Eastern Docklands, European Planning Studies 7 (13) pp.
10. Huylenbroeck, G et al. 2007. Multifunctionality of Agriculture: A review of Definitions, Evidence and Instruments, Living Reviews in Landscape Research(1), p.3.
11. Jacobs, J., 1961. The Death and Life of Great American Cities. Vantage, New York.
12. KajtazI, B., 2007.Measuring Multifunctionality of Urban Area, Thesis. International Institute for Geo-Information Science, Enschede, The Netherlands.
13. Kaufmann-Hayoy R., Hammer T., Raemy D.,2007. *Institutional Steering and Collective Action for Sustainable landscape Development* - The Case of the Vineyard Landscape at the Lake of Biel, http: //www.ikaoe.unibe.ch/forschung/nie-bielersee/index.html [Accessed: 2nd July 2012].
14. Majoor, S., 2003. New Norms for Multiple Intensive Land Use", 39th Iso CaRO Congress www.isocarp.net/Data/case_studies/306.pdf [Accessed: 2nd July 2012].
15. Naranjo F. Z.,2006. Landscape and spatial planning policies, Landscape and Sustainable development: Chalanges of the European Landscape Convention, Council of Europe
16. OECD, 1998.Multifunctionality: a framework for policy analysis, AGR/CA (98) 9, Paris www.oecd.org [Accessed: 3rd July 2012].
17. OECD, 2001. Multifunctionality: Towards an Analytical Approach, OECD PUBLICATIONS, Paris www.oecd.org/tad/agriculturalpoliciesandsupport/40782727.pdf [Accessed: 3rd July 2012].
18. Verkeer, R., De Groot H. & Verhoff E.T., Urban Multifunctional Land Use: Theoretical and Empirical Insights on Economies of Scale, Scope and Diversity, Built Environment 30 (4), pp. 289–307.
19. Vesnić Neđeral ,Ž., 1990.Rekreativna funkcija otvorenih prostora u gradu (Recreational function of urban open spaces), Faculty of Architecture University of Belgrade Belgrade.
20. Waters, S., Smith M., 2002. The Planning and management of urban open spaces in Scotland", Scottish Natural Heritage Review No 130.
21. Wiggering ,H. et al., 2006. Indicators for multifunctional land use: Linking socio-economic requirements with landscape potentials, Ecological Indicators 6 pp. 238–249., http://tran.zalf.de/home_ip-sensor/products/publications/Wiggering_2006_Ecological_Indicators.pdf [Accessed: 3rd June 2012].
22. Wilde, Th. S., 2007.Multiple use of land in railway station areas, Congress Paper for The sustainable city 2002: Urban regeneration and sustainability, 2002, in: Haccou H. et al, MILU Guide: practicioners handbook for multifunctional intensive land use, MILU net The Habiforum Fondation, Gouda.
23. Willemen, L., 2010. Mapping and Moddeling Multifunctional Landscapes, Thesis, Wageningen University, Wageningen, The Nederlands www. edepot.wur.nl/137843 [Accessed: 2nd June 2012].
24. Živković,J., & Vasiljević, N. 2010. Predeo i održivi prostorni razvoj Srbije (Landscape and Sustainable Spatial Developlent of Serbia). In: M. Bajić-Brković (Ed.), Kreativne strategije za održivi razvoj gradova u Srbiji (Creative strategies for sustainable urban development in Serbia) (pp. 123-157). Univesity of Belgrade Faculty of Architecture, Belgrade.
25. Živković, J.,2000. Uticaj ekoloških zahteva na oblikovanje otvorenih rekreativnih prostora u gradu (The Impact of Ecological Demands on Design of Open Recreational Spaces in Urban Environment), unpublished MSC Thesis, University of Belgrade Faculty of Architecture, Belgrade.
26. Živković, J., Lalović, K., & Milovanović-Rodić, D.,2012. Multifunkcionalnost otvorenih prostora u kontekstu prilagođavanja gradova klimatskim promenama (Multifunctionality of Open Spaces in Adapting Cities to Climate Change), In: M. Bajić-Brković (Ed.), *Klimatske promene, nacionalne politike i lokalni razvoj (Climate changes, national policies and local development).* Faculty of Architecture University of Belgrade, Belgrade.

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GREENING AS AN APPROACH FOR URBAN RENEWAL OF SHRINKING CITIES

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ABSTRACT

Nowadays, many European, American, and Australian cities are faced with the problem of shrinkage, manifested through demographic decline, economic loss and perforation of urban tissue. In the face of the shrinkage process, there are many challenges that cities and planning faced with. This paper presents „greening" as a new approach for urban renewal of shrinking cities. Through the review of the greening models implemented in developed countries, the paper examines "greening", understood as a tool for the improvement of the quality of built, natural, and living environment, i.e. an opportunity for qualitative changes within these retired cities regarding their chances of recovery and success. Lessons learned from these examples offer guidelines and recommendations for the reframing of urban planning in the context of Balkan shrinking cities.

Keywords: shrinking cities, greening, urban planning

1. INTRODUCTION

The interaction of negative social and economic factors at the global level, in the late twentieth and early twenty-first century, resulted in the polarisation of spatial development that produced the global cities which managed to integrate into the global network, but also led to an increase in disparities between cities and the emergence of global phenomenon of shrinking cities. Research shows that the phenomenon of urban shrinkage is increasingly widespread in Central and Eastern Europe, the United States, developed countries in Asia, North America and Australia (Rieniets, 2006). Data on the state of European cities show that many of them have entered the shrinkage process in the 1960s and that the phenomenon of stagnation in the period of the 1990s was more pronounced than the phenomenon of growth and development of cities (Turok & Mykhnenko, 2007). Conducted research on the territory of Serbia (Djukić, Antonić, & Vujičić, 2017) and Bosnia and Herzegovina (Vujičić & Đukić, 2015) show that this problem does not only affect Europe and the developed countries, but also that urban stagnation is a more dominant process than the process of urban growth and development in Balkan countries.

The consequences of urban shrinkage are manifold. Population decline and economic downturn led to the decreasing demand for housing, social infrastructure, and commercial facilities, thus creating a surplus in the built environment (Rößler, 2008) This surplus is manifested through the increasing number of vacant lots and abandoned buildings, derelict and unused spaces, i.e. different types of brownfields calling for the action. A drop in population density directly affects the built environment and led to the transformation of the urban fabric, called by Lütke-Daldrup (2001) *perforated city* (Lütke-Daldrup, 2001). This paper put the focus on these perforated urban areas, understood as a resource and field suitable for implementation of the greening concept. In that sense, the paper examines not only the spatial concept of the greening but also the accompanying background processes that enable the success of its realisation. Exploring the experiences of

developed countries in this field, the paper defines recommendations for implementation of the greening concept, applicable in the context of Balkan shrinking cities.

2. GREENING - APPROACH TO THE IMPROVEMENT OF QUALITY OF LIVING ENVIRONMENT IN SHRINKING CITIES

Under stagnation conditions, planning is compelled to change its approach. Growth is not in focus here than solving the accumulated problems in different spheres of local community life. In other words, planning is not development-oriented, but rather to problem-solving. The urban restructuring of shrinking cities should focus on improving the quality of life in these cities and supporting the sustainable development in affected areas through the implementation of the greening concept. However, such a strategic approach even in developed countries is also faced with a number of obstacles in various fields: planning, management, maintenance, finance, and legislation. The greening concept appears as a new approach, a response to the problems within the built environment, recognized through a large number of abandoned and dysfunctional spaces. However, the question is whether it is justified in conditions where local budgets are declining and the number of inhabitants and jobs is decreasing. In face of this conditions, we have to ask ourselves: why greening, how to implement it, and with what resources?

2.1. Greening

There are a wide variety of greening models that differ in terms of shape, size, function, relations between public and private, the extent of participation, type of users, etc. but all models share the same idea and goal of bridging the gap between people and nature in built environment. One of the most promoted model of greening all around the world is so-called community gardening. Gardens are accepted as a model that contribute to: the gathering of neighbours, integration of social disadvantaged group such as homeless and migrants, promotion of healthier eating, rise of ecological awareness. Some authors divide it in two main categories: individual-plot, i.e. allotment gardens and colective gardens (Alberta Health Services, 2016). The most common type is so-called "neighbourhood garden" in which free plots are rented to members at annual basis to plant vegetables for their own use. There are also other types such as residential, institutional and demonstration (Marin Master Gardens, 2018). Residential gardens are typically shared among residents in apartment communities. It is organized and maintained by residents living on these premises. Institutional gardens are defined as a model embedded to public or private organizations that offer numerous beneficial services for residents such as, for instance, different types of rehabilitation or skills development. Demonstration gardens are used as polygons for education and recreation. This concept of gardening offers seminars, presentations, and training, as well as provides help necessary for operating and management of communy gardens (Marin Master Gardens, 2018).

2.2. Challenges of greening in shrinking cities

In order to understand the complex structure of influencing factors contributing to or preventing the implementation of the greening concept in declining cities, a review of key aspects: space, governance, finance, and legislation is provided below.

The urban environment radically changes its functional and spatial, physical patterns in shrinking cities. This research distinguishes two key patterns of urban form, which are reflected through the process of urban transformation of shrinking cities. First, compact city characterized by densely populated and built urban areas, mixed land use and clear boundaries between built areas and non-urban green belts (Jenks, Burton, & Williams, 2005; Jenks & Burgess, 2004). The second is perforated city characterized by random, dispersed gaps that have emerged as a result of the demolition of abandoned buildings (Lütke-Daldrup, 2001). The process of urban transformation from compact to perforated city and accompanying the demographic and financial flows, as well as the challenges facing these cities, are symbolically represented in figure 1. In the spatial level, intensive urbanization has produced more or less compact cities where the growth of requirements for construction threats the green spaces of the city. The population loss and the economic downturn led to the degradation of the urban fabric, the decline of facilities and land. In response to this problem, many European cities have developed the programs of demolishing of ruined buildings. However, the negative perception associated with these areas and generally shrinking cities has not been missing. Therefore, the emptiness created at places of demolished buildings are recognized as a resource suitable for the development of green spaces, and greening is accepted as a strategy for strengthening the positive image of these cities and areas.

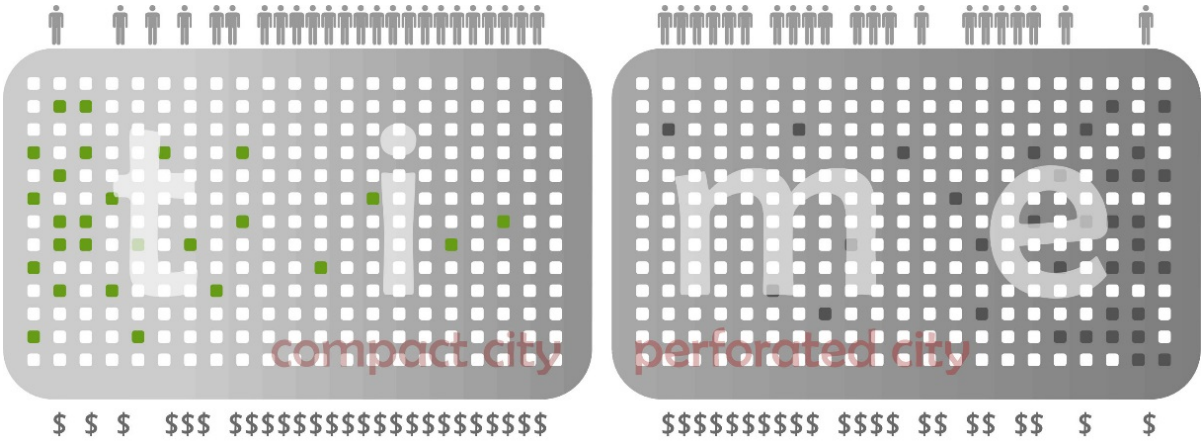

Figure 2: From compact to perforated city (Ilustration: Tijana Vujičić)

One of the key parameters for investing in space, in the political and administrative domain, is the level of utilization of a given space. Negative demographic changes bring different intensity and way of using green spaces. Unlike the densely populated areas where the value of the green spaces are under the threat of overcrowding, conflicting interests, and vandalism, in the less populated cities, the decline in the quality of the use of green spaces is characterized by insufficient use and lack of social interaction. The insufficient level of use of green spaces, both existing and potential, directly affects the level of financial investments in the establishment and maintenance of these areas. Therefore, one may conclude that the decline of the population directly affects the financial arrangements of local authorities focused on the realization of the concept of greening. In the conditions of reduced budgets and reduced demands, the extinction and decay of existing green spaces are certain, while the greening of new empty spaces is questionable.

Accepting stagnation as the reality of a large number of cities, many of developed countries have changed and adapted the legislative framework in order to help the recovery of affected areas and to make improvement of the planning system. However, there are a large number of legal restrictions in these countries regarding the conversion of construction land into green spaces. One of the key obstacles that Rößler points to is the remaining building rights on formerly built properties and the high value of land. The involvement and mediation of representatives of national, regional and local authorities in these processes are necessary (Rößler, 2008).

Understood as an opportunity to improve the quality of life and the urban environment in cities affected by urban shrinkage, greening as an idea and concept become a part of different strategies. Meanwhile, the new patterns and types of green spaces began to spontaneously develop in practice. Strategically observed, there are two different approaches: temporary and permanent greening (Rößler, 2008). Which concept will be developed, greatly depends on various economic and legal limitations. Decision making about the demolition of abandoned buildings and the realization of new green areas on this land are conditioned by these factors. Therefore, implementation one of the greening concepts, temporary or permanent, depends on the interests, opportunities, and needs of community. According to Rößler, experience shows that temporary greening has developed spontaneously and it has been conditioned by the lack of interest for the building. Although this led to the regeneration of affected areas, new investments, and activation of the surrounding built space, in the long run, their sustainability and survival were not guaranteed. Unlike temporary greening, permanent greening required systemic approach, planning, and management of this area. Involvement of local authorities and planners was indispensable. Local authorities assisted in regulating property rights and provided financial support, while planners developed greening strategies understood as a means to improve the quality of living environment (Rößler, 2008).

2.3. Type of green space applicable in shrinking areas

Different types of green spaces have been developed during the process of urban restructuring of shrinking cities. Depending on the size of the affected territory and the available financial resources, different models of greening have been implemented. Differences between types can be traced through 1) spatial patterns of organization and applied plant species, 2) the size of the territory, 3) funds necessary for the realization, 4) citizen involvement, and 5) maintenance models.

Figure 3: Typology of green space (Ilustration: Tijana Vujičić according to Rößler, 2008)

Rößler distinguishes four basic types of greening: urban forestry, urban agriculture, urban gardens and urban wilderness (Figure 3) (Rößler, 2008). Urban forestry is one of the cheapest greening models with very low maintenance costs. It also represents a method for the preservation of urban form. Empty holes at the site of the former residential buildings are filled with trees, so-called "green walls" (Rößler, 2008, p. 150). These natural structures contribute to the visual and aesthetic integration of fragmented space, and the morphology of the urban blocks. Urban agriculture appears as an alternative to building and response to the problem of the financial profitability of new land use. It has mostly developed in response to climate change, and through energy crops as renewable sources. According to Robler, acceptance of the concept of urban agriculture by the inhabitants has not been sufficiently researched, and emerging spatial patterns of urban agriculture within the urban blocks are similar to the rural ones. Contrary to the previous two types of greening, which are largely within the jurisdiction of the municipalities, urban gardens have developed as a new type of greening driven by community and individuals. The need for part of a private green space close to high rise buildings is one of the main factors that led to the development of this model. There are many examples of gardens in Europe and North America, not only in declining cities, as well as official programs that have supported this model of greening. The measure of allotment of free space for the gardens has produced many benefits recognized by the community: 1) strengthening social cohesion and interaction between different social groups and generations, 2) healthy food production, 3) activation of empty spaces - greater use of abandoned areas, and 4) reduction of maintenance costs. Model of urban wilderness has not experienced great application. However, it has been discussed between experts as a model applicable in situations of large free space, lack of users and shortage of money. Warning of the negative effects of this approach, such as a negative perception of decay, the question of urban form, uselessness, and bad accessibility to these spaces, Rößler emphasizes: “missing idea or money should not be sold as ecological value” (Rößler, 2008, str. 151).

3. GREENING OF SHRINKING CITIES IN THE BALKAN COUNTRIES

In the Balkan countries, awareness of shrinking cities is growing. However, the raising of public awareness is exclusively associated with demographic and economic factors, while negative spatial changes resulting from these flows are little or no analyzed. The sudden, extensive migrations of people to developed western

countries during the past few years put the problem of depopulation as a key symptom of shrinkage in focus of the public arena. Such sudden and radical negative demographic changes help to raise awareness, but it is forgotten that many other, slow and longlasting processes have caused this trend. A chain of negative changes, from economic decline, falling of living standards, through the decline in natural population increase, to an aging population, is also very important causes of stagnation of cities. Most affected cities are the smaller peripheral ones. A very small number of experts and researchers deal with the spatial consequences of these processes. In the absence of vision and money, this topic is more likely to be avoided, while the themes of growth and prosperity continue to be unjustifiably emphasized.

Figure 4: (a) Industrial brownfield, and (b) Residential brownfield (Photo: Tijana Vujičić)

In such conditions, the development of the greening concept seems like an unattainable dream. Namely, Balkan countries are far from approaches and measures implemented by developed West countries. First, there is no information on abandoned estates and land, and there is no clear picture about the extent of the affected areas (Figure 4.) (Đukić, Simonović, & Vujičić, 2014). Second, in situations of reducing municipal budgets, the topic of urban renewal of shrinking areas does not come to the agenda. Beside all other difficult issues and problems facing these cities, greening seems to be a luxury. The assumption is that the advocacy of this idea would open up a number of questions by local authorities such as cost-effectiveness, maintenance, property relations etc. In the political arena, green spaces are not as much important as construction, jobs, incomes, infrastructure, and services. Additionally, demolition inevitably has a negative connotation unacceptable for politicians. Third, the demolition of existing abandoned facilities occurs only if there is interest in new construction. If there is no interest, the status quo is retained, because demolition requires certain finances and (non-existent) means. Thus, affected areas decay more and more and degrade the image of cities. Demolition for the sake of greening is almost utopian. It has not been recognized as a chance for cities' recovering and opportunities for improving the quality of life (environment). Fourth, same as in the Western countries one of the important obstacles in the regeneration of these areas in the Balkan countries are property rights and acquired building rights. In addition, the specificity of the Balkan mentality is a strong emotional attachment to property. Therefore, very often owners refuse any intervention on their property, even if ruin objects threaten the security of citizens. Fifth, there are no any programs dealing with the problems of declining cities, as well as the visions of their regeneration, neither at the local or state level. The concept of greening in shrinking urban zones has not been recognized. If there are certain activities on the creation of green spaces within affected areas, it is mainly isolated examples initiated by individuals or certain social groups (Figure 4).

Figure 5: Visitor Center Pecka, Bosnia and Herzegovina – example of the regeneration of old abandoned school (Photo: Boro Marić)

4. CONCLUSION

Experiences of developed western countries show that the concept of greening is one of the major approaches to urban renewal of declining cities. Understood as a chance to improve the quality of life, this concept has been widely used. Return to nature, the experience of rural life in urban areas, the production of healthy food, the strengthening of social cohesion and interaction, ecological recovery of affected areas, are key factors for the implementation of this concept in shrinking cities. Developed countries have implemented the concept of greening through different, more or less organized and managed models: from urban forestry, over urban agriculture and gardening to urban wilderness. Benefits that are realized are multiple, and differ from type to type. However, experiences gained through the background processes that follow and enable the implementation of the greening concept are more important lessons for the Balkan societies. How to realize the concept of greening is a more important question than, which model of greening should we apply.

In the complex structure of the various negative factors that characterize the image of shrinking cities in the Balkans (demographic, economic, legal, social, institutional, ecological and spatial), it is necessary to research, think, apply and adjust foreign practices to the local context. First, it is necessary to identify the extent and scale of stagnation in declining cities. Second, the creation of the integrated strategies for urban renewal is one of the best and recommended approaches. It would enable a comprehensive view of different aspects. Greening is seen here as a chance to recover the cities from crisis and opportunities for improvement of the living environment. The assumption is that such changes within urban zones will stimulate their recovery and attract the residents from the region and other towns to those areas. Third, in the shortage of financial resources and in times of crisis, every single initiative is welcomed and should be supported by the municipalities. The emerging practices are experimental in their nature and they offer the most opportunities for learning and improvement of approaches and processes. Fourth, the experiences of developed countries show that the demolition of abandoned facilities is inevitable. The urban form in shrinking cities is significantly degraded, and the value of land decreases day by day. Therefore, local, as well as, national authorities should work on promoting and accepting such ideas before it comes to the agenda. The assumption is that this idea will not be accepted and that examples of good practice in the local context will help to understand the importance of this approach. Fifth, if the idea of demolition would be accepted, it was necessary to adjust the legal framework, especially in the field of property rights and building rights. Involvement of both local and national authorities is needed in this part, and a collaborative approach is recommended. Sixth, only if the minimum conditions for the implementation the idea of greening (in different, previously mentioned, areas) was ensured, more intensive application of this concept could be expected. Nevertheless, it is certain that in the Balkans' countries, the single initiatives will emerge as a response to the recognized needs of the community, while systemic access will be delayed. Furthermore, this concept, recognized by specific strategic orientation to the urban renewal of the shrinking areas, will not be implemented by all cities. Therefore, we have to wait to see which strategic orientation will contribute to positive demographic, economic and spatial changes, i.e. mitigation of stagnation.

To sum up, the experiences of developed countries show that the greatest obstacles to the implementation of the greening concept are found in the legislative, financial and planning framework. In this context, it is necessary to develop strategies that will comprehensively analyze needs and opportunities; costs and benefits, as well as define short-term and long-term horizons and finally justify advocating of the greening idea.

REFERENCES

1. Alberta Health Services, 2016. *Community Gardens Handbook - A Guide for Community Groups in Alberta.* Alberta Health Services. https://www.albertahealthservices.ca/assets/info/nutrition/if-nfs-community-gardens-handbook.pdf [Accessed: 28th September 2018]
2. Djukić, A., Antonić, B. and Vujičić, T. M., 2017. Urban shrinkage in a ‘shrinking’ Serbia – the approach to a global phenomenon in a local context. *Geodetski vestnik, 61*(4), 614-629. doi:10.15292/geodetski-vestnik.2017.04.614-629
3. Đukić, A., Simonović, D. and Vujičić, T., (Eds.). 2014. *International Scientific Monograph BROWNINFO. Toward a Methodological Framework for Brownfield Database Development.* Banja Luka: University of Banja Luka, Faculty of Architecture Civil Engineering and Geodesy.
4. Jenks, M. and Burgess, R. (Eds.), 2004. *Compact Cities: Sustainable Urban Forms for Developing Countries* (2nd ed.). Spon Press, Taylor & Francis e-Library.

5. Jenks, M., Burton, E. and Williams, K., (Eds.). 2005. *Compact City: A Sustainable Urban Form?* (2nd ed.). Spon Press, Taylor & Francis e-Library.

6. Lütke-Daldrup, E., 2001. Die perforierte Stadt. Eine Versuchsanordnung [The perforated city. A test arrangement]. *Stadtbauwelt, Volume 150*, 40-45.

7. Marin Master Gardens, 2018. *Community Gardens*. (Univeristy of California, Devision of Agriculture and Natural Resources) http://marinmg.ucanr.edu/Great_Gardening_Information/Marin_Community_Gardens/ [Accessed: 28th September 2018]

8. Rieniets, T., (2006, December 4-5). *Shrinking cities—growing domain for urban planning.* http://aarch.dk/fileadmin/grupper/institut_ii/PDF/paper_presentation_EURA2005.pdf. [Accessed: 28th August 2013]

9. Rößler, S., 2008. Green space development in shrinking cities: opportunities and constraints. *Urbani Izziv, Vol. 19, No. 2, Mestne zelene površine / Urban green spaces (2008), 19*(2), 147-152. https://www.jstor.org/stable/24906040?seq=1&cid=pdf-reference#references_tab_contents [Accessed: 20th September 2018]

10. Turok, I. and Mykhnenko, V., 2007. The Trajectories of European Cities, 1960-2005. *Cities, 24*(3), 165-182. http://www.policy.hu/mykhnenko/Turok%2526Mykhnenko2007Cities.pdf [Accessed: 24th March 2017]

11. Vujičić, T. M. and Đukić, A., 2015. Methodological framework for shrinking cities case study research: northwest region of Bosnia and Herzegovina. *Geodetski vestnik, 59 (3)*, 520-536. doi:10.15292/geodetski-vestnik.2015.03.520-536

MODERN HOSPITALS IN THEIR NATURAL ENVIRONMENT

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ABSTRACT

Contemporary research into the architecture of hospitals as a result has evidence that the immediate natural environment of the hospital, as well as in the hospital, has a positive impact on general conditions and faster recovery of patients. In this paper we will analyse hospitals located in and out of the city core, with their natural environment or without it. Also, the paper will present the ways which could, depending on the location of the hospital, introduce the nature into the environment.

Keywords: hospital; location; site; natural environment; patients; impact

1. INTRODUCTION

Modern scientific research in the field of hospital architecture proves that hospitals should be placed in natural environment to provide patients and employees with the view to green areas, gardens, forests, lakes, with the aim of reducing stress and creating an environment that facilitates faster recovery.

This paper examines the choice of location of modern hospitals in European and Asian countries that have been designed in the last ten years, as well as design principles that achieve the introduction of natural light and green environment in and around the buildings, along with a historical overview of the location of the oldest hospitals in Europe and Serbia. The aim of the paper is to determine whether modern hospitals are being moved out of the city centers and also what is the percentage of hospitals in the natural environment.

Historical method, analysis and synthesis, comparison and classification were used in the paper.

The results of work show the conclusions about the parameters of the location selection for the construction of modern hospitals and the introduction of nature into the area of the treatment facility, when there are limitations.

2. HISTORICAL REVIEW OF THE LOCATION OF HOSPITALS

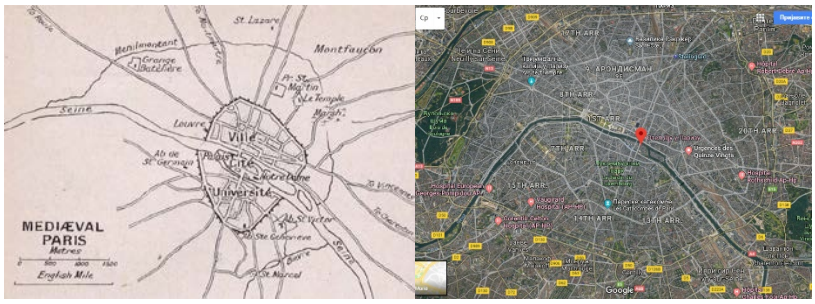
The first part of the study explores the locations chosen for the construction of existing, older hospitals. The historical method was used to search for literature in order to define the guidelines that were used to select the location at the time the hospitals were built. It is also being investigated whether there were thoughts about the presence and impact of greenery in the immediate environment of the treatment facility. The comparison method compared the city plans from the time when first hospitals were built with today's

maps of cities in order to determine the location in today's urban structure of the city. The aim is to determine whether the sites were selected on the outskirts of the city and what were the factors for the selection criteria.

In one of the first books of hospital building standards from 1863, Note of Hospital, F. Nightingale on site selection states: „The elements which ought to determine the position of a hospital are the following : First, and before all others, purity of the atmosphere. Second, the possibility of conveying the sick and maimed to it. Third, accessibility for medical officers, and for the friends of the sick. Fourth, convenient position for a medical school, if there be one. All of these elements are of importance, every one in its place. It is obviously of no use to build a hospital in the best air in the world, if neither patients nor medical officers can get to it. It is only in applying common sense to such a question, and by always giving a preponderance to the condition of highest importance—namely, pure air, when the other conditions can be at the same time reasonably obtained, that the best will be done for the sick. There is no doubt that suburban sites, nearest to the population likely to apply for relief.“[1] Also, the importance of fresh air, good ventilation of the building and space around it, as well as exposure of the patient to sunlight, all from the aspect of achieving faster healing of the patient is mentioned. However, there is no indication of the importance of greenery in the immediate surroundings of the hospital building.

One century later, in the book „Hospitals“, Stanko Kliska recommends in the chapter on the method of construction that the buildings should occupy 20% of the plot, communications and yards 15%, physical exercise 5-10%, and parks 55-60%. [2] Although the text does not indicate the importance of the surroundings of the hospital building in greenery, it is sufficient to establish that in 1960s they were built in such a way that more than half of the plot belonging to the hospital was covered with greenery. This method of planning and design has provided a sufficiently large surface area belonging to the hospital, which has included further upgrades and modifications.

The 7th-century Paris plan, when a hospital known as Hôpital de l'Hôtel Dieu was built on the natural island of the river Seine, near the Notre Dame cathedral, suggests that the location was in the past, as well as the present city structure in the center, but also isolated, because it was surrounded on two sides by the river, Figure 1.



(a) (b)

Figure 1: (a) Paris, France, medieval plan Paris, Photo by University of Texas at Oustin, Universiti of Texas libraries, https://legacy.lib.utexas.edu/maps/historical/mediaeval_paris_1912.jpg [Accessed: 06.09.2018.] and (b) Paris, France, plan from 2018, Printscreen Google maps 2018, [Accessed: 06.09.2018.]

(a) (b)

Figure 2: (a) London, UK, plan from about 1300, https://commons.wikimedia.org/wiki/File:Map_of_London,_1300.svg [Accessed: 06.09.2018.] and (b) London, UK, plan from 2018, printsceen Google maps, 2018. [Accessed: 06.09.2018.]

[1] Nightingale F., 1863. Notes on Hospitals, Longman, Green, Longman , Roberts, and Green, London, Book from the collections of Harvard University, http://books.google.com/books?id=FJhN-SqxUawC&oe=UTF-8, pp. 29

[2] Kliska S., 1961. Bolnice, University in Belgrade, Belgrade, pp. 5

At the beginning of the 12th century, a hospital at St. Bartholomew's Monastery was established in London. At that time, the plot was on the outskirts of the city, surrounded by fields, but today, with the growth of the city, it is found in the very city core. In 2014, the reconstruction and upgrading of the hospital was completed, the appearance of the facades that was 900 years old and a part of the inner courtyard and the park were preserved. The hospital is also a monument of architectural heritage, Figure 2.

It is similar with the locations of the first purpose-built hospitals in Serbia, built in the second half of the 19th and the beginning of the 20th century. The first purpose-built hospital in Serbia was built in Šabac in 1865, soon afterwards in Belgrade in 1868.[3] For the building of the hospital in Šabac, a plot of approximately 4 hectares was selected, and it was away from the former business and residential part of the town, in a block that was on the very edge of the town, Figure 3.

(a) (b)

Figure 3: (a) Sabac City, Serbia, plan from 1910. Photo by Dragutin Petrović, National library of Serbia, http://secanjanasabac.blogspot.com/ [Accessed: 07.09.2018.] , and (b) Sabac City, Serbia, plan from 2018., printscreen Google maps 2018. [Accessed: 07.09.2018.]

The building of a hospital in Belgrade was initiated by Prince Mihailo in 1861, who donated for this purpose the plot he bought from Đorđe Cenić, at Palilula, as well as the construction material that was prepared for the construction of his summer house in Smederevo.[4] The building was built and moved in, in 1868. The Belgrade Plan of 1893 unambiguously shows that the location for the hospital was on the very edge of the municipality of Palilula, as well as that north of the plot, there were not any buildings, Figure 4.

(a) (b)

Figure 4: (a) Belgrade City, Serbia, plan from 1893. photo by Historical Archive of Belgrade, and Belgrade, Serbia, plan from 2018, print screen Google maps 2018. [Accessed: 07.09.2018.] and (b) Nis, Serbia, Vinter`s plan from 1896, National Museum of Nis, and Nis, Serbia, plan from 2018, printscreen Google Maps 2018. [Accessed: 07.09.2018.]

In Niš, the first civil hospital, District Hospital, was founded in the private house of Mr Andon at the Nišava quay. The hospital was opened in July 1881 and it was in this house until it was moved to a purpose-built building in 1910. Three buildings for the hospital in Niš were built on a plot of 3 hectares. At that time, a three-storey building was built for patient admission and treatment, a ground-floor building for the treatment of patients suffering from infectious diseases and a building for administration of the District Hospital and the apartments for managers and assistants. [5]

In this part of the research we come to the conclusion that for the hospitals of the earliest construction periods, large area locations on the outskirts of the cities were selected, but they were connected by roads

[3] Nikolic O et al: 2018. First hospital buildings in Serbia and their present purpose and function, Proceedings of Conference XVIII anniversary International scientific Conference by Construction and Architecture VSU'2018, Sofia, Bulgaria, pp. 26

[4] Stanojevic V., 1960. Najstarije bolnice u Beogradu, book VII, GMGB, Belgrade, Serbia, pp. 84.

[5] Nikolic O. and Nikolic V., 2012. Ecological and psychological aspects of green roofs and facades of buildings hospital, Proceedings of Conference 1. Studentski simpozijum "Reciklažne tehnologije i održivi razvoj"; Soko banja, Serbia, pp. 167

with other city structures to facilitate the arrival of patients and family members, as well as the delivery of all necessities for the work of the hospital. By selecting a location for the construction of hospitals in the suburban area, a larger area of the plot was available where the upgrades and extensions could be carried out, according to the needs of the hospital's capacity and monitoring the development of technology in medicine. It was also important that the location should be well lit and well ventilated. The presence of greenery was not mentioned as an important factor in the recovery of patients, but on the plot, around the facilities for patient care, well-organized park surfaces were formed.

3. MODERN HOSPITALS AND NATURAL ENVIRONMENT

In the second part of the paper, the locations of today's hospitals will be analysed to draw conclusions about the presence of greenery in the immediate surroundings of the health facilities. The architecture of modern hospitals is based on the application of the results of scientific research in the design process which proves the influence of different factors on the faster recovery of the patient. Such a design is known as Evidence Based Design. The aim of the scientific studies is to test whether the design can directly affect the clinical outcomes.[6]

According to the EBD principles the positive impact on the stress reduction with employees and patients has the introduction of greenery and nature into space, either physically or through the provision of views from inside to the outside. It has long been known that nature has calming, healing effects, which is one of the reasons why access to the natural environment is so important. In hospitals located in the city core itself or on plots with a large coefficient of construction, as well as in hospitals with a great depth of space and premises without natural lighting, nature is introduced into the space using wood materials. Green and brown colors, artworks that point to nature, can also subtly contribute to the reduction of stress with patients and staff.

After abandoning the idea of building a monoblock type of healthcare facilities that marked the 20th century in the architecture of hospitals, the "greening" of healthcare facilities began. One of the reasons is the consideration of the significance of scientific research on the "treatment area", which began with the pilot study of Roger Ulrich and the implementation of design results in order to create the place that can heal. Another reason is the creation of an energy-efficient building or a sustainable architecture for healthcare facilities and environments.

For the needs of this work, the locations of hospitals designed in the last ten years in Europe and Asia, which have been completed or are under construction, are analysed. The following parameters are observed: the area of the plot, its position in relation to the central city core or the center of the area to which it belongs, the representation of the designed greenery on the plot and within the hospital itself, as well as the amount of greenery in the immediate environment.

Hospitals are classified according to the presence of greenery on the plot as:

- Hospitals with greenery on the plot and
- Hospitals without greenery on the plot

3.1. Hospitals with greenery on the plot

In Europe, and especially in Scandinavian countries, the principle of building hospitals out of residential areas, located in the natural environment is generally accepted. Hospitals like the Helsingborg Hospital in Sweden, which is under construction, the New Aalborg University Hospital in Denmark, which has been being built since 2013 and will be completed in 2020, Figure 6, as well as Espoo Hospital, in Espoo, near Helsinki, Finland have several common features. Whether they are new hospitals or were built on existing plots, they are distant from the city centers, are located on the outskirts overlooking the nature, are characterized by the bases with one or several interior courtyards filled with plants, they are well lit. The key to the whole design was flexibility, clear layout, variety, human scale, green courtyards and optimal conditions for daylight. It is similar to the hospitals designed by the Henning Larsen Architects bureau in Denmark, the idea that the ultimate goal of the hospital design process is to create a hospital environment that combines all the available knowledge in creating a symbiosis between the hospital and the environment, which together creates a hospital of feelings. Herlev Hospital, New Odense Hospital, New Mental Health Building within the Bispebjerg Hospital are examples of innovation in health promotion**.**

[6] Susan Francis et al, 1999. *50 YEARS OF IDEAS in health care buildings*, The Nuffield Trust, London, pp. 57

The climate in Scandinavia is similar to the climate in Russia, sharp and cold, but in spite of that, hospitals in Russia are very closed from the aspect of internal greenery and creation of illuminated, indoor spaces. The architecture of modern hospitals in Scandinavia resembles hospitals in Spain and other countries with a warmer climate, a similar principle is applied in the choice of location and design. In the city of Mostoles, near Madrid in Spain, on its outskirts, Rey Juan Carlos University Hospital was built in 2012. In addition to the location on the very edge of the city and the designed greenery on the plot, the hospital is characterized by two large, partially covered atriums as well as planted high plants in two levels, within the main hall, Figure 7. Hospitals in several cities in Slovakia have been designed in a similar way and they are part of the Next Generation Hospital project whose construction will be completed in 2021.

Figure 5: New Aalborg University Hospital, Aalborg, Denmark, Photo by AART Architects, https://aart.dk/en/projects/aalborg-university-hospital, [Accessed: 08.09.2018.]

Figure 6: King Juan Carlos Hospital, Mostoles, Madrid, Spain, Photo by Printscreen Google maps Mostoles and Rafael de La-Hoz, http://www.rafaeldelahoz.com/[Accessed: 08.09.2018.]

In Asian traditional medicine, the concept of biophilic design has been present for more than four thousand years. For Chinese traditional medicine hospitals as well as Indian Ayurveda hospitals, the most important is the choice of location. Hospitals are located in a natural setting, near water, forests ... Within hospitals, open spaces and atriums are designed so that each unit, room or place would have its own direct connection with nature. And precisely this approach tends to design modern hospitals on all continents.[7] In her master thesis, Ying Yu concludes: Because of the large population, hospital design in China tend to make the hospital very large so as to receive more patients. Many projects in recent years designed a hospital with over one thousand beds, and even make the hospital a medical city. And when looking at hospitals built in China in 2000s, especially in big cities like Shanghai, many projects extend the hospital vertically to over 100 meters with a centralized layout.[8] However, an analysis of hospitals designed after 2010 shows a shift in planning and spatial organization and the return to the fundamentals of human design, where the medicine architecture of this continent is based, but it is also concluded that the shift is under the influence of the American school of architecture of health facilities.

[7] https://architizer.com/projects/ayurvedic-hospital/, 15.09.2018.

[8] Ju J., 2015. Master thesis Hospital Architecture in China ---- Through Comparison between Chinese and Nordic Hospital Design, Department of Architecture Chalmers University of Technology Gothenburg, Sweden, pp. 9

(a) (b)

Figure 7: a) Gleneagles Hong Kong Hospital, Hong Kong, China, Photo by NWS Holdings Limited, https://www.nws.com.hk/EN/Media-Resources/Photo-Gallery [Accessed: 08.09.2018.] and b) Shanghai Jiahui International Hospital, Shangai, China, Photo by HOK, https://www.hok.com/design/type/healthcare/shanghai-international-hospital-design-competition/ [Accessed: 08.09.2018.]

Gleaneagless Group is building several new hospitals in China. The buildings are of high capacity and multispecialized. In 2017, the Gleneagles Hong Kong Hospital in Hong Kong was opened, it has a capacity of 500 beds, it is built on a large plot, at the outskirts of the city and at the foot of the hill. The building corresponds to the topography of the terrain, it is filled with greenery in and around the building. The group opened the 350-bed general hospital Gleneagles Chengdu in 2018 and the 70-bed obstetrics and gynecology hospital Gleneagles Nanjing will be opened in 2019. What is particularly interesting is the Gleneagles Medical and Surgical Center, which is planned for construction at a location of about 2.5 ha in the inhabited area. On the south side of the building there is a pair of designed buildings, the orchard in the east, and the forest in the north. In the west, the surface water is designed. The roofs are landscaped. Figure 8.

Shanghai Jiahui International Hospital, a privately owned facility that opened in Shanghai in December 2017, is one of the first and largest foreign-funded tertiary-level general hospitals in China. The design of the sustainable and patient- and family-friendly facility relied on a “hospital in a garden” approach, driven by research on the healing benefits of nature in healthcare environments and the desire to mitigate pollution issues within the city. Large shade trees around the hospital act as a buffer to the city, provide shade and noise reduction, and create a threshold for patients entering the building, while varied understory plantings provide a tapestry of different plant colors and textures.[9]

Khoo Teck Puat Hospital in the northern part of Singapore, Figure 9, is the most energy-efficient healthcare facility in Asia. It was designed by architect Chris Johnston, and built in 2010. The building is 93.000 m2, with a capacity of 590 beds and was built on a 3.5 hectare plot, on the shores of the lake. The wings of the building are in the form of the letter V which opens to the north. It is designed with horizontal and vertical greenery whose total surface is four times the base area. Roof terraces are actually gardens in which fruit and vegetables are grown for the needs of the hospital, and it is maintained by community volunteers. According to CPG Consultants, hoo Teck Puat Hospital (KTPH) sets a new benchmark in healthcare design with its 'hospital in a garden, garden in a hospital' concept.[10]

Figure 8: Khoo Teck Puat Hospital, Singapore, Photo by RMJM and ChannelNewsAsia, https://www.alpolic-americas.com/innovative-singapore-hospital-uses-customized-alpolic-panels/ [Accessed: 29.07.2018.]

3.2. Hospitals without greenery on the plot

With existing hospitals built in the inner city core, compact structures and centralized hospitals, from visions towards a built-up urban environment or to the adjacent wing of the hospital, it is not possible to

[9] https://www.healthcaredesignmagazine.com/projects/acute-care/photo-tour-shanghai-jiahui-international-hospital/#slide-2, 18.09.2018.

[10] https://www.cpgcorp.com.sg/our-work, 07.09.2018.

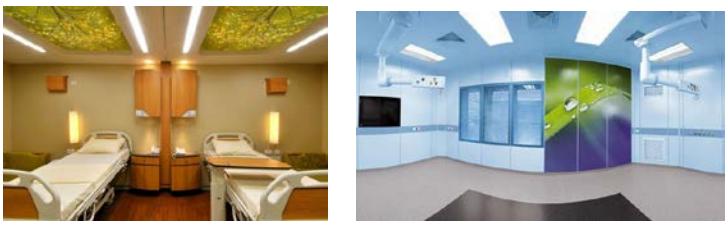
introduce nature and greenery into buildings from the outside to the inside. In this case, the interior uses colors and materials of natural tones, artworks with motifs of nature, all in order to make a warm and soothing environment that reduces stress.

When in 2014 the reconstruction and construction of The Royal London Hospital was completed, it was necessary to demolish 13 buildings at the Royal London and create a new 17-storey building, making it Europe's largest hospital at the time.[11] The new hospital was built on the site of an existing 17th-century hospital, located in the center of today's urban structure of today's London. This hospital is one of the rare examples of a modern hospital with a maximum degree of occupancy of the plot and no park areas around the hospital, Figure 10. The hospital designers, at the time of the project development, decided that because of the lack of reenery in the environment, they can introduce the motifs of nature into the interior. Interior design will last another two years, and teams of artists design the hospital so that it is a pleasant and relaxing environment. Figure 10 shows the screen dividers between the hospital beds with the panorama of London and the Thames designed by Ella Doran. Stylized motifs of nature are also found in the corridors of the building, Figure 10.

(a) **(b)**

Figure 9**:** a) The Royal London Hospital,London, UK, location view, Photo by http://www.eastlondonadvertiser.co.uk/news/politics/we-re-paying-over-the-odds-for-new-royal-london-hospital-say-nhs-campaigners-1-3933745, [Accessed: 21.06.2018.] b) The Royal London Hospital interior, Photo by Ella Doran, from http://elladoranshop.blogspot.com/2012/03/royal-hospital-london.html, [Accessed: 21.06.2018.] and Photo by Avery Dennison, http://graphics.averydennison.eu/en/home/resources-and-learning/case-studies/decorating-child-friendly-hospitals.html, [Accessed: 21.06.2018.]

The soothing color tones of nature and printed light panels on the ceiling with motifs of flowering trees as well as the emphasized vertical symmetry are characteristic of hospital rooms in the Indian city of Bangalore. The introduction of a motif of nature, except in halls, waiting rooms and rooms for patients, can also be found in the operating rooms and intervention rooms. This is the case with the operating theater in the Belgian city of Liege.



(a) (b)

Figure 10: a) Hospital in Bangalore, India, Photo by Angela Carson, http://angelasbangalore.com/shop-in-bangalore/health-and-fitness/expat-visits-doctor-in-bangalore/ [Accessed: 22.06.2018.] and b) Operating room department, Liège, Belgium, Photo by Hospital Solutions Maquet, https://hospital-solutions.maquet.com/int/reference-projects/liege-belgium/[Accessed: 22.06.2018.]

4. CONCLUSION

It follows from the paper that from 2010 in the area of hospital design, new standards are established regarding the location selection and the presence of nature in the hospital environment. Modern hospitals are built on large plots outside residential blocks or at the outskirts of the settlements, by the lakes, rivers, forests. Inpatient units, as well as the working space of the employees, are oriented towards the nature, thus providing visions for which a positive, calming effect has been proven. Greenery within the arranged park areas

[11] SCANSKA, Capital Hospitals and Barts and the Royal London Transforming London's historic hospitals, https://www.skanska.se/4929c6/siteassets/om-skanska/press/nks-i-media/barts-white-paper-single-pages-brochure-format.pdf, pp. 2, 23.09.2018.

surrounds the hospital, but it is also present on the facades and roofs. Light and nature in objects are also introduced through inner courtyards as well as covered, glazed atriums. In this way, the concept of building hospitals that marked the 20th century was abandoned, which was reflected in the construction of monoblock-type hospitals, in densely populated urban areas, on small plots with a high occupancy index. Parameters for the location selection for the construction of modern hospitals are most suited to the parameters from the 18th and 19th centuries when standards in the architecture of hospitals in developed European countries were set and when health care was established in Serbia. The concept of biophilic design has a broad and consistent application in the architecture of health facilities.

According to the implemented classification in the modern practice, there are very few hospitals without greenery in the environment. The most common locations for hospitals in the urban core are chosen in multi-million, densely populated cities, such as cities in China. Despite the limitations due to location, the elements of nature are introduced into this type of object through the interior.

Although examples from Europe and Asia have been analysed in the paper, the conclusions can also be applied to the American type of hospital that is present in America, Australia and the Middle East. The reason for this are the results of scientific research in the field of architecture of healthcare facilities, the largest percentage of which is conducted in America, as well as the functioning of specialized design companies for healthcare facilities at the world level.

REFERENCES

1. Ju J., 2015. Master thesis Hospital Architecture in China ---- Through Comparison between Chinese and Nordic Hospital Design, Department of Architecture Chalmers University of Technology Gothenburg, Sweden, pp. 9

2. Kliska S., 1961. Bolnice, University in Belgrade, Belgrade, Serbia, pp. 5.

3. Nightingale F., 1863. Notes on Hospitals, Longman, Green, Longman, Roberts, and Green, London, UK, Book from the collections of Harvard University, http://books.google.com/books?id=FJhN-SqxUawC&oe=UTF-8, pp. 29.

4. Nikolic O. and Nikolic V., 2012. Ecological and psychological aspects of green roofs and facades of buildings hospital, Proceedings of Conference 1. Studentski simpozijum “Reciklažne tehnologije i održivi razvoj”; Soko banja, Serbia, pp. 167.

5. Nikolic O et al: 2018. First hospital buildings in Serbia and their present purpose and function, Proceedings of Conference XVIII anniversary International scientific Conference by Construction and Architecture VSU'2018, Sofia, Bulgaria, pp. 26.

6. SCANSKA, Capital Hospitals and Barts and the Royal London Transforming London’s historic hospitals, https://www.skanska.se/4929c6/siteassets/om-skanska/press/nks-i-media/barts-white-paper-single-pages-brochure-format.pdf, pp. 2, [Accessed: 23.09.2018.].

7. Stanojevic V., 1960. Najstarije bolnice u Beogradu, book VII, GMGB, Belgrade, Serbia, pp. 84.

8. Susan Francis et al, 1999. 50 YEARS OF IDEAS in health care buildings, The Nuffield Trust, London, UK, pp. 57.

9. https://architizer.com/projects/ayurvedic-hospital/ [Accessed: 18.09.2018.].

10. https://www.cpgcorp.com.sg/our-work, [Accessed: 07.09.2018.].

11. https://www.healthcaredesignmagazine.com/projects/acute-care/photo-tour-shanghai-jiahui-international-hospital/#slide-2, [Accessed: 18.09.2018.]

SUSTAINABLE PLANNING IN PROTECTED NATURAL AREAS - CASE STUDY OF VLASINA LAKE

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ABSTRACT

The concept of sustainability comprises different aspects of human activities, including the environment, economy and social sphere, thus creating the frame for urban and spatial planning in theory and practice (Mitrovic, 2017). Haughton (1996) draws attention to its most important features that are the foundation for the long term development, such as natural conservation, efficient economy, civil society and social progress. As the main pillar of the sustainability, the ecological aspect remains one of the dominant concerns of the territory development and planning over decades. The equal attention is being drawn to the urban areas as well as the protected natural areas. Many conflict zones and interests overlapping in such areas are also an exhaustless source of inspiration and ideas.

This was the starting point for the creation of a case study of Vlasina Lake in Serbia as a task for the students of Master course at the Faculty of Architecture, University of Belgrade. Vlasina Lake district has significant natural values, quality landscape and water resources as well as settlements and tourism capacities, which together create many developmental problems. As a territory with numerous conflicted situations, it has been treated through several spatial and local urban plans. The paper presents the educational process during three subjects focused on the sustainable planning and design in natural environment.

The pedagogical methodology was implemented in the three main teaching units: planning studio, which involves learning-by-doing process and is project-based; workshop, which includes site investigation, and seminar, which provides theoretical foundation related to the sustainable development and planning. The educational corpus is designed so that all parts should be complementary in terms of the methodology and form of teaching and learning. In this paper, the outcomes of studio, seminar and workshop are presented as an example of well-designed assignment for the master course level in domain of urban planning that gives realistic planning solutions and encourage teamwork, as well as the cooperation with the local community.

Keywords: sustainable urban planning; protected natural areas; educational process; pedagogical methodology

1. INTRODUCTION

The concept of sustainability comprises different aspects of human activities, including the environment, economy and social sphere, thus creating the frame for urban and spatial planning in theory and practice (Mitrovic, 2017). Haughton (1996) draws attention to its most important features that are the foundation for the long-term development, such as natural conservation, efficient economy, civil society and social progress. As the main pillar of the sustainability, the ecological aspect remains one of the dominant concerns of the territory development and planning over decades. The equal attention is being drawn to the urban areas as well as the protected natural areas. Many conflict zones and interests overlapping in such natural areas are also an exhaustless source of inspiration and ideas. This was the starting point for the creation of a case study of Vlasina Lake in Serbia as a task for the students of Master course at the Faculty of Architecture, University of Belgrade. The teaching and learning unit of three subjects is one of the main educational pillars of the module for education of future young architects-urban planners at the institution.

The paper presents the educational process during three subjects focused on the sustainable planning and design in natural environment. The pedagogical methodology was implemented in the three main teaching units: planning studio, which involves learning-by-doing process and is project-based; workshop, which includes site investigation, and seminar, which provides theoretical foundation related to the sustainable development and planning. The educational corpus is designed so that all parts should be complementary in terms of the methodology and form of teaching and learning and all remain interconnected from the beginning till the final outcome and results. The feedback between the knowledge units and the flow of ideas is also very much encouraged. The main goals of the educational corpus are related to the understanding of complex relations between natural and built environment, the implementation of the principles of the integrative and sustainable urban planning and developing a creative approach to the existing and realistic planning assignment.

2. BACKGROUND RESEARCH

2.1. The concept of ecological sustainability

Although exploited, discussed, supported but also denied over several decades, the concept of sustainability remains the driving force for the theory and practice of contemporary urban planning and urban design worldwide. From highly defined goals to the results and outcomes in the planning practice, sustainability remains the starting and ending point for a countless number of research and practical results. The everlasting attention of the concept is drawn to the natural resources and places with high quality of natural features, within the umbrella of ecological sustainability. The Sustainable Development Goals, the new international agenda to achieve a better and more sustainable future for all, again draw attention to the environment and natural resources, through Goals no. 3, 7, 15 and more. These goals are promoting healthy living and a healthy environment, as well as clean energy, but most significantly, they urge for protection, restoration and promotion of sustainable use of terrestrial ecosystems, sustainably forests management, and halting and reversing land degradation and biodiversity. Equally important for the regions with special natural values are the Goals no. 8, 9 and 12, referring to the economic growth, industry, infrastructure and innovation development, and responsible production and consumption. Many authors, such as Haughton (1996) emphasize the importance of natural conservation, renewable energy, as well as the social progress for the long term development, while others also focus on self-sustainable communities and the economic vitality (Choguill, 1996; Hardoy, 1992). In order to achieve sustainable urbanisation, the basic aspect of sustainability should be well connected to the development of urban-rural territory (UN Habitat, 2004). Additionally, the overall living conditions and the employment in urban- rural areas can be improved by imposing strong connections between them (Tacoli, 1998, 2003; Rosenthal, 2000). Taking into account the needs of the local population and economy, focusing on the rational sustainable land use and local characteristics, create a foundation for the sustainable local planning (Mitrovic, 2017). In terms of theoretical background, the paper is focused on exploring different types of activities and functions for the future of the development of Vlasina lake area, through the master educational corpus, such as new types of tourism – food tourism, agro tourism, tourism for different socio-economic types of visitors, new forms of recreation and leisure, from hiking, paragliding to recreational fishing, and many more, in accordance with the potentials of the case study territory. These activities aim to promote local culture, tradition and products and to add value and attract the users. During the educational process, the highlight of the course was to develop a teaching and learning model that would develop and promote a locally sensitive approach to urban planning and emphasize the local potentials, aiming to its sustainable, long term exploitation.

2.2. Educational process

The concept of educational practice involving the learning-by-doing methods and its significance has been widely recognized and analysed over a long period, through numerous studies (Demirbas and Demirkan, 2003; Kvan and Jia, 2005; Casakin and van Timmeren 2014). Aside from different opinions and criticism, its beneficial outcomes have been recognised and used in education and schools including architecture and planning. Educational model used in studio and the designing process is undoubtfully closely linked to the development of students' expertise (Casakin, 2011). Learning by doing presents a theory of the processes that enables a student to learn while engaged in solving a problem, therefore studios, as the most appropriate form for applying learning-by-doing approach, highly influence students' levels of expertise through practical learning (Schön, 1983; Gibbs, 1988). Demirbas and Demirkan (2003) also emphasise the importance of the studio for the architectural higher education, considering it the core of its curriculum.

The education in the architectural studio should have three basic components: (i) knowledge (the theoretical part of any education programme that is taught using education technologies); (ii) skills (taught by practice and demonstration); and (iii) design/creating (Chakradeo, 2010). Furthermore, there are 5 principles for successfully educating students to be creative: (i) targeted practice in the solving of problems; (ii) highly organized and systematic training based on realistic examples; (iii) creativity training for extended periods of structured practice; (iv) training on broad knowledge and skills; and (v) targeted practice aimed at acquiring specific knowledge and skills (Cropley and Cropley, 2010). Some authors go even further, claiming that any architectural education program should link theories to applied design work in a studio setting (Nabih, 2010).

3. RESEARCH METHODOLOGY

In the field of education in urban and architectural design, one of the main observations is that the focus of design teaching is on the final product/project, rather than on a process itself. In that sense, this research paper shows an overview of the methodological and educational process that has been developed and used for multi-layer course on the master level of studies at the Faculty of Architecture in Belgrade - the Department of Urbanism. This course entitled: "Creating and designing in the natural environment" was developed by one of the authors of this paper - professor Biserka Mitrović. It has been divided into three different, but interconnected subjects: planning studio, workshop, and seminar, which provide theoretical foundation related to the sustainable development and planning. The educational corpus is designed so that all parts should be complementary in terms of the methodology and form of teaching and learning. This is seen best from the algorithm presented in the figure below *(Figure 1). This schematic structure shows how these three subjects are connected and how they overlap creating a systematic methodology from the introduction to the conclusions.

All of the three subjects are focused on the sustainable planning and design in natural environment. The planning studio was practice-based and directly oriented towards real locations and therefore the problems that students encounter and try to resolve are realistic, and chosen in the cooperation with local municipality, authorities and planning officials. The learning process is developed through the cooperation of students, their mentors and representatives from the Local community from the very beginning – the choice and preparation of the case study area, during the research and project definition phase, to the finalisation of the concept and project/plan proposals. The process of studio project is predefined and divided into following steps:

- Research based on primary and secondary sources
- Cooperation with the local community, authority and institutions
- Defining a set of values, goals and different scenarios
- Identifying the potentials and problems
- Developing the conceptual framework based on theory and research
- Regulatory plans with detailed land use and traffic solution
- Detailed plan of activities and physical structures
- Public exhibition

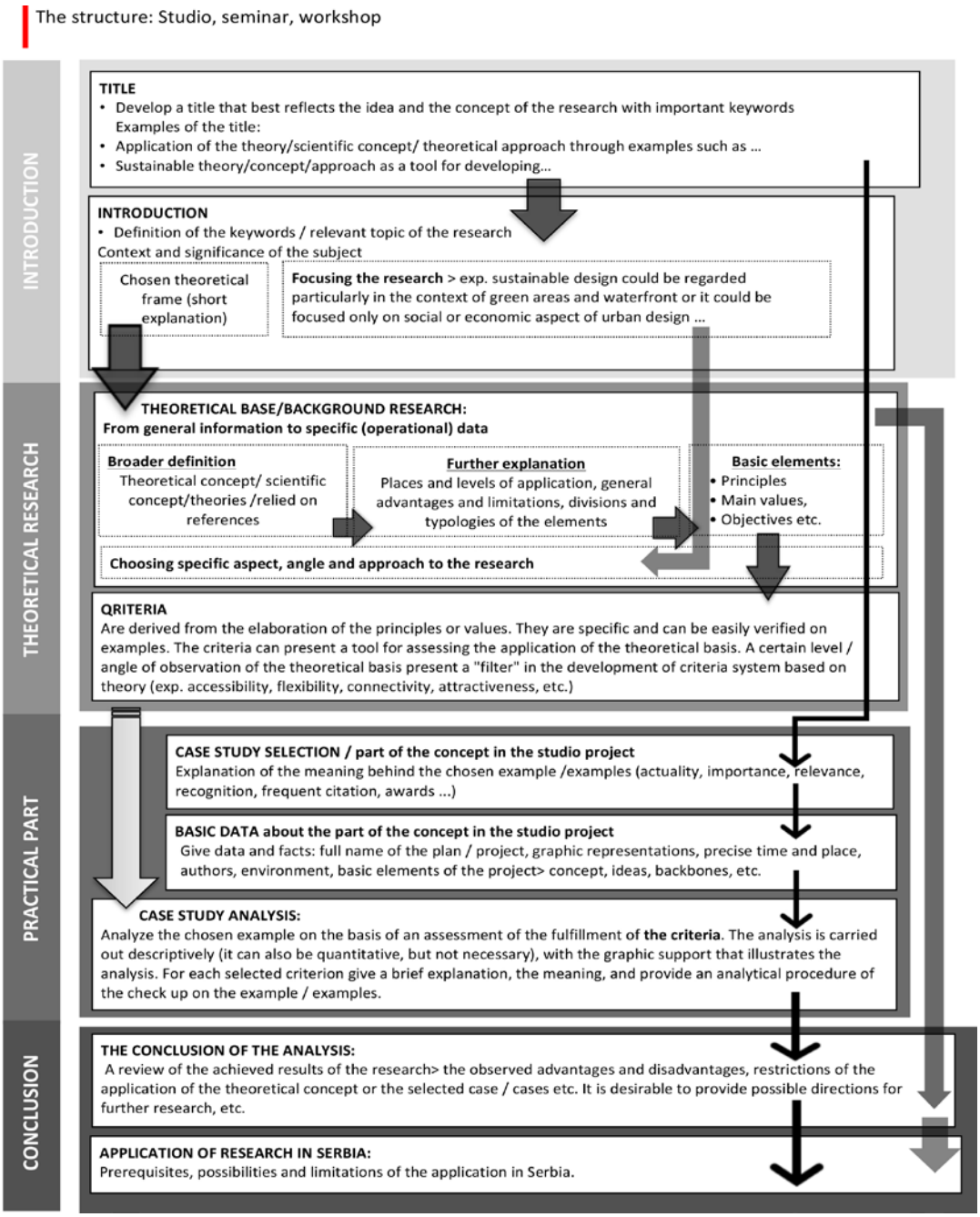

Figure 1: The algorithm representing the structure of the studio, seminar and workshop

Following the specific planning and urban design methodology, theoretical part is based on the extensive research, analysis of urban plans in different scales, comprehensive literature review, as well as cooperation with local authorities and institutions followed by the field research (workshop). Theoretical teaching of the course provides the knowledge base in the urban domain necessary for understanding and creating urban planning solutions taking into account the complexity of the special natural environment. In this sense, the theoretical part encompasses the importance of morphological, climate, ecological, architectural, economic and other characteristics of the area on the one hand, and on the other hand, considers the possibilities of creating contemporary solutions in the context of sustainable urban planning and design. Further research steps included defining the specific set of values and goals regarding the ecological, social and economic sustainability and local development. One of the important methodological steps is creating a specific set of criteria based on previously defined principles and examples of good practice. Next step is creating a specific, unique and elaborated concept that leads to the detailed regulatory plan proposal, with multifunctional land use and traffic solutions. The last phase defined the master plan and modelling of the physical structure, as well as the detailed plan of future activities. These steps are done in the period of maximum 5 months – one

semester. Students were both concentrated on the final product as well as on the process of planning and urban design. This process also included a workshop of 2 days of field work, organised at the Vlasina lake area so that students could experience the area, with all its potentials and problems, ambient and specific characteristics, followed by the collaboration with the great number of stakeholders: city and regional government representatives, professionals from the planning institutions and regional Institute for the historic conservation and protection, and many others. The final assessment of student work will be the exhibition where the local professionals will be able to see the final product and use the ideas and the concepts/plans/projects for the overall development and the benefit of the area of Vlasina lake.

The following paragraph presents the results of a five-month period and aforementioned process of urban planning and design done by the group of 13 students.

4. RESULTS

Work in this kind of a planning studio includes wide range of research, planning and urban / architectural design in the natural environment of the region of exceptional characteristics creating new activities and physical structures that are in conjunction with the natural environment and local needs, interests, potentials and limitations. The study relies on research work, creating both planning and urban design projects. Students develop the capabilities of an integrative approach in the treatment of complex natural areas, as well as the ability to apply the principles of sustainable urban planning and design in conjunction with local needs and interests.

4.1. Case study of Vlasina Lake

As mentioned, the task in the studio is focused on the locations with natural ambient and specific local needs, interests, potentials and limitations. The natural environment is an area with outstanding natural features, such as national parks, nature parks, etc. In this specific course, the selected location is the area of Vlasina Lake.

Figure 2: Vlasina lake district with the three treated settlements – Vlasina Rid (on north-west side of the lake), Vlasina Stojkovićeva (on the east side of the lake) and Vlasina Okruglica (on the south side of the lake), showing the extent of the area treated through the student projects

Vlasina Lake district has significant natural values, quality landscape and water resources as well as settlements and tourism capacities, which together create many developmental potentials as well as problems and it has been treated through several spatial and local urban plans. Due to its unique nature, the area of the lake holds a special protected status, and was treated through the Spatial plan of the special purpose area of Vlasina (Republic Agency for Spatial Planning, 2004), as well as with the Program of Environmental Protection of the Municipality of Surdulica for the years 2015 – 2025, issued by the municipality in 2015. The many restrictions enforced by the plan limit the possibilities when it comes to area usage and the existing and future built environment, establishing three key zones of protection within it. The area of the lake and its immediate

surrounding have the harshest regulations (like permitting permanent type buildings, usage of non-natural resources or even usage of motor vehicles within the lake and the land area that isn't already designated for them), while the rules get less prohibitive the further one moves away from the water surface and towards the existing areas of settlements. During the course of the studio, the students overwhelmingly chose to consider and honour these rules and regulations set by the official spatial plans for the Vlasina lake district, and incorporate them into their resulting planning solutions, trying to focus their works towards sustainable and environmentally friendly programmes, while also facing all of the limitations the existing built environment and morphology of the terrain imposed on them. The projects focussed on one of the three existing settlements or their parts, located in the close vicinity of the lake – Vlasina Rid, Vlasina Stojkovićeva and Vlasina Okruglica. Together all of the projects encompassed the surrounding of the entire lakeside, treating specific locations that were identified in collaboration with the local authorities as suitable points for possible development within these areas in more detailed fashion. The final results showed a wide array of different ideas and environmentally sustainable approaches, which not only envisioned the integration of new activities within the open and untouched natural areas, but worked towards redefining the existing built environment, and incorporating contemporary solutions suitable within the protected natural environment and geared towards both the local community and tourists.

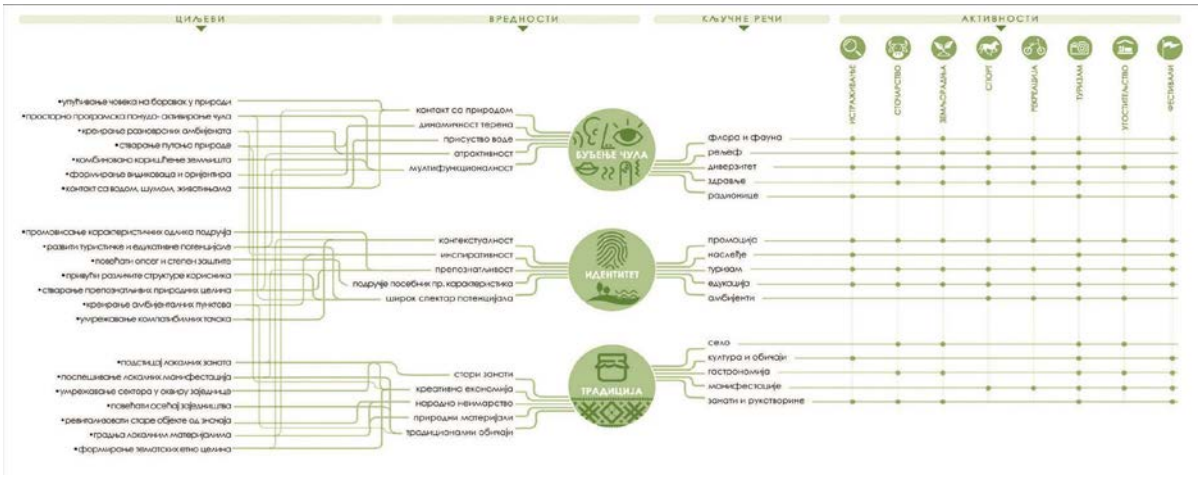

Figure 3: Example of a diagram showing the relation between the identified main goals, values and activities that are compatible with the conceived conceptual framework in one of the student projects; Authors: Slavić, S., Živković, K., Đorđević, A., Đurić, S. (2017)

Each concept had a different set of goals and primary incentives identified as the main initiators of local development – ranging from incorporation of a broad array of different types of accommodation and accompanying complementary spaces and activities for unconnected types of users, towards approaches that focused dominantly on the local community and the redefinition of traditional means of production, as well as more "radical" solutions that used available sustainable resources in order to integrate the environmentally friendly means of light industry that would work towards creating the first regional energy self-sustainable settlements.

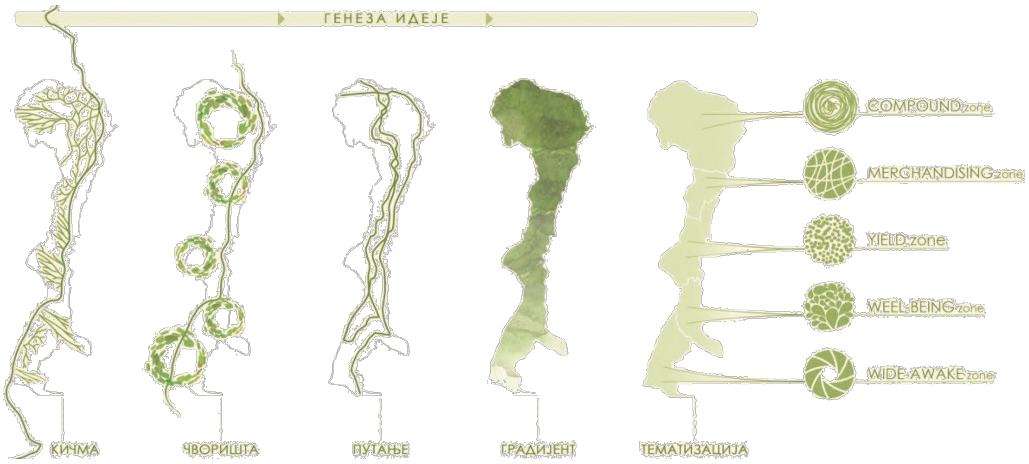

Figure 4: Example of the broader spatial genesis of the theoretical and conceptual framework; Authors: Slavić, S., Živković, K., Đorđević, A., Đurić, S. (2017)

For example, one of the more notable projects in the studio course (titled Caravanserai), dealt with creating a natural route connecting the settlement of Vlasina Rid with the lake side and other key points, spatially intertwining them. The formed zones were set on being visually, thematically and functionally different, while also being mutually interconnected with the usage of walking paths and routs for different types of sustainable transportation means and devices, and with connections in the form of different activities and functions strategically overlapping. The main aim of the project was to incent people to connect with the natural environment and spend more time in it, promoting a healthier and more active lifestyle while also trying to accentuate the unique natural landscape and its maybe overlooked values. Leaning on the available natural resources and their preservation, the resulting outcome depicted a good application of the of the principles and methods of sustainable planning and development that also managed to reimagine both the delicate and the untamed natural areas, properly bringing out the right man-made assets of this one-of-a-kind environment as well.

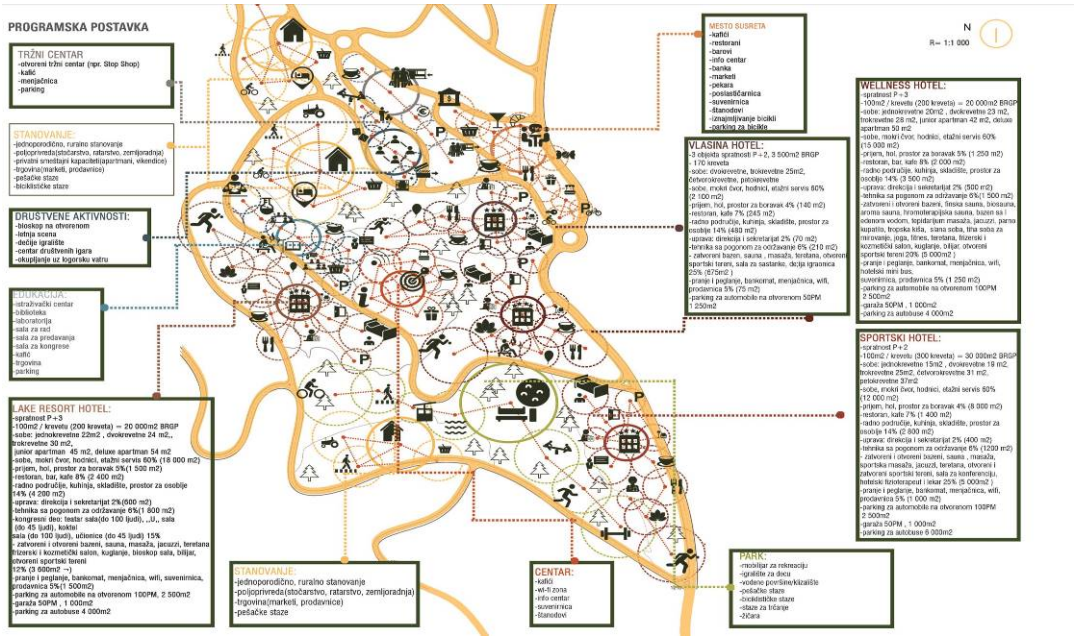

Figure 5: Example of the more detailed spatial depiction of the distribution of different uses and activities, and the identified functional connections; Authors: Karać, S., Matić, D., Antonijević, N. (2017)

4. DISCUSSION AND CONCLUSION

Design as a tool require integrated approaches, combined methods, and synergism between different specializations, and one profession at the forefront of addressing those interdisciplinary problems is urban and regional planning (Krizek & Levinson 2005). Designing is a complex, personal, creative and open-ended skill. Although Dreyfus and Dreyfus (1986) label the design process as 'unstructured' and Lawson (2006) sees it as a 'prescriptive job', creating features of the future in this particular case the process of designing and creating is predefined, the students are encouraged to develop unique concepts and projects and are not limited with existing planning documents and proposals in order to develop a new way of analytic thinking. Their specific approach to the real territorial issues they are treating has resulted in creating a unique concepts and projects that could be beneficial to the local municipalities and future courses of development.

One of the main advantages is that the outcome of the student works is overviewed and guided by the mentors and done in close collaboration with the local municipality and the planning officials, who participated in the process from the very beginning. In this way we believe that by developing a model that works as a simulation of a professional practice in the area of urban and architectural design, we are providing students with necessary skills for becoming future professional experts in the field of urbanism. This direct interaction with relevant stakeholders and the concrete location, provided with the field research, is an important stepping stone in the educational process, and it effects on shaping the mind-sets of the next generations of young professionals, it shouldn't be overlooked or skipped, especially during the higher levels of education within the domain of urban and planning studies.

REFERENCES

1. Casakin H. and van Timmeren A., 2014. Analogies as Creative Inspiration Sources in the Design Studio: The Teamwork. Atiner Conference Paper Series No: ARC2014-1188, Athens, Greece
2. Casakin, H., 2011. Metaphorical Reasoning and Design Expertise: A Perspective for Design Education. *Journal of Learning Design*, Vol. 4, 2, 29-38.
3. Chakradeo, U., 2010. Design pedagogy: A tested path. *International Journal of Architectural Research*, 4(2-3), p. 107-115.
4. Choguill, C. L., 1996. Toward sustainability of human settlements. *Habitat International*, 20(3), VIII.
5. Cropley, D. and Cropley, A., 2010. Recognising and fostering creativity in technological design education. *International Journal of Technology and Design Education*, 20(3), p. 345-358
6. Demirbas, O. O. and Demirkan, H., 2003. Focus on architectural design process through learning styles. *Design Studies*, 24, p. 437-456.
7. Dreyfus H.L. and Dreyfus S.E., 1986. Mind Over Machine, the Power of Human Intuition and Expertise in the Era of the Computer. Free Press, New York, USA
8. Gibbs, G., 1988. A Guide to Teaching and Learning Methods. Oxford Centre for Staff and Learning Development Oxford, Oxford Brookes University, (Online edition (2013)), UK.
9. Hardoy, J. E., 1992. Environmental problems in third world cities. Earthscan, London, UK.
10. Haughton, G. and Hunter, C., 1996. Sustainable cities. Jessica Kingsley Publishers, London, UK.
11. Krizek, K. and Levinson, D., 2005. Teaching Integrated Land Use-Transportation Planning: Topics, Readings, and Strategies. *Journal of Planning Education and Research.* 24: 304-316.
12. Kvan, T. and Jia, Y., 2005. Student's learning styles and their correlation with performance in architectural design studio. *Design Studies*, 26, p. 29-38.
13. Lawson, B., 2006. How designers think, the design process demystified. Architectural Press, Elsevier, Amsterdam
14. Mitrović, B., 2017. Integrative and locally sensitive approach to the community planning in Serbia. Conference proceedings, Places&Tehnologies 2017, Sarajevo.
15. Municipality of Surdulica, 2015. Program zaštite životne sredine opštine Surdilica za period 2015-2025 [Program of Environmental Protection of the Municipality of Surdulica for the years 2015 – 2025]
16. Nabih, H. E., 2010. Process-based learning: Towards theoretical and lecture-based coursework in studio style. *International Journal of Architectural Research*, 4(2-3), p. 90-106.
17. Republic Agency for Spatial Planning, 2004. Prostorni plan područja posebne namene Vlasina [Spatial plan of the special purpose area of Vlasina]
18. Schön, D., 1983. Educating the reflective practitioner: Toward a new design for teaching and learning in the professions. Temple Smith, London, UK.
19. Tacoli, C., 1998. Bridging the Divide: Rural-urban Interactions and Livelihood Strategies. International Institute for Environment and Development, London.
20. Tacoli, C., 2003. The links between urban and rural development. *Environment&Urbanization*,Vol 15 No 1 April 2003
21. UN Habitat, 2004. Urban indicator guidelines, Kenya
22. United Nations, 2015. Sustainable Development Goals (SDGs) - Sustainable Development Knowledge Platform. https://sustainabledevelopment.un.org/?menu=1300 [Accessed 30th September 2018]
23. Bagley, E. and Shaffer, D. W., 2015. Learning in an Urban and Regional Planning Practicum: The View from Educational Ethnography. *Jl. of Interactive Learning Research,* 26(4), 369-393
24. van Dooren, E., Rooij, R. and Willekens, L, 2014. Urban and Regional Design Education: Making the Design Process Explicit. AESOP conference From control to co-evolution, Utrecht

TEACHING SUSTAINABILITY: CONCEPT OF SMEDEREVO AS A HEALTHY CITY

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ABSTRACT

Sustainability as a broad concept has developed into a numerous new approaches both in theory and practice. One of the concepts that emerged from the ecological aspects of sustainability is the healthy city concept. Indubitably, its importance is emphasized in a new universal set of global goals – the Sustainable Development Goals, SDGs (UN, 2015), which represent a platform of the sustainable development by 2030. Namely, the Goal no. 3: Good health and wellbeing refers to the health-for-all concept, universal health safety and the access to quality health facilities (UN, 2015; Mitrovic, 2017). Nowadays, the healthy city concept refers to a wider frame - healthy environment and good quality of life in urban areas.

Meeting the contemporary trends in sustainable planning, as well as in high education for sustainability, the Master class in 2018 at the Master course Integral urbanism, Faculty of Architecture, University of Belgrade embraced the diversity of topics within an umbrella-topic 'Strengthening the cultural identity in Danube basin: case study of Smederevo', under the DANUrB international project and through INTERREG Danube EU program. It was released with the support of the city of Smederevo. Master class program was conducted in two parts: master thesis and master project.

One of the approaches to the assignment was to examine the possibilities of implementing of the health city concept to the city of Smederevo and its tributary areas. While the master thesis examined the theoretical background of the healthy city concept and in situ conditions of Smederevo, the master project offered a future network for diverse healthy places and activities, from the city centre to the surrounding green areas. The focus of this paper is to present the educational process and pedagogical methodology which resulted in the quality, realistic and implementable solutions.

Keywords: sustainability; healthy city; urban planning; educational process; pedagogical methodology

1. INTRODUCTION

The 2018 Master class course of the Master Studies in Integral Urbanism programme at the Faculty of Architecture, University of Belgrade, embraced the diversity of topics within an umbrella-topic 'Strengthening the cultural identity in Danube basin: case study of Smederevo'. The course was realised as a part of the DANUrB international project and through the INTERREG Danube EU program, with the support of the local authorities of the city of Smederevo, which represented the main territorial focus and research ground of the students' projects.

The Master class program consisted of two parts. The first part, master thesis focused on research and analysis, and the different theoretical sustainable concepts and aspects that could be applied, while aiming to define a conceptual framework and basis for the next step – the master project. Here the focus was steered towards implementation of the recognised theoretical principles, within the city of Smederevo and its surrounding area.

One of the sub-topics that were tackled by the students in the Master class course (B. Mitrović, mentor and T. Vukovic, teaching assistant) was related to sustainable urban and spatial planning as a support for cultural identity development of the territory of the city of Smederevo. The aim of the master studio was to address the contemporary trends in sustainable urban and spatial planning, as well as to pursue the aspects of sustainability in high education. General goals were related to researching the possibilities of an advanced activation of green areas within the city of Smederevo and its surroundings, through examining and implementing the healthy city concept. The focus of this paper is to present the educational process and pedagogical methodology which resulted in excellent, but most importantly, feasible solutions that could be easily implemented within the local context.

2. BACKGROUND RESEARCH

2.1. Sustainability framework

The sustainability still remains the concept which offers the most solutions to the problems of the contemporary city. Emphasising the local values, identity and the quality of life, sustainability itself becomes the different living concept for the cities and their tributary areas. The concept of sustainability provides the frame for the theory and practice of urban and spatial planning and joins the different aspects, such as economy, environment, social life and many more (Mitrović, 2017). According to Haughton (1996), the long term development can be assured by comprising the natural conservation, improvement of social progress and civil society. Other authors emphasize the rational use of renewable resources, self-sustainable communities, the economic vitality, and many more characteristics (Choguill, 1996; Hardoy, 1992). The new term of sustainable urbanisation refers to the relation between the basic aspects of sustainability and the urban-rural territory (UN Habitat, 2004). Today, sustainable urbanisation is very much promoted by the international organisations, such as UN-Habitat, OECD, World Bank and European Commission (Li-Yin Shen, 2011). Sustainability as a broad concept has developed into a numerous new approaches both in theory and practice.

2.2. Healthy city concept

One of the concepts that emerged from the ecological aspects of sustainability is the healthy city concept. Indubitably, its importance is emphasized in a new universal set of global goals – the Sustainable Development Goals, SDGs (UN, 2015), which represent a platform for sustainable development by 2030. Namely, the Goal no. 3: Good health and wellbeing refers to the health-for-all concept, universal health safety and the access to quality health facilities (UN, 2015; Mitrovic, 2017). Nowadays, the healthy city concept refers to a wider frame - healthy environment and good quality of life in urban areas (Edwards and Tsouros, 2008). The World Health Organisation (WHO, 2012) claims the health of the population is dependent of the conditions of communal life and the environment, while at the same time the improvement of the public health is seen as a constant process (WHO, 1999).

A healthy city is a city which is aware of its health and works on improving and preserving the health by creating and improving the possibilities of its built environment and by broadening the different resources that are available to its community in such a way that they enable the citizens to be physically active in their everyday life (Živković, 2015). A healthy city promotes different aspects of health, continually creates and improves its physical and social environments, expands the community resources, invests in the needed infrastructure to support these needs, and develop strategies and courses of action that are needed to realise

goals of improving the overall life of its citizens (WHO Europe, 2010). The three fundamental spatial-oriented elements are: supporting environment, healthy living and healthy urban design (WHO Europe, 2009).

The strategies connected to the healthy urban development need to be dynamic and ever present in the lives of the citizens, and in this way they are able to strive towards multi-layered and interconnected programs of urban development. These programs are usually implemented through relatively small but strategically planned spatial interventions that are intertwined with each other, as they are meant to be the starting points for future wide range connections. Furthermore, the preservation of the existing green spaces, and the integration of the new ones within the city, as well as programs who promote their usage as a part of an active and healthy lifestyle are stressed as very important for the implementation of the healthy city concept. Many of such programs and solutions have already been proposed or realised, such as ZJA, OKRA, & Witteveen+Bos**,** (2018), who created multipurpose spaces that can accommodate a broad range of activities on local levels, trying to reduce the negative effects and sources of different types of pollution (such as air, noise, light, soil, water, etc.) within the city.

The relevance and importance of the principles of sustainability and the healthy city concept were the starting points for the examining the possibilities of their implementation within the master thesis and master project. Being a very current global topic, relying both on the raising awareness about the need for a healthy lifestyle, as well as on the risks of living in the polluted urban areas, the healthy city offered myriads of opportunities for solving the problems of a heavily polluted, greenery-lacking industrial city of Smederevo.

3. METHODOLOGY APPROACH

The Master class program consisted of two parts: master thesis and master project, both being tied to the topic 'Sustainable urban and spatial planning as a support for cultural identity development of the territory of Smederevo' (Mitrović, B., mentor and Vuković, T., teaching assistant). The aim of the master studio was to address the contemporary trends in sustainable urban and spatial planning, as well as to pursue the aspects of sustainability in high education. Additionally, the goals of the course were related to the development of skills on specific knowledge, approaches and principles on sustainable development and urban planning and design, with the aim of understanding relations between natural and artificial surroundings (Mitrović at Al, 2017).

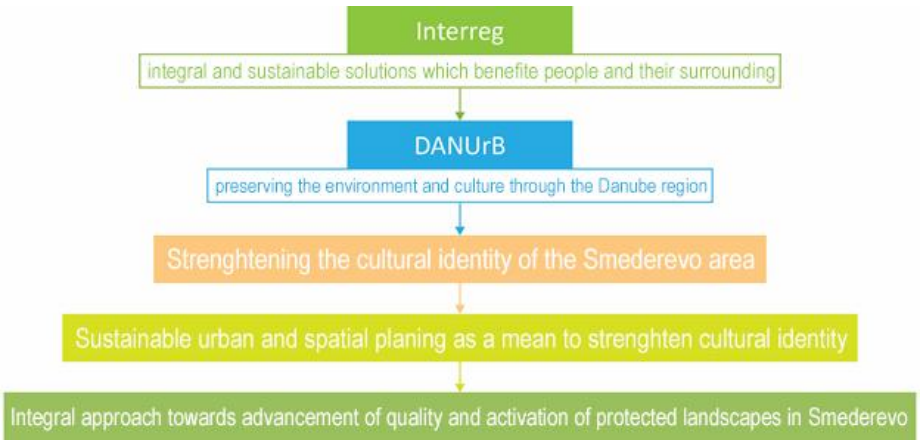

Figure 6: Diagram setting up a thematic framework; Author: Stanojević, M. (2018)

The first part - master thesis –was conducted in two directions: the research related to the Smederevo case study and theoretical research of the relevant sustainable concepts. Case study research included the content and documents research, as well as the field research, aiming to gather and systematise valid information, as well as to assess the present green infrastructure, and the general characteristics of city and its surrounding.

Additionally, master thesis aimed to define a conceptual framework and basis for the next step – the master project. Here the focus was steered towards implementation of the healthy city principles within the city of Smederevo and its tributary area. The master project was conducted in accordance with the educational model used in a studio, which is continuously considered as the most appropriate form for applying learning-by-doing approach and enhancing students' levels of expertise through practical learning (Schön, 1983; Gibbs, 1988; Casakin and van Timmeren, 2014).

The master project was focused on: examining and establishing different levels of intervention, defining the green network and reviving green places, with the aim to attract all groups of inhabitants and tourists. This

learning approach enabled the diversification of solutions at different planning levels – from strategic, general and related to the whole of the Smederevo territory, to the local regulatory planning, while spanning from the city centre to the surrounding green areas. At the same time, the teaching methods led the master project towards the testing of the chosen concept of the healthy city though introducing the eco-park model and defining the detailed plans of activation of green areas.

4. CASE STUDY OF SMEDEREVO

The city of Smederevo was identified as a suitable location for the realization of the 2018 Master course in collaboration with the aforementioned DANUrB project. With its medieval historical sites, production and economic growth traditionally focused both on agriculture and heavy industry, the proximity to the Danube river, many underdeveloped or under-promoted tourist attractions, and distinct culture, the city checks many of the boxes required to make it an area open to a wide array of research topics and thus possible directions for future development. On one hand, due to the former and existing factories and their heavy-duty character, the urban area is highly polluted, which highly urges for action towards creating a healthier and ecologically sustainable environment. On the other hand, the city's position by the Danube river, as well as its tributary green areas offer various possibilities for contemporary activation, meeting the needs of the local community as much as the needs of visitors.

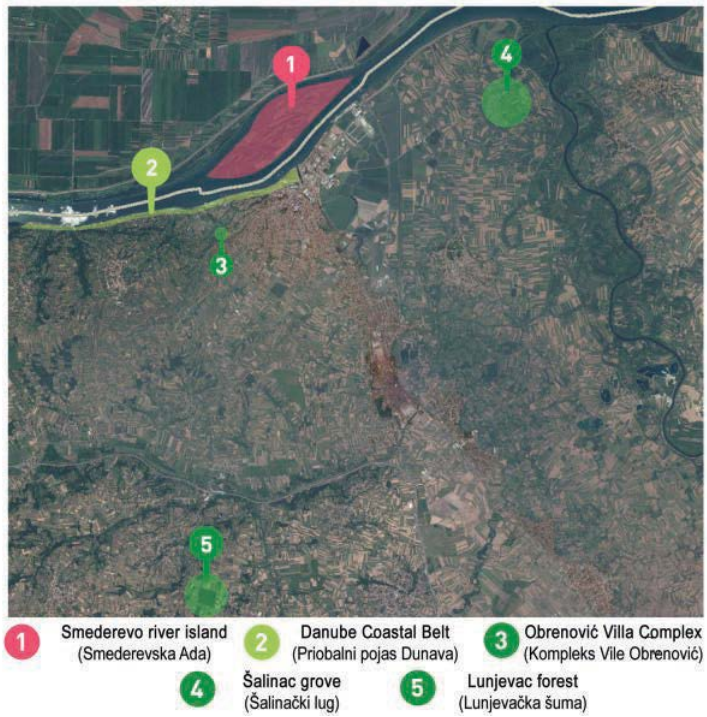

Figure 7: Spatial disposition of the important natural and cultural landscapes within the city of Smederevo recognised by the Spatial plan of the City of Smederevo; Author: Stojanović, M. (2018)

4.1. Characteristics of Smederevo

Smederevo territory is located in the north-eastern part of Serbia, on the right bank of the Danube river. The rich historical heritage of the city combined with its many natural beauties and resources, made the area suitable for urban and industrial development in the 20th century. The heavy industrialization left the region of the city highly polluted, having a great impact on its environment and citizens and urging for environmental action. Nonetheless, there are still untouched green areas located next to the river and its close proximity, while the accompanying non-urban parts of its metropolitan area are mostly used as agricultural land.

In the Spatial plan of the Republic of Serbia (2010), Smederevo is recognized as an important regional center. Its proximity to the Danube makes Smederevo an integral part of this European transportation network, thus further emphasising the need to explore different ways of its future development. The city territory presents a fertile ground for incorporating modern concepts of sustainable development, where one of the main goals should be focused on the revitalization and preservation of the available natural resources and scarce green areas, as well as on the improvement of overall health of the local community.

The analysis of the landscapes of Smederevo shows there are four types of landscapes within the city territory: natural, urban, suburban and cultivated, as well as natural and cultural landscapes, all of them being a representative aspect of the city's cultural heritage and identity (Spatial plan of the City of Smederevo, 2010 – 2015 – 2020). These natural and historical areas are scattered throught the city and its metropolitan area and have suffered gratelly due to human actions (Figure 2). One of them is the Šalinac grove (Šalinački lug), which is listed as one of the few protected natural areas of the city of Smederevo. These green places, starting from the city centre and stretching to its periphery and beyond, can form a green spine - a developmental route that promotes ecological and healthy lifestyle awareness, and a modern concept of tourism.

5. RESULTS AND FINDINGS

As aforementioned, the process of defining multi-level solutions was conducted through the master project, following thorough analysis and research methodology, focused on identifying the natural and environmental resources. The process is shown in the Figure 3 and is based on a co-relationship between the elements used in the research and the ways they form a model for improving and activating the natural landscapes.

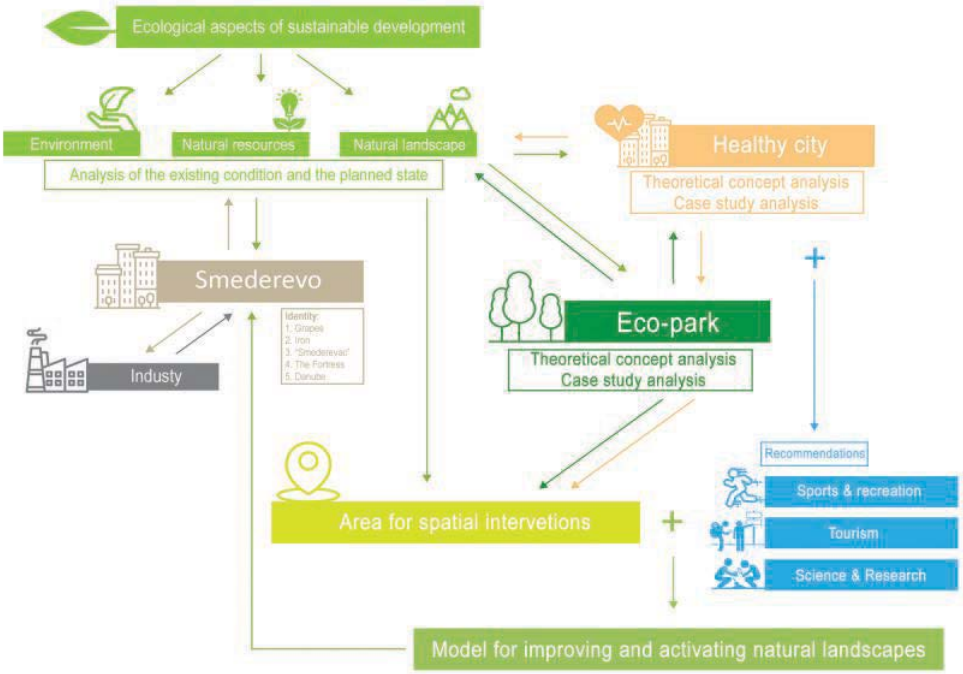

Figure 8: Diagram of the co-relationship between the elements used in the research and the ways they form a model for improving and activating the natural landscapes; Author: Stojanović, M. (2018)

In order to establish a basis for a healthy city strategy for Smederevo and to offer a variety of possibilities, programs and activities aiming to introduce healthy lifestyle, but also to revive and activate the natural resources, green network in the form of green route was proposed. Its purpose was to connect different places of interest, all with different attributes and attractive in different ways. The idea was followed by the detailed proposal of different activities, active and passive ways of recreation, leisure, entertainment, culture and education, as well as new forms of tourism, targeting different groups of users – inhabitants or visitors. It was given in the form of programme and capacity assessment (Figure 4).The main criteria were related to diversity, compatibility, unique identity, optimal capacity and branding the targeted green places. Green spots are planned as mixed use of sport and recreation, tourism, protection of the environment, and science and research. Listed below are four chosen green areas – green points, with their specific characteristic:

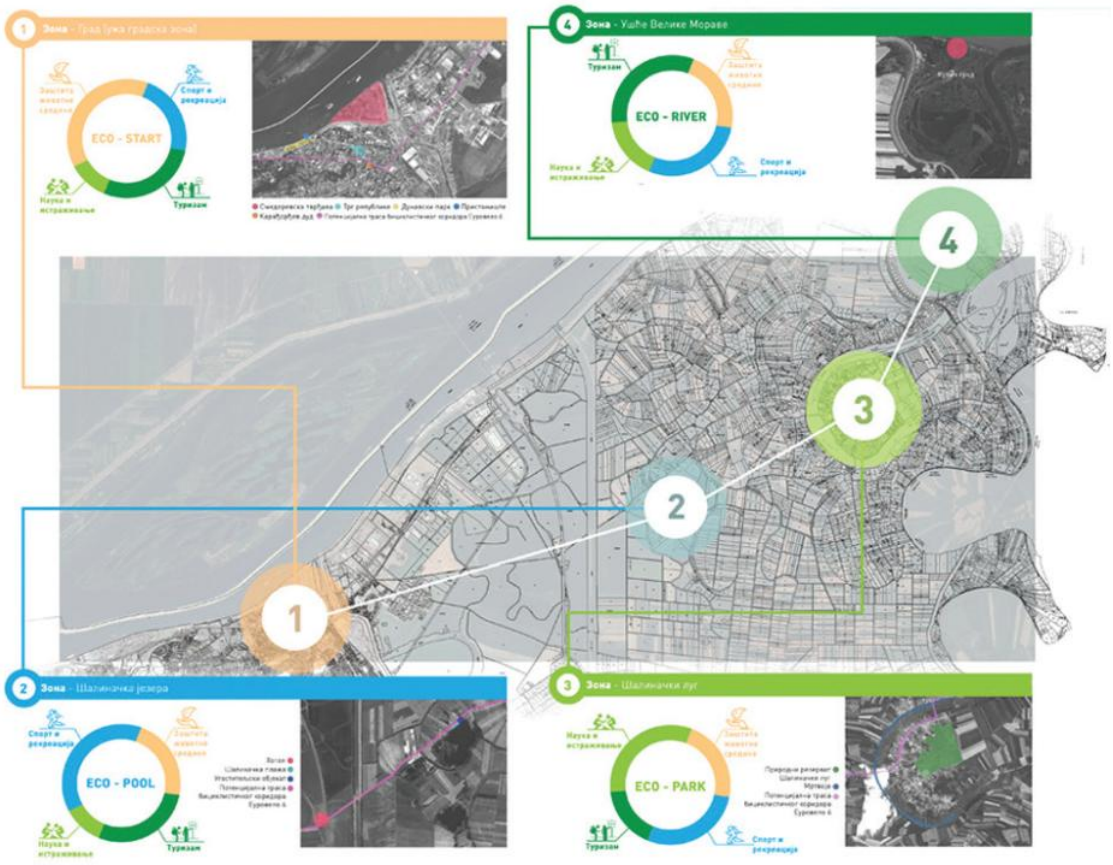

Figure 9: Illustration of the proposed 'eco-route' concept; Author: Stojanović, M. (2018)

- Eco-start - The urban center of Smederevo –cultural and historical center, and place of gathering, with variety of cultural, educational and recreational activities. This location is imagined as the starting point of the route whose main focus was cantered around tourism and raising awareness of the importance of environmental preservation and a healthy lifestyle;
- Eco – pool - The Šalinac lakes (Šalinačka jezera) –in the close proximity to the city core, serves as the centre of activities related to sports and recreation within the Eco route. The planned spatial interventions include the improvement of the existing beach area of the lakes and integration of new spaces and activities meant for both tourists and the local community, such as open courts and playgrounds, recreational tracks, restaurants that serve local and healthy food products, as well as a hotel, gift shops and areas meant for sports tournaments and manifestations;
- Eco – park - The Šalinac grove (Šalinački lug) – rare protected natural landscape in the region, serves as the key point within the proposed green route. The planned solutions include the promotion of science and research with the stress on the preservation of the unique flora. It has different types of accommodation that would suit the incoming researches, lecturers, experts and tourists. The plan of development of this location is closely related to the activation of the protected grove area.
- Eco – river - The confluence of the Great Morava – an area of natural beauty and untouched greenery, also the location of an important archaeological site, Kulič city (Kulič grad) is the last stop of the route. Its main spatial focus is centred around the preservation of historical and cultural heritage, with the incorporation of a museum and spaces for cultural manifestations, all while keeping the plentiful untouched green areas in this location intact.

The four points, already presently connected to a certain extent by the Eurovelo 6 route, would be activated in different ways and to a different extent. Each of them would be a node with distinct types of dominant activities, intertwined within the overall green web. The idea was not only to determine the best possible courses of future development, but also to conduct a study of planning possibilities of these core points. In the previous research phase, a connection between the healthy city concept and eco-parks as one of the possible means of implementing the concept, were found. The Šalinac grove (Šalinački lug) was recognised as a

potential location for creating and developing such a complex use and thus testing the planning possibilities of the protected natural reserve and the settlement within which it is located.

Figure 10: Illustration of the first step in the process of spatially contextualizing the theoretical and analytical framework, with the distribution of uses and activities within the area of the Šalinac settlement that lead to the proposed detailed regulatory plan of the area ; Author: Stojanović, M. (2018)

The outcome of the whole process was a detailed regulation plan, whose main goal was to preserve, reactivate and redevelop the space it treated. The focus of new functions was on research, recreation and tourist spaces and facilities. The result was a well-structured, high quality work, which aimed at introducing fresh concepts, activities and spaces in a contemporary and most importantly feasible and realistic manner.

6. CONCLUSIONS

The paper presented the educational process, methodology and the outcome in the form of different planning solutions in accordance with the healthy city concept as well as in accordance with the main principles of ecological sustainability.

It is fair to say that the link between the research methods and further project-based method in the master thesis and project have given realistic and applicable results, tailored according to the needs of potential users. This learning approach enabled the diversification of solutions at different planning levels – from strategic, general and those related to the whole of the Smederevo territory, to local regulatory planning, encompassing a spatial frame spanning from the city center to the surrounding green areas. At the same time, this method enables the development of a set of skills on specific knowledge, but more importantly it incites critical thinking and a more creative approach to this real-life-based planning assignment. Finally, the process enabled the testing and proving of the chosen theoretical concept within an existing spatial setting, through these several aforementioned planning levels as a part of the master class project course.

The healthy city concept has proven itself as a valid solution that offers many options within the field of urban development – from raising the awareness of the necessity of a healthy lifestyle, to different land use solutions that involve and cater to different types of users. Furthermore, it proved to be a good choice in terms of minimizing the negative impact of industrial facilities on the urban areas and a benefit for the human health, through opening the possibilities of various forms of relaxation, recreation and leisure. The choice of Smederevo as the 'training ground' for the more detailed theoretical and spatial analysis of this concept, helped in showing not only the extent of the environmental and other issues that arose from directions of contemporary urban, often non-sustainable growth, but also highlighted the importance of these, essentially vulnerable areas and a broader spatial and contextual scope when it comes to integrating modern, creative and, most importantly sensible solutions.

REFERENCES

1. Casakin H. and van Timmeren A., 2014. Analogies as Creative Inspiration Sources in the Design Studio: The Teamwork. Atiner Conference Paper Series No: ARC2014-1188, Athens, Greece
2. Choguill, C. L., 1996. Toward sustainability of human settlements. Habitat International, 20(3), VIII.
3. Edwards, P. and Tsouros, A., 2008. A Healthy City is an Active City: A Physical Activity Planning Guide. WHO Europe, Copenhagen.
4. Gibbs, G., 1988. A Guide to Teaching and Learning Methods. Oxford Centre for Staff and Learning Development Oxford, Oxford Brookes University, (Online edition (2013)), UK.
5. Hardoy, J. E., 1992. Environmental problems in third world cities. Earthscan, London, UK.
6. Haughton, G. and Hunter, C., 1996. Sustainable cities. Jessica Kingsley Publishers, London, UK.
7. Li-Yin Shen, J. J., 2011. The application of urban sustainability indicators - A comparison between various practices. Habitat International 35: 17-29.
8. Mitrovic, B. at al, 2017. Food Tourism Concept - Creating Synergy Between Urban and Rural Places - Case Study Of Maglič, Serbia. Conference proceedings, Places&Technologies 2017, Sarajevo.
9. Mitrović, B., 2017. Integrative and locally sensitive approach to the community planning in Serbia. Conference proceedings, Places&Tehnologies 2017, Sarajevo.
10. Republic Agency for Spatial Planning, 2011. Prostorni plan Republike Srbije 2010 – 2020 [Spatial plan of the Republic of Serbia 2010-2020]
11. Schön, D., 1983. Educating the reflective practitioner: Toward a new design for teaching and learning in the professions. London, U. K.: Temple Smith.
12. Smederevo Land Development Public Agency, 2011. Prostorni plan Grada Smedereva 2010 - 2015 – 2020 [Spatial plan for the city of Smederevo 2010 - 2015 - 2020]
13. Stanojević, M., 2018. Integralni pristup unapređenju kvaliteta i aktiviranju pejzažnih celina u Smederevu - Formiranje Eko - parka na principima koncepta Zdravog grada (Master thesis). Faculty of Architecture, University of Belgrade, Belgrade, Serbia.
14. UN Habitat, 2004. Urban indicator guidelines, Kenya
15. United Nations, 2015. Sustainable Development Goals (SDGs) - Sustainable Development Knowledge Platform
16. World Health Organization - WHO. 1999. Health21: The Health For All Policy Framework for the WHO European Region. World Health Organization, Copenhagen, Denmark. ISBN 92 890 1349 4
17. World Health Organization Europe - WHO Europe. 2009. Zagreb Declaration for Healthy Cities. World Health Organization, Copenhagen, Denmark.
18. World Health Organization Europe – WHO Europe. 2010. What is a healthy city?. http://www.euro.who.int/en/health-topics/environment-and-health/urbanhealth/activities/healthy-cities/who-european-healthy-cities-network/what-is-a-healthy-city [Accessed April 15, 2015]
19. Živković, J., 2015. Koncept integrisane rekreacije i mogućnost primene u uslovima razvoja gradova Srbije. 1-293, Doctoral dissertation, University of Belgrade, Faculty of Architecture, Belgrade.
20. ZJA, OKRA, & Witteveen+Bos, 2018. The Healthy City, Making Singapore a worldwide precedent for The Healthy City. https://www.zja.nl/nl/media/inline/2016/2/23/793_the_healthy_city.pdf [Accessed: 20th September 2018]

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INDUSTRIAL HERITAGE THROUGH CITY OF NIS´ SPATIAL PLAN -VALUATION AND RECOGNITION WITH RECOMMENDATIONS ON INTEGRATION OF RENEWABLE ENERGY SOURCES

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ABSTRACT

This paper aim is to present historical heritage of abandoned industrial buildings, now placed near the city centre, as important urbanistic points. Old and abandoned buildings along with the area of intervention can be reconstructed so that marginalized parts of the city can be revived. The paper points out to the settlements of the Roma population formed on the periphery of such former industrial giants, problems and challenges.

The paper will show examples of the former leather factory "Djuka Dinic" and former factory "Tobacco Industry", as well as examples from abroad for comparison. The aim is to identify the element of industrial heritage use along with environmental measures that include use of renewable resources. These can contribute to a new, sustainable dimension of buildings and parts of the city where abandonment and social instability occur.

The results of the analysis indicate that the measures of reconstruction from the urban point of view represent worthy elements of spatially more alleviated development and as such they can help that the parts of Nis are better and more comprehensively valorised. This is the opposite to the current practice of transferring elements of spatial plans to the new ones without considering proactive measures to revitalize the forgotten parts of the city. Giving priority to certain heritage of historical significance bears the consequence of forgetting important urban points and form a city like Nis as a museum-city, instead of a city that undergoes its history through reuse and useful interventions for its prosperity and improvement.

Keywords: urban planning; reconstruction, urban areas, industrial heritage, renewable energy sources, the city of Nis

1. INTRODUCTION

Most of the southern Serbia cities are developing on the course and the formation of some of the previous settlements. But such distant past and all subsequent layers of development should not be the place where the city development or of any other settlement is interrupted, but places where tourism, sports and culture are being promoted.

Niš is treated as a macroregional gravity center in the network of settlements, which covers a large number of functional areas (regional settlement systems) serving as a rule population of 1000 000 people. Because of the importance of the city today,as well as its position, its development strategy has been designed and adopted accordingly. It is based on sustainable development, determination of potential advantages and development directions of the city of Nis, maintenance of stable economic growth, promotion of innovations, protection of

the life saloon, improvement of the quality of life of citizens.[1] According to this development, some of the industrial objects, abandoned in the course of transition, modernization or change of owners, regardless of whether they are protected as cultural goods or not, can be seen as unmet milestones of the city´s development. Depending on the re-development potentials, using renewable energy sources can be a forthcoming aspect of the process. Many of these buildings can be treated within the concept of industrial heritage appreciation and allocation, in terms of material and cultural sustainability of city´s parts. Industrial heritage can be defined as material and non-material residues (memories, records, photographs) that are the consequence or testament to the development and operation of the industry, which have historical, social, architectural and scientific value. Industrial heritage includes plants and factories that have lost their original purpose, as well as old machines, mines and auxiliary structures. It also includes residential and public buildings designed for workers, as well as entire accompanying settlements that grow on the outskirts of industrial complexes.[2]

In the analysed case study of Nis, it will be shown how parts of the industrial heritage can find their purpose within the transfer to renewable energy sources and it will be argued how urban planning plays a role in this process. The outcome of the paper is acknowledgement of current states in planning.

2. METHODOLOGY OF THE PAPER

The methods of the paper include comparative analysis of case studies abroad that use the urban revival opportunities to introduce renewable energies in urban planning, with the cases study of Nis. . The case studies chosen both had the same problem: social degradation and needed revival to achieve social cohesion of those neighborhoods within the whole city. The circumstances of these case studies were like those existing in Nis, according to the previous analysis of Nis´s architecture and urban morphology. Some of the urban plans of Nis have been analysed within the historical method.

3. RENEWABLE ENERGY SOURCES (RES) -TYPES OF SYSTEMS FOR THEIR UTILIZATION WITH REFERENCE TO NIS

Renewable energy sources are available as local resources in almost all parts of the Earth, where cities are built. For once, geothermal energy (GE) is considered to be the form of renewable energy which is available at certain depths in all soils underneath. Its thermal capacity is determined by the local thermal gradient (Reber et al., 2014)[3]. Its utilization via heat pumps is therefore possible, regardless of the outer influences, such as weather conditions (cloudiness, availability of wind throughout the year) or sun' s irradiation intensity at a specific location on Earth. There are passive and active systems that utilize these sources of energy (Pucar, 2006)[4]. Passive systems are connected to the architectural morphology and are related to urbanistic parameters such as layout of the buildings within urban blocks, their compactness, orientation and thermal capacities and thermal exchange between building materials and soil and vegetation. One may not influence the upgrades of these systems, as they do not convert energy but rather serve as sinks -forms where energy is best utilized in its basic, initial form (whether it is sun, geothermal energy, wind, tidal and sea wave energy, for example). On the opposite side, active systems such as solar collectors, photovoltaics (PVs), heat pumps (for geothermal energy utilization) or wind generators transfer the initial energy source into either electricity or heat.

The focus of this paper would be both active and passive energy systems, applied on a specific cases study location.

[1] Генерални урбанистички план Ниша 2010-2025. „Службени гласник РС“број 43/2011

[2] Слободан Наумовић, Ресурс од кључног значаја: индустријско наслеђе Бора виђено из перспективе индустријске археологије, етнологије рударства, политичке антропологије и визуелне антропологије, made available March 2012, accessed October 2018, source: http://www.biblioteka-bor.org.rs/2012/03/dr-slobodan-naumovic-resurs-od-kljucnog-znacaja-industrijsko-nasledje-bora-vidjeno-iz-perspektive-industrijske-arheologije-etnologije-rudarstva-politicke-antropologije-i-vizuelne-antropologije/

[3] Reber et al., 2014, The transformative potential of geothermal heating in the U.S. energy market: A Regional Study of New York and Pennsylvania, Energy Policy, 2014, p. 30-44

[4] Pucar, M., Bioclimatic architecture–Glazed Spaces and Passive Solar Systems, Beograd, 2006

Nis is rich in renewable energy sources (Jovanović, 2017)[5]. Solar irradiation in South-East of Serbia is larger than most of the Northern parts of the country and is above average In European terms. Daylighting conditions and sunlight availability throughout the year are also very convenient, in terms of the passive systems 'use [6]. Geothermal energy in form of heat pumps is an option which is favorable as well as opportunities for deep GE within the direct use from locally available aquifers underneath (Radaković, 2011)[7]. Some wind energy is also available, although the location of Nis in the valley surrounded by hills and mountains makes it less convenient for such use[8]. Other cities and municipalities in Serbia, especially in the north of the country, are considered more convenient for the development of wind-powered generators. On the other hand, careful planning of solar and geothermal installations is the most favorable in terms of urban tissue upgrades and even at the level of the city´s strategic planning (Jovanovic, 2017)[9]. To understand the options for utilizing RES for urban revivals, comparison to other case studies is made.

4. THEORETICAL DISCOURSE ON RENEWABLE ENERGY SOURCES 'UTILIZATION IN THE CONTEXT OF INDUSTRIAL REFURBISHMENTS

When considering the possibility of introducing renewable energy sources in buildings that were once used by industry, during revitalization, it is necessary to determine the zones of industrial heritage within the city centers. The neglected appearance of the industrial building and the environment reduces the overall quality of the urban environment that is most often distinguished from other areas or buildings and this leads often to these areas´economical impoverishment too.[10] For the local community, the revitalization of historic buildings and the return to use is an important aspect of development policy, as the areas around abandoned factories are the most common places for living for the socially vulnerable population. Based on Milanovic's study, there are several basic models of remodeling, with which the level of real estate value of cultural heritage is placed in the context of sustainability- This is achieved by creating new contents inside the fabric of the interior and exterior of the zones and objects of industrial heritage. he most frequent models of rational urban renewal of industrial heritage (if the original purpose is lost) are transformations to new funcianalities: objects of public functions, business centers, fun recreational centers, art center (zones of art galleries and showrooms) and business and residential buildings.[11] A case study with economic justification is an obligatory act of potential investors, with data on functional obsolescence which leads to loss of purpose, due to which it is necessary to do:

- physical,
- social ,
- and functional revitalization. [12]

With the aim of networking all revitalized industrial sites and buildings, the ERIH - European Route of Industrial Heritage Association was established in Germany, for the purpose of tourist information in cross-border

[5] Jovanovic, A., On "Long-Run-Transitions" in Urban Planning Supported by More Advanced Geothermal Energy Utilization in City of Nis, Serbia, Architecture and Urban Planning, Vol 13, issue 1, 2017

[6] Fakultet zaštite na radu, centar za upravljanje rizikom u životnoj sredini, koordinator Nenad Živković, 2014

[7] Radakovic Milos, Geotermalna energija, 2011, 13.

[8] Генерални урбанистички план Ниша 2010-2025. „Службени гласник РС"број 43/2011

[9] Jovanovic, A., Contribution of geothermal energy to the urban transformation of the city of Utica in the USA, with regards to urban planning, 2017, Proceedings KGH, Beograd, 2017

[10] English Heritage, Heritage Works, The Use of Historic Buildings in Regeneration, London, 2006, 3.

[11] Рудник Милановић Александар, Савремени приступи за успостављања могућих модела ревитализације, конзервације и презентације индустријског наслеђа, Инжењерска Комора Србије Регионални центар Крагујевац Матична секција пројектаната, приступила окт. 2018 https://docplayer.es/49101330-Inzhenjerska-komora-srbije-regionalni-centar-kragujevac-matichna-sekcija-projektanata.html

[12] English Heritage, Heritage Works: The Use of Historic Buildings in Regeneration, London, 2006, 7)

European countries. In the wider sense, the revitalization of industrial buildings comes out of the notion of local and becomes part of the global European network of industrial complexes and buildings protection.[13]

5. INTEGRATION OF RENEWABLE ENERGY SOURCES AND ARCHITECTURAL CONCEPTS IN OTHER CASE STUDIES

In Wilhelmsburg, Germany, which is the first case study analyzed, a former city-suburb of Hamburg was transformed in 2013 following the International exhibition project (IBA). With its background as a suburb of Hamburg with mostly immigrants and socially instable population, lack of integration into the whole of Hamburg, a proposal for urban regeneration and integration has been made. Other parts which have been upgraded were Harburg´s upriver front and Veddel island (also in Hamburg). The upgrades to the city´s infrastructure and buildings included in the master plan by the architectural office of *Jo Coenen & Co* and *Agence Ter* (landscape planning) were the revitalizations of Wilhelmsburg Urban Railway Station as well as new erecting of Wilhelmsburg Central (housing area), involving Hybrid Houses (made from ship containers modules, with low costs per square meter of the house plan) [14], Smart Materials- and urban linkage. Using RES was made within the concept of the old bunker from the WW2, where solar collectors and accumulated heat containers were installed, within the refurbishment of the building and new use as an exhibition café (see Figure 2) One ingenious concept in the bunker was that it accumulated waste heat from a near-by factory and served to heat the dwellings near-by when they needed heat.

Figure 1 (left): IBA exhibition containers, , source:https://www.hamburg.de/contentblob/3880096/bd906b953e46d5d86d60b28a50269ac3/data/b-iba-dock.jpg, accessed 05.10.2018

Figure 2 (right): Old WW2 Bunker Building, source: https://www.ecologic.eu/14982, accessed 05.10.2018

Figure 3, View of Wilhelmsburg central project with housing and old industrial riverfront's upgrades, source: http://www.beaconpathway.co.nz/images/uploads/International_Building_Exhibition_Hamburg.pdf, accessed 05.10.2018

5. HISTORICAL DEVELOPMENT OF NIS AND ITS URBANITY

Urban matrix of the city´s central zone was inherited from the Oriental period. From the end of the 19th until WW2, Nis acquired its European-influenced architecture and planning strategies, whereas they were integrated in the previous Ottoman morphology of the city (see Fig.4 for illustration of this planning).

[13] https://www.erih.net/, accessed on 06.10.2018

[14] See: http://www.hybridhomes.lk/, accessed 05.10.2018 for more information

Today's urban concept is based on the oriental heritage, which immediately began to change after the liberation from the Turks in 1878, by adopting the first regulatory plan, "The project for the regulation of the town of Nis", designed by Winter. [15] But apart from all the expectations of the indigenous population, after the liberation there were no major changes in the division of social capital and property, social power, or the division of traditional occupations within economy system.

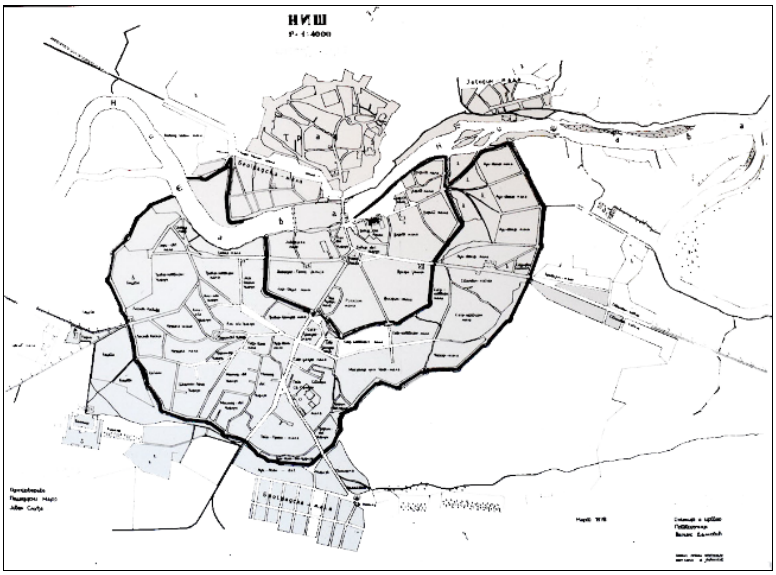

Figure 4, Appearance of Nis in the 19th century, right after the liberation from the Turks. The plan made by sub-lieutenant Feliks Deljkovic shows the Fortress (upper part of the picture), surrounded by city walls (central part) and scattered housing around it. This scattered oriental form will become the future urban core of the city in the 20th century and beyond; source: M. Medvedev, private collection16

Lastly, Nis began to develop in an industrial manner in the second half of the twentieth century.

After the First World War, Niš turned into a city and it is developing according to the new Andonović plan adopted in 1907. The economy is transformed from craftmanship-based and accumulation of capital into an industrial production-based economy, which opens the way to the construction of industrial plants. Niš became a city of increased development for the settling of western industrialists until 1939. It was until this year that Nis got today's appearance of the central part, and when other functional zones were determined.[17] Before the commencement of the Second World War in 1936, a new General Regulatory Plan of Nis was approved by the Cabinet of Ministers in 1939, which was never implemented until the adoption of the new 1949. Prior to the adoption of the new plan, Niš had already had 49,000 inhabitants.[18]

Here, many times, the industrial zones were given new locations by increasing the number of inhabitants and by Nis´ economy´s development.

5.1. ARCHITECTURAL HERITAGE IN NIS WITH FOCUS ON INDUSTRIAL BUILDINGS

The general urban plan provides a proposal for urban protection, measures imply the obligation of preservation, further research and presentation of immovable cultural assets in accordance with the Law on Cultural Property. [19] From many industrial buildings built before and after the end of the First World War, only two historic buildings, the old *Monopoly* building of the old tobacco industry and old tire factory buildings, have been preserved and protected, while the rest of the modernization, due to the changes in the ownership structure, have been destroyed.

[15] Ћирић Јован, Из тополошке историје Ниша, Зборник 6-7, Народни музеј Ниш, Ниш, 1991. стр. 72-85.

[16] Source: https://slovojuga.rs/vinterov-plan-urbanisticko-resenje-koje-je-uvelo-nis-iz-turske-kasabe-u-evropske-gradove/, accessed on 04.10.2018

[17] Source: Ћирић Јован, Ниш 1878-1915, Нишки зборник бр. 5-6, Градина, Ниш, 1978. стр. 73-90.

[18] Source: https://issuu.com/zedes/docs/50g_zavod_za_urbanizam_nis_-_monogr, accessed on 29.10.2018

[19] Закон о културним добрима („Службени гласник“бр. 71/94, 52/2011 – др.закони 99/2011 – др.закони)

English Heritage gives a definition of the term: "Historical buildings are: a) buildings included in the statutory list List of Buildings of Special Architectural or Historic Interest (listed buildings); b) buildings located in conservation areas; c) buildings that are of local architectural or historical interest and which are listed in the local plans; d) buildings of architectural and historical interest within the national parks, a zone of exceptional natural beauty and a place from the World Heritage List." The area includes the following buildings: Tobacco Factory Building, Duka Dinić Skin Factory Building with a complex of buildings, but the Old Brick Factory Building near Pivara.

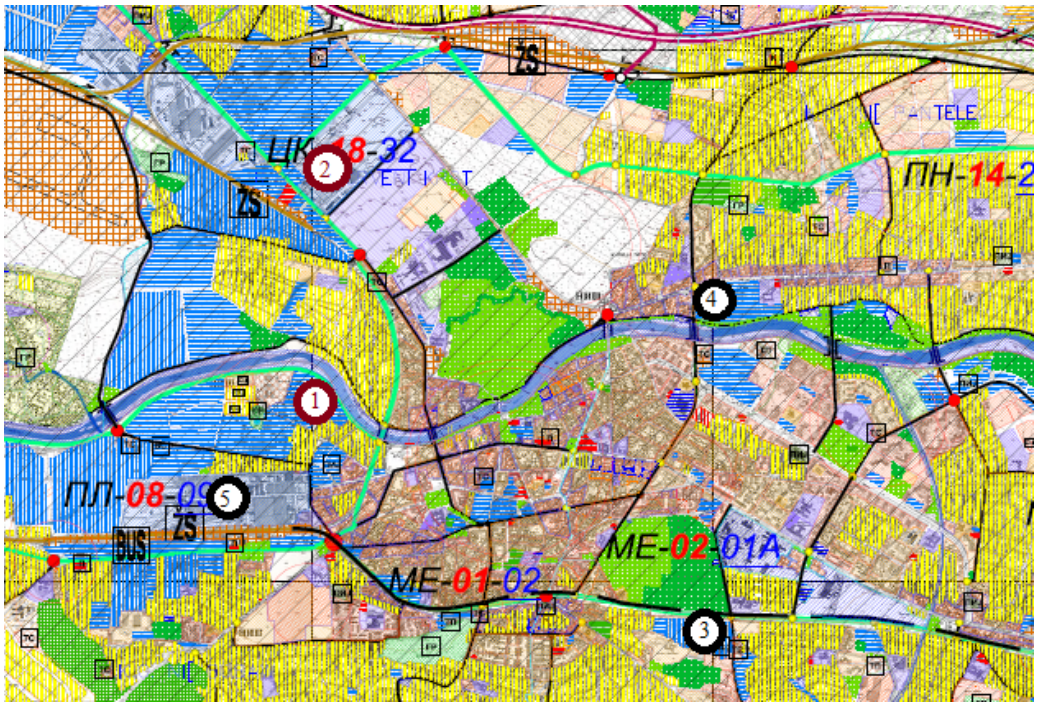

Figure 5: shows the GUP (General Urbanistic Plan) of Nis for the year period 2010- 2025 with allocation of industrial sites and buildings: **1.** The old "Vulkan" building **2.** Tobacco ´factory (now Philip Morris Int.) , **3.** Brewery "Apelovac", 4. Textile factory (now Benetton)"[20]

The leather factory "Balkan" Vasili Milojkovic, was founded in 1914, but in 1926 it was expanded to the account of the steam mill "Konstantin", on the left bank of the river Nisava. In the already existing building, the owner has built a drying warehouse, which corresponds to the appearance and size of today's building protected by the Law, the old "Vulkan", in the literature known as the old leather factory "Djuka Dinić". The building was built of baked bricks, the total area was around 550 m2, comprising a four-story building with a smaller building on the southwest side and a high chimney. The facade is dominated by unmanufactured bricks and a uniform number of window openings on all sides with over 70 windows. It was listed as protected by Law in 1987. The whole complex is a devastated building of the former administration built, abandoned, without function and purpose, as well as other mentioned previously in the paper. (See Figure 5, circled as" 1")

The new Factory of Tobacco Industry at the Crveni Krst was put into operation in 1930 (see Figure 6) and was built for four years. The new object in the spirit of eclecticism was designed by Djordje Mijovic and was enlisted as protected by the Law in 1987. Within the complex there are several auxiliary buildings, as well as a new production facility. The factory, as well as the assets of the company, was transferred to the "Benetton" group in 2003. The building of the old "Monopoly" was an old tobacco store, during which during the First World War, tobacco was produced from machines sent from Belgrade due to the fear of bombardment by Austrian troops. It is located next to the railway line with one encircled residential area. Building has three floors, and can be approached through the yard, oriented north-east-southwest, which covers an area of over 1000 m2. Today, the buildings and yards are partly used by sportsmen and economic societies. (See Figure 5, circled as" 2")

The brewery in Nish is the first industrial enterprise founded in 1884 the same year when railway transport from Belgrade to Nis was established. It was built by the old industrialists Jovan Apel as a steam brewery. The

[20] Source: authors, based on GUP 2010-2025, JPZURB, Sl.glasnik 43/2011

brewery was inherited in 1897 by sons Joseph and Hubert. It was modernized in 1910 by the introduction of electrical power. In 1921, since 1925, it was owned by Lazar Dunđerski, which was called "Apelovac" in 1929 and this name remained until 1945. After the confiscation of property, it transferred to state ownership.[21] Today, it has private owners. (See Figure 5, circled as" 3")

The textile factory, today's "Benetton" (See Figure 5, circled as" 4") was erected on the site and foundations of the former textile factory founded in 1897. The factory was built by the industrialist Mita Ristic, and was confiscated in 1945, leading to the situation where no buildings from previous periods were left preserved.

The Railway Workshop was founded in 1885 as the first state-owned industrial enterprise for the repair of locomotives and wagons, immediately after the establishment of railroad traffic in 1884. After the Second World War, the workshop became "Machine Industry" Nis. (See Figure 5, circled as" 5")



Figure 6 (left): Old Tobacco Industry [22] ; Figure 7 (in the middle): Old Brick Factory Buidling [23], Figure 8 (right): Old Factory "Vulkan" (former leather factory *Djuka Dinic*) [24]

However, there are other buildings in Nis which are not protected by law, but which will become industrial heritage buildings in the years to come. For once, electronics industry site, currently used by one University and various companies within different production and economic businesses. Even if they turn to using RES in their buildings and make them more sustainable, the areas around which they gravitate are still to remain unsustainable and chaotic for a longer time.

6. CONCLUSIONS

Although investing in heritage revitalization has seen an increase in Europe in the last years, there is still little focus on its importance as means of living environment protection. Its role for fighting social segregation in Europe is recognized as well as a tool for valorization and keeping of cultural values of the areas.

In the analyzed case study of Nis and its spatial plan, the planners recognized the areas around the industrial heritage buildings. The guidelines on "how" to achieve their sustainable integration in the urban planning process, were given scarcely. This allows for private enterprises to be the sole bearers of their future use and utilization of renewable energy sources as means of achieving "low energy" buildings 'concepts". The presented case study and other like these should not be the sole bearers of putting an emphasis on these buildings 'use. If these re-use studies only for the sake of economy, they make little sense for the socially vulnerable communities (such as Roma population in the area surrounding "Vulkan" and "Old Tobacco factory"). This is because buildings and their revitalizations are economy-based, and they mean increase in the real estate pricing and lead to the adjoining areas developing into expensive hubs for gentrification over time. The gentrification process may be inflicted by the "ramification" of these industrial buildings by the media and by the population, nevertheless architects and urban planners themselves.

The solution is an intensified master planning in these areas, which should take over the existing spatial plan recommendations and replace them with a diversity of ideas for the whole area. These competitions should focus on RES utilization, for once as measures for fighting the gentrification, urban sprawling of the city and in the long-term, as generators of ecological turn in using zero energy concepts for transformations, focusing on

[21] Енциклопедија Ниша- привреда, уредник Драгољуб Симоновић, Градина, 1996. год. стр. 66

[22] Source: Javno vlasništvo, https://sr.wikipedia.org/w/index.php?curid=432264

[23] See: https://mapio.net/pic/p-30642984/

[24] Source: Authors´ photography

locale values and potentials. This is much better option then not doing anything in creating systematical renewable energy utilization in the city.

REFERENCES:

1. Heritage Works: The Use of Historic Buildings in Regeneration, London, 2006, 3, 7
2. https://www.erih.net/, accessed 06.10.2018
3. http://www.hybridhomes.lk/, accessed 05.10.2018 for more information
4. Генерални урбанистички план Ниша 2010-2025. „Службени гласник РС“ број 43/2011
5. Слободан Наумовић, Ресурс од кључног значаја: индустријско наслеђе Бора виђено из перспективе индустријске археологије, етнологије рударства, политичке антропологије и визуелне антропологије, made available March 2012, accessed October 2018, source: http://www.biblioteka-bor.org.rs/2012/03/dr-slobodan-naumovic-resurs-od-kljucnog-znacaja-industrijsko-nasledje-bora-vidjeno-iz-perspektive-industrijske-arheologije-etnologije-rudarstva-politicke-antropologije-i-vizuelne-antropologije/
6. Reber et al., 2014, The transformative potential of geothermal heating in the U.S. energy market: A Regional Study of New York and Pennsylvania, Energy Policy, 2014, p. 30-44
7. Pucar, M., Bioclimatic architecture–Glazed Spaces and Passive Solar Systems, Beograd, 2006
8. Jovanovic, A., On “Long-Run-Transitions” in Urban Planning Supported by More Advanced Geothermal Energy Utilization in City of Nis, Serbia, Architecture and Urban Planning, Vol 13, issue 1, 2017
9. Fakultet zaštite na radu, centar za upravljanje rizikom u životnoj sredini, koordinator Nenad Živković, 2014
10. Radakovic Milos, Geotermalna energija, 2011, 13.
11. Jovanovic, A., Contribution of geothermal energy to the urban transformation of the city of Utica in the USA, with regards to urban planning, 2017, Proceedings of the 48th International congress & exhibition on heating, refrigeration and air-conditioning KGH, Beograd, 2017
12. Енциклопедија Ниша- привреда, уредник Драгољуб Симоновић, Градина, 1996. год. стр. 66
13. Закон о културним добрима („Службени гласник“бр. 71/94, 52/2011 – др.закони 99/2011 – др.закони)
14. Рудник Милановић Александар, Савремени приступи за успостављања могућих модела ревитализације, конзервације и презентације индустријског наслеђа, Инжењерска Комора Србије Регионални центар Крагујевац Матична секција пројектаната, приступила окт. 2018 https://docplayer.es/49101330-Inzhenjerska-komora-srbije-regionalni-centar-kragujevac-matichna-sekcija-projektanata.html
15. Ћирић Јован, Из тополошке историје Ниша, Зборник 6-7, Народни музеј Ниш, Ниш, 1991. стр. 72-85.
16. Ћирић Јован, Ниш 1878-1915, Нишки зборник бр. 5-6, Градина, Ниш, 1978. стр. 73-90.
17. Mihailo Medvedev, Zavod Za Urbanizam Nis, 1959-2009, 50 godina organizovanog Urbanog Planiranja Grada Nisa, Monografija, https://issuu.com/zedes/docs/50g_zavod_za_urbanizam_nis_-_monogr, accessed 05.10.2018
18. Slovo Juga, web stranica: Vinterov plan-urbanisticko resenje koje je uvelo Nis iz Turske kasabe u Evropske gradove, source: https://slovojuga.rs/vinterov-plan-urbanisticko-resenje-koje-je-uvelo-nis-iz-turske-kasabe-u-evropske-gradove/ accessed 04.10.2018

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SPATIAL PLANNING AS A LAND-USE AND BUILDING REGULATION TOOL FOR PROTECTED NATURAL AREAS IN SERBIA

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ABSTRACT

Urban planning in Serbia sets the land-use and building rules and conditions but limited on urban settlements and potentially on touristic centres in protected areas, particularly in the mountains. The land-use and building regulation outside of urban areas is, therefore, dependent on spatial plans of various purposes and territorial embracement. As monitoring over irregularities in building and absolutely spontaneous construction in sparsely populated areas is more difficult than in cities, countryside and nature protected areas in Serbia remain fragile and endangered by quality decrease or devastation of their landscape values, identity and nature protection.

This research will present problems and challenges in spatial planning when it comes to collision between building and nature protection. In relation to it, the article will reveal measures contained in spatial plans in order to regulate building outside of cities by taking Spatial Plan of the Republic of Serbia 2010-2020 as the base, and particularly four special purpose area spatial plans prepared for nature protected areas as case studies. Thus, besides the goal to show diversity and systematisation of existing measures in nature protected, this research will also contribute to understanding of challenges and bring up recommendations about future improvements of methodology in planning and implementation of plans in order to more successfully balance between development and protection.

Keywords: spatial planning; protected natural areas; land-use; building regulations; Serbia

1. INTRODUCTION

Even though the primary role of protected areas is to protect and preserve biodiversity, ecological and natural values and resources, natural environment can get added value if properly used for other purposes and activities because they become multifunctional (Sayer et al., 2003; Ranganathan, 2010; Bergandi et al., 2013). However, balance between development and protection is an ultimate challenge for societies aware of contemporary climate change issues and not so rare misuse of natural resources (Belokurov, 2010; HABIT CHANGE, 2013). Since urban planning and urban plans are predominantly aimed to make order in urban areas, one of the initial and key tools for balancing between development and protection outside of cities is spatial planning, particularly special purpose area spatial plans, as well as their direct or indirect elaboration in urban plans. Therefore, the task of this paper is to show how protected areas are integrated in spatial planning regarding regulation of nature protection and building.

In order to obtain results, few spatial planning documents were reviewed, compared and observations generalised. The first among plans that was considered is the latest Spatial Plan of the Republic of Serbia

(2010), followed by four spatial plans at lower hierarchical level – special purpose area spatial plans [SPASP]. At the moment of preparation of this paper, there were nineteen SPASP adopted by the Government of the Republic of Serbia and the Autonomous Region of Vojvodina, therefore, a set of criteria was created to support shrinking the list for the purpose of this research: (1) all plans together cover all types of protected areas treated in spatial planning in Serbia, (2) each spatial plan is chosen to represent different type of protected area, (3) all together, the spatial plans represent different geo-morphological areas – mountains, lowlands, large water accumulation, river basin and/or Ramsar areas, (4) spatial plans are representatives of a larger time-sequence from 2004 to 2015. Based on the criteria, the following SPASP were chosen for the analysis: the Vlasina Landscape of Exceptional Features (2004), the Kopaonik National Park (2009 and 2016), the Gornje Podunavlje (Upper Danube Area) Special Nature Reserve (2012) and the Tisa River Multifunctional Ecological Corridor (2015).

2. RELATIONS BETWEEN THE LEGISLATIVE ON NATURE PROTECTION AND SPATIAL PLANNING

The basic legal acts that regulate nature protection in Serbia are the Law on Nature Protection (2009) and the Order on Protection Regimes (2012a), while the spatial planning is being primarily regulated by the Law on Planning and Construction (2009). In sphere of spatial planning, national spatial plans could be also taken as legislative acts because they are being adopted and published in the same manner as any other law; anyhow, it will be more thoroughly represented in the following section of this paper, together with special purpose area spatial plans.

The Law on Nature Protection defines three types of protection: (1) protected areas, (2) protected species and (3) mobile protected nature documents. The last two types do not intersect with spatial planning because they are whether mobile – so they are not related to specific location – or they represent individual natural elements (e.g. a specific three) that take insignificant amount of space to be subject of spatial planning. In contrast to those types, protected areas comprise seven sub-types of protection, where four of them are foundation for ordering, preparing and adoption of a SPASP. These are national parks, landscapes of exceptional feature, nature parks and special nature reserves. Their common characteristics are interrelations between nature and culture, where predominantly natural areas are still inhabited by sparse settlements and by people that preserve forms of traditional life-style. Those areas could vary in size from couple of hectares to over 100.000 hectares. Another group of protected areas are natural monuments and protected habitants, which are usually rather smaller in terms of territorial sprawl, therefore, usually included in spatial plans with/within other protected areas or ecological corridors. The last category are strict nature reserves that are not inhabited and have solely nature protection role, for which they are not of particular interest in spatial planning.

Among other tools, the Law on Nature Protection recognises spatial and urban plans, as well as planning and project documentation as tools for planning, ordering and use of protected areas. There is one more connection between the Law on Nature Protection and the Law on Planning and Construction: preparation of strategic environmental assessment (additional, but inevitable document following a spatial plan preparation) and study for accessibility evaluation (a document defined by the Law on Nature Protection as a part of the strategic environmental assessment). If the mentioned documents show that environmental impact is too high and non-sustainable, measures defined by spatial plan cannot be implemented.

The Order on Protection Regimes defines three levels of protection within a protected area, which is also accepted in spatial planning and spatial plans, while the Law on Planning and Construction sets the principles and protection, order and development propositions. The planning legislative act also defines constructions in natural environment that does not need construction permit (e.g. hiking paths and infrastructure that follows the paths, etc.).

3. PROTECTED AREAS IN SPATIAL PLANS

3.1. Problems

Support to nature protection by spatial planning starts with the statement and elaboration of existing environmental problems. In general, but also regarding construction activities and building, the issue is conflict between development and protection. In spite of planning and urban documents, defined land-use and building regulations, attractive touristic and scenic locations are simply being overloaded by illegal construction. Most of the analysed plans indicate that there are unsolved issues on land market and that state

land privatization out of control lead to, not only to construction of illegal building, but also unplanned and spontaneous conversion of agricultural land to building land. These trends diminish identity and attractiveness values, but also bring negative impact on biodiversity and pollution. The main pollution comes from the liquid and solid waste, because illegally build areas are not equipped with appropriate infrastructure (water-supply, sewage system and waste disposal solutions). The Kopaonik National Park is one of representative examples in negative light: its high landscape attractiveness is 'punished' by uncontrolled building actions in such extent that this protected area is getting close to lose features that put it on the protected area list at the first place (Official Gazette, 2009 and 2016). In spite of several decades of spatial and urban planning for this area and proclamation of balanced distribution of tourism accommodation capacities, only a few locations have been in centre of interest for building (areas above 1.600 m), while many other locations, especially in lower altitude areas, have remained untouched. This is also the case in European mountains – the trend of shifting skiing related activities and infrastructure to higher altitudes due to the impacts of climate change and shift of upper snow line to lower altitudes (Marty, 2013).

Besides illegal land conversion and building, which is the common problem detected by each analysed plan, the planning documents also detect issues that might be specific for certain type of protected area. For example, major problem in Vojvodina region is shallow groundwater that is easily polluted by turning a well into cesspit, or slowing down a river flow due to embankment of riverbeds, which further leads to eutrophication of swamps (Official Gazette, 2012b; Official Gazette, 2015). This already indicates that not only absence of implemented plans, but also implemented projects can cause undesirable consequences. One of the examples is realisation of some plans for afforestation by allochthonous species that has led to the biodiversity loss, such as in case of the SPASP for the Tisa River Multifunctional Ecological Corridor (Official Gazette, 2015), giving open-hands in construction of small hydropower plants that turned to be almost absolutely out of control leading to loss of forests, excessive erosion, loss of river biodiversity and in some cases even to loss of entire streams, change of meso-climate, etc. (Vujić, 2018). Another example of unproper implementation of planning are ski-slopes, such as the case at Stara Planina (Ristić et al, 2009), or elsewhere because this sort of infrastructure requires interventions and even use of high mountain areas that are usually in the I or II zone of protection. Underground distribution of gas and fuel does not allowed growth of plans with deep roots, which put limits to sprawl of forests and agricultural activities (Official Gazette, 2015).

3.2. Zoning

One of the basic actions by which spatial planning protects environment, as well as general interest, is land-use zoning. Since protected areas already have their three zones distinguished by level of protection, spatial planning integrates them into land-use planning process and add to it another layer of zoning typical for planning procedure – division on water-, forest-, agricultural- and building-land. It would be useful to mention here that in practice spatial plans usually cover a slightly broader area than the protected area itself, which allows the planners to put these extra zones in function of additional protection, but also proclaim them for zones with no additional limitations.

Taking in account zones defined in protected areas, analysed spatial plans concentrate the greatest amount of activities in the zone of III level of protection, more restricted functions and use they allow in the zone of the II level of protection – usually soft-impact activities and inevitable constructions of public interest, while the zone I of the protection is prohibited for any type of construction and activities basically limit to scientific research and hiking. The task for spatial planning is to, within defined protection zones that allow few or more diverse types of construction, subtract locations where these activities are still prohibited – this again refers to locations of public and general interest such as water-source zones, protection belts, etc. In the particular case of SPASP for Vlasina Landscape of Exceptional Features, there are also defined locations where tourism activities are prohibited – the area upstream from the dam, places of water inlets into the accumulation, swamp areas and floating islands (Official Gazette, 2004).

Another aspect in zoning is, for example, prohibition of building for private and personal use, but opened possibility for building tourism accommodation. Besides, in the II level of protection zone is allowed construction of small water accumulations for local water supply of mentioned accommodation, and in case of ski-centres is also allowed construction of objects related to functioning of cable cars and ski-slopes. This indicates that ski centres represent the case in which the II zone of protection is the mail area of activity and is the most intensively used. The spatial planning practice tries to minimize the impact by proclamation of minimal removal of forest cover, obligatory recovery of terrain after interventions through grassing and afforestation with autochthonous species of trees. Hiking paths and paths for Nordic skiing use already existing

forest paths, therefore, their impact is minimal if existing at all. In addition, some of the analysed spatial plans prepare tourism development zones that differ in type and extent of permitted tourism activities, as well as in type and extent of building (intensive/extensive, small/large extent, etc.).

When it comes to zoning according to land-use type, water-land is, almost as the rule and independently from kind of area that is being subject of a plan, aimed for water protection and protection from water; hence, constructions and buildings on this type of land is predominantly in accordance with its functions, but could also allow soft-impact activities such as tourism, recreation and sports. Further on, agricultural land is intended for agricultural production and other agricultural activities, which means that the type of building allowed is in function of it, as well as forest-land is limited to constructions in function of forests, forestry and hunting. All three types of zones/land-use allow constructions of lineal infrastructure (e.g. electricity, gas and fuel transport). Economically speaking, the most valuable zone, therefore the most commonly mis-used and the most difficult to control, is zone of building-land. In effort to protect natural resources, spatial plans proclaim building regulations for building-land outside of settlements, because settlements should be covered by urban plans. General tendency in analysed plans is enlargement of building-land, but with efforts to decrease it in any location where it is possible, and with focused sprawl in contact zones between settlements or other built areas. The plans also highly recommend building-land re-use and use of brownfield locations – so to say 'land recycling'.

3.3. Building regulations

There are two major types of constructions and buildings that spatial planning deals with: buildings made for public interest and buildings made for private interest. In contrast to the most of private building constructions, public interest buildings are not only in function of protected areas use, but also in function of their protection.

Some examples of constructions that are aimed to proper use of protected areas have already been mentioned in previous paragraphs: cable-cars, ski-slopes, tourism resorts, electricity-supply infrastructure. In addition, there can be mentioned other tourism and development infrastructure such as parking lots, garages, bus stops, roads, ports, docks, moors, marinas, car-camps or development of inter-modal transport zones. However, regarding the topic of this paper, it is even more relevant to list examples of nature protection, starting with anti-erosion measures, wind-safety belts, sewage-systems, canals for atmospheric water, water-purification systems (waste-water management), re-cultivation planned and spontaneously organized landfills (solid-waste management).

Besides regulation of public infrastructure, spatial plans regulate building rules for individual and private building projects. In accordance with Law on Planning and Construction, SPASP contain the division of planning areas into zones with specific regulations (regulation rules and construction rules with urban parameters, parcel subdivisions, etc.). Therefore, planning solutions and propositions establish the 'regime of use', i.e. obligations and restrictions regarding the manner of use (Živanović Miljković, 2018). Since protected areas are in the focus here, these regulations often put limitations or prohibition in building in order to preserve sustainable use of natural resources. Not all spatial plans give the same regulations, nor they regulate the same aspects, however, these are the various urban parameters and land use regulations found in the analysed examples:

- Number of floors (sometimes prohibition of increase of floor numbers for already build buildings);
- Gross population density allowed (e.g. 46 stationary users per ha);
- Overall number of beds in tourism accommodation;
- Number of allowed buildings on one plot (usually one holiday house + accompanying construction – garage, storage place, etc.);
- Minimal area size of a plot;
- Minimal width of a plot;
- Land occupancy index (usually low, about 10%);
- Floor area ration (also usually low, about 0.3);
- Maximal gross area of main and accompanying building;
- Position of a building on a plot – in reference to side borders of a plot, and regulation line towards road and towards e.g. river bank;
- Roof slope;
- Minimal distance from one building to another;

- Allowance/disapproval for balcony, porch or pergola construction;
- Hight of bottom and top edge of a fence (in order to secure free movement/migration of wild animals);
- Type of a fence allowed (green, transparent, etc) or prohibition of any type of fence;
- Hight of a fence;
- Removal of certain type of buildings/activities (e.g. farms);
- Types of allowed house designs – usually based on local tradition and local materials.

In order to secure nature protection, SPASP do not stop at listed regulations, but also define procedures that need to be followed on the way from an idea of potential intervention in space to its implementation. Thus, plans call for necessary preparation of urban plans and engineer projects before building. In another words, a potential constructor or resource exploiter must contact corresponding institutions for obtaining necessary permits based on prepared documentation. If it is more influential intervention, investors are obliged to finance preparation of impact assessment on its own expense. Spatial plans also mark areas that need further elaboration in terms of urban and detailed urban planning. Often, given locations represent simply rough suggestions that get practical use only through preparation of urban plans and projects that elaborate them into details. There is even open possibility that one special purpose area spatial plan calls for preparation of another spatial plan of the same kind within its territory, e.g. Spatial Plan for Donje Podunavlje Special Nature Reserve (Official Gazette, 2012b).

The problem of illegal building has been already stated in the article. It is also included in building regulations defined by spatial plans, and the general tactic is removal of the buildings, but also prohibition of their further enlargement if the building is located in the newly defined building-land. If a building was illegally built outside of building-land, their legalization is not permitted and its future is on local government to decide. If a building has obtained building permit before the spatial plan defined new building locations, the owner should build waste-water and solid waste system disposal and additionally thoroughly examine and harmonize with new set of regulations. In any other case of construction are applicable rules and regulations defined by spatial plans.

In addition to detailed building regulations, spatial plans can also address more general rules such as prohibition of constructing barriers in riverbeds in order to keep fish migratory habits, prohibition for building commercial buildings, waste disposal and landfills in vicinity of rivers. On the other hand, greening of spaces between build areas is supported and their minimal mutual distance defined (100-300 m), path paving and paving in general are also put under regulation (e.g. not closer than 20 m from river bank) and pavement slope limited to 45 % in order to ensure easy transit of wild animals. If a protected area is related to a larger river, spatial plans also defined desirable locations for beaches with mobile equipment, as well as they define conditions for changes in riverbeds (minimal depth, width, curve radius, etc.). For the places where infrastructural corridors intersect ecological corridors, spatial plans recommend preparation of a technical solution for provision of unrestricted migration of animals, including solutions against electrocution of birds (Official Gazette, 2015).

Fiscal policy, decrease of local taxes and provision of bank loans for energy efficient building are some of the suggestions in analysed spatial plans that connect building regulation and nature protection, although indirectly. Therefore, role of national and local government is significant in provision of incentives, but, as analysed spatial plans additionally address, governmental role is crucial in sphere of prevention and inspection of illegal building activities – the problem that must be put under the control.

3.4. Principles

The latest Spatial Plan of the Republic of Serbia (2010) has defined, among other, a goal that relates to environment and nature protection. According to the goal, up to 2020 Serbia should obtain increase of protected area by 10%, or for almost 100% compared to 2008. On the way to reach the aspiration, the national spatial plan, as well as other plans analysed here, follow and promote a set of principles. Some of them are in direct relation to the topic of nature protection and building, while others should bring indirect benefits with this regard and should be also set by SPASP as it follows:

- Sustainability – governing and development of nature assets so that they will be preserved for the following generations, too;

- Relativization of conflict between nature protection and development – e.g. between nature protection and tourism development in mountain areas, or between nature protection and alternative rural economies in river/accumulation basins;
- 'Urban recycling' – rather reuse of neglected buildings and location on building land than sprawl of building land;
- Identity – creation of attractive settlement and landscape identity by means of architecture and construction in rural areas, too;
- Tradition – support to traditional styles and forms of building and space arrangement and by use of autochthonous materials;
- Synchronized capacities – number of beds for tourists must be in accordance with other capacities such as ski-lifts, ski-slopes, water supply and sewage infrastructure, nature revitalisation capacity, etc.;
- Realisation in phases – tourism services and buildings are planned to be built in phase so the it is followed by timely construction of supra- and infra-structure and for potential observation of required changes;
- Participation – reconstruction of settlements conducted through special programs that include successors of 'old' households;
- Public-private partnership;
- Improvement of organisation and staff skills – especially of local institutions and inspection sector;
- It is not too late – if the existing building/construction does not fit newly set regulations, it should be adapted to new rules by any following reconstruction and intervention;
- Infrastructure at the first place – no construction or building is allowed before prepared infrastructure, primarily sewage system;
- After exploitation comes re-cultivation – use of local resources is supported in building, but only with previous permit by local authorities and with obligation of beneficiary to re-cultivate the site; and
- Density over sprawl – rather plan increase of population density than sprawl of building land.

4. CONCLUSIONS

The role of spatial planning in nature conservation appears to be relevant, particularly for territories that are not in focus of urban development such as cities, towns and tourism resorts. In practice, various land-use regulation instruments are implemented, based on planning solutions and propositions, regarding the fact that plans are legally binding (Živanović Miljković, 2018). As presented, special purpose area spatial plans can set generally binding content for land-use and building in protected areas, which is mandatory for everyone, irrespective if buildings are made for public or private use, or land is public or private. As it is presented through this paper, relations between planning, building, land-use and nature protection have been recognized in a few areas of action – from planning and regulation of large infrastructural constructions of national importance (e.g. touristic centres, supra- and infrastructure, etc.) to rather precise regulation of building and fence height or building materials. At the very precise level, spatial plans define building instructions in a manner usually expected for urban detailed planning, although they are being defined for areas outside of cities.

Recognition and statement of different environmental problems caused by human activity is one of the efforts of spatial planners to raise awareness on diverse issues, if not broader, then within the professionals involved in development, decision-making and governance. Parallel consideretion of several zoning criteria and relativisation of conflicts between nature protection and development – level of protection regime and land-use – represent foundation in the planning process, which also shows that planning for naturally valuable areas is the main precondition in creation of special purpose area spatial plans. By following sustainability and other principles based on sustainability, planning practice puts effort in order to reach balance between protection and development, so to keep values and identity of countryside and nature in Serbia.

In spite of the efforts, there are the cases when interventions and investments in space reach only short-term benefits, but on the expense of long-term damages. It is not necessarily about unsuccessful planning, but poor implementation and partiality in decision-making proces (Milijić, 2015). However, lessons should be learned and future planning should emphasize potential negative consequences that interventions in fragile natural surrounding could cause and define instructions for implementation phase as precise as possible.

It is easier to understand identification of a great number of illegally build objects in protected areas that have been put under the protection just recently. But, it is alarming to notice that each spatial plan analysed here states the same problem even though some of the areas are under protection and regulated by spatial and urban plans for decades. As it was identified in other sources (Bryson, 1993; Pantić, 2014; Pantić et al., 2018), absence of implementation of spatial plans – their regulations and measures – is the problem, and not the absence of planning documents. Therefore, it is of a crucial relevance to point out the gap between planning and realization of plans – the field where is the most expected from the governance at the national and at the local level. Only after awareness on the problem is raised among professionals and local communities, responsible actions and support can be expected from citizens themselves. One of the most operational tools reccommended by analysed documents is enforcement of the inspection sector.

In summary, the role of spatial planning is decisive for development of protected natural areas in Serbia, but it is not the action where development ends. In contrary, an adoption of a spatial plan represents only an initial phase and foundation that further on must be completed and upbuilt by plans at lower hierarchy level, responsible implementation, inspection and monitoring.

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REFERENCES

1. Belokurov, A., Dudley, N., Krueger, L., Lopoukhine, N., MacKinnon, K., Sandwith, T., Sekhran, N., Stolton, S. 2010. Natural Solutions: Protected Areas Helping People Cope with Climate Change. Imprint WWF International.
2. Bergandi, D., Blandin, P., 2012. From the Protection of Nature to Sustainable Development: The Genesis of an Ethical and Political Oxymoron, in *Revue d'histoire des sciences*, 2012/1 Vol. 65, published by Armand Colin, pp, 103-142.
3. Bryson, M. J., Bromiley, P., 1993. Critical Factors Affecting the Planning and Implementation of Major Projects. Published by: Wiley Online Library. Retrieved from: doi.org/10.1002/smj.4250140502 (accessed in October 2018).
4. HABIT CHANGE, 2013. Management Handbook: A Guideline to Adapt Protected Area Management to Climate Change. Project implemented through the CENTRAL EUROPE Programme, co-financed by the ERDF.
5. Institute for Nature Conservation of Serbia (Zavod za zaštitu prirode Srbije) (2018), www.zzps.rs (accessed in September 2018).
6. Law on Nature Protection (Zakon o zaštiti prirode) (2009/2016), Official Gazette of the Republic of Serbia No. 36/2009, last amended in 14/2016.
7. Law on Planning and Construction (Zakon o planiranju i izgradnji), Official Gazette of the Republic of Serbia No. 72/2009, 81/2009 - corr., 64/2010 – Constitutional Court decision, 24/2011, 121/2012, 42/2013 - Constitutional Court decision, 50/2013 - Constitutional Court decision, 98/2013 - Constitutional Court decision, 132/2014, 145/2014.
8. Marty, C., 2013. Climate Change and Show Cover in the European Alps, in the book *Impacts of Skiing and Related Winter Recreational Activities on Mountain Environments*, Ronaldo, A., Rixen, C. (eds.). Publisher: Bentham, pp. 30-44.
9. Milijić, S., 2015. Sustainable Mountain Area Development in Serbia (Održivi razvoj planinskih područja Srbije), Institute of Architecture and Urban & Spatial Planning of Serbia, Belgrade.
10. Order on Protection Regimes (Uredba o režimima zaštite) (2012a), Official Gazette No. 31/2012.
11. Pantić, M., 2014. Sustainable Development Perspectives for Serbian Mountain Areas: Lessons from the European Concept, (Doctoral thesis). Retrieved from QUCOSA - Quality Content of Saxony, (urn:nbn:de:bsz:14-qucosa-144339), http://nbn-resolving.de/urn:nbn:de:bsz:14-qucosa-144339.

12. Pantić, M., Nenković-Riznić, M., Milijić, S., 2018. Participatory Approach for Innovation in Spatial Planning Process in the Context of Climate Change in Serbia. Presented at the poster session at the MedCLIVAR2018 Conference in Belgrade.

13. Ranganathan, J., 2010. Promoting Development, Protecting Environment. World Resources Institute web site. Retrieved from: www.wri.org/blog/2010/02/promoting-development-protecting-environment (accessed in October 2018).

14. Ristić, R., Vasiljević, N., Radić, B., Radivojević, S. (2009): Degradation of Landscape in Serbia Ski Resorts – Aspects of Scale and Transfer of Impacts, in the SPATIUM No 20, pp. 49-52.

15. Sayer, J., Elliot, C., Maginnis, S., 2003. Protect, Manage and Restore. Conserving Forests in Multi-Functional Landscapes, in the Congress Proceedings: World Forestry Congress XII – Forests, Source of Life. Quebec, Canada. Retrieved from: www.fao.org/forestry/87724/en/ (October 2018).

16. Spatial Plan of the Republic of Serbia (Prostorni plan Republike Srbije) (2010), Ministry for Environment and Spatial Planning of Republic of Serbia, Official Gazette of the Republic of Serbia No. 88/2010.

17. Special Purpose Area Spatial Plan for Gornje Podunavlje Special Nature Reserve (Prostorni plan područja posebne namene specijalnog rezervata prirode 'Gornje Podunavlje') (2012b): Official Gazette of the Vojvodina Autonomous Region, No. 3/2012.

18. Special Purpose Area Spatial Plan for Kopaonik National Park (Prostorni plan područja posebne namene Nacionalnog parka Kopaonik) (2009), adopted by the Government of the Republic of Serbia, Official Gazette of the Republic of Serbia, No. 95/09.

19. Special Purpose Area Spatial Plan for Kopaonik National Park (Prostorni plan područja posebne namene Nacionalnog parka Kopaonik) (2016), adopted by the Government of the Republic of Serbia, Official Gazette of the Republic of Serbia, No. 89/2016.

20. Special Purpose Area Spatial Plan for the Tisa River Multifunctional Ecological Corridor (Prostorni plan područja posebne namene za Multifunkcionalni ekološki koridor Tise) (2015), Official Gazette of the Vojvodina Autonomous Region, No. 14/2015.

21. Special Purpose Area Spatial Plan for Area of Special Use Vlasina (Prostorni plan područja posebne namene 'Vlasina') (2004), adopted by the Government of the Republic of Serbia, Official Gazette of the Republic of Serbia No. 133/2004.

22. Vujić, P., 2018. Ministarstvo: Zabraniti gradnju mini hidro-elektrana. Retrieved from: mondo.rs/a1137535/Info/Drustvo/Mini-hidro-elektrane-gradnja-Ministarstvo-ekologije-protiv-MHE.html (accessed October 2018).

23. Živanović Miljković, J., 2018. Urban Land Use Regulation in Serbia: An Analysis of Its Effects on Property Rights, in: Jean-Claude Bolay, Tamara Maričić and Slavka Zeković (Eds) *A Support to Urban Development Process*, EPFL and IAUS, pp. 129-147.

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STORMWATER MANAGEMENT: JEDDAH WADI'S POTENTIALS

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ABSTRACT

Urban growth results in the rapid development of cities' infrastructure that includes roads sewer and utilities, the resolution made toward green infrastructure and water resources management as an essential component of an environmentally sustainable city. Considering the importance of this factor in Jeddah city as a hot-aired climate where municipalities and communities are striving to create a liveable, sustainable urban center. Water management strategies and rainwater reuse have long been recognized as a potential strategy for water scarcity. However, its application is minimal regarding the potentials provided within the surrounding urban context. This paper aims to know how water uses directly affects green space management. Suggest a solution to water crises in Jeddah to mitigate the impact on disposed rainwater. Proposing water harvesting systems within the capacity of plant irrigation and wetland reclamation that will lessen the stormwater runoff, improve the water use and re-establish very important eco-system and at the end explore the possibility of applying the proposed technique regarding economic volubility. There must be a fundamental shift in the way we manage and deal with the water resources. The research concludes the importance of integrated environmental management to avoid water losses considering an ecological approach and assessing impacts on the extended urban context considerations.

Keywords: city, resilience, rainwater harvesting, resources management, environment, reuse

1. INTRODUCTION

In the last decade, many of the developing countries in Asia have seen increasing interest in industrialization; this has led to the unplanned development of urban areas and has affected adversely on general environment and maintaining ecological balance. Because of the increased population in urban areas. It became more important to revitalize depressed areas in ways that satisfy the wishes of residents. Cities cannot ignore the importance of urban green infrastructure in reducing energy consumption by countering the warming effects of paved surfaces. As such, this greenery confers a wealth of environmental, economic and health benefits to city residents. By actively cooling the urban landscape, it helps reduce carbon dioxide emissions. Trees, shrubs, and turf remove smoke, dust and other pollutants from the air. The problem is that urban greenery needs water, and all too often, the response to past droughts has been to stop watering it, to conserve water for people!

In the Arab region, KSA occupies about four-fifths of the Arab Peninsula of which about 40% are desert lands (figure 1). Rethinking about the greenery impact is essential. More green space within a city's boundaries can improve the urban environment. Helping regulate air quality and Climate. Especially in the main urban cities like Jeddah, because the past development patterns of this city significantly affect environmental management conditions today. (Collymore, 2003).

Subregion	Annual precipitation		Annual internal renewable water resources		
	Height	Volume	Volume	% of the Middle East	Per inhabitant (2005)
	(mm)	(million m³)	(million m³)	(%)	(m³)
Arabian Peninsula	117	362 041	6 110	1	108
Caucasus	702	130 582	73 104	15	4 597
Iran (Islamic Republic of)	228	397 894	128 500	27	1 849
Near East	439	673 531	276 376	57	1 964
Total Region	**238**	**1 564 048**	**484 090**	**100**	**1 711**

Figure 1: Regional distribution of water resources. (source: Aldakheel, 2003)

When talking about the city's ecological balance and environmental management, the concern is increasingly focusing on natural resources management. In arid and semi-arid regions, water is the prior critical natural sources that require extreme attention and interest.

2. IMPORTANCE OF RAINWATER MANAGEMENT

In cities, Water plays an essential role in a life-support system. Today, how cities address their water challenges will be critical to their ability to prosper and grow. The ecological activities today mostly about natural resources conservation, and when we talk about arid and semi-arid region water resources become the priority. In Saudi Arabia, the resources available for water supply are limited and considered non-renewable, which make the water issue more challenging.

2.1. Water facts

The average annual rainfall in Jeddah is like less than 50 mm, and the recharge contribution from rainfall to groundwater is minimal only a small portion of this water infiltrates into the ground. Because of the preamble surfaces and unplanned urban development, Earth has a fixed amount of water that circulates within the hydrological cycle. When we use the water source, we are borrowing water from that cycle. Oceans and seas are the most extensive water storage in that cycle, but this salty water requires desalination process before being used by a human. This desalinated water is The primary source of water in Saudi Arabia, and it costs a lot to produce, this production will dramatically increase and will reach about 6,472 million US$ by the year 2020. (Ouda, 2013). In the other hand rainwater is a naturally desalinated seawater with zero cost. However, in response to the flash floods of stormwater; Jeddah municipality launched billion dollar contract to implement flood water drainage projects to drain the storm water safely To the sea out fills (Al-Sulami. 2012). The issue is about wastage related to water resources. The following figure 2 represents potential reuse for excess water, which points out the necessity to adopt more sustainable strategies.

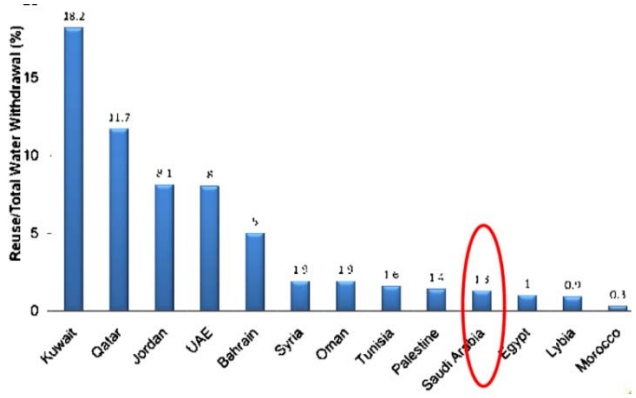

Figure 2: Water Reused as % of Total Water Withdrawal in MENA Countries-(source: water research institute)

According to the described harsh environmental conditions in Jeddah, it became necessary to conserve and develop every single drop of water; Researchers see water scarcity as typically the result of shortsighted or poor planning strategies. Meanwhile retaining the water resources in Saudi Arabia is challenging to meet the growing consumption needs. Activities related to the agriculture sector is the primary consumer of water accounting for 88%, as per figure 3; (Ouda. 2013).

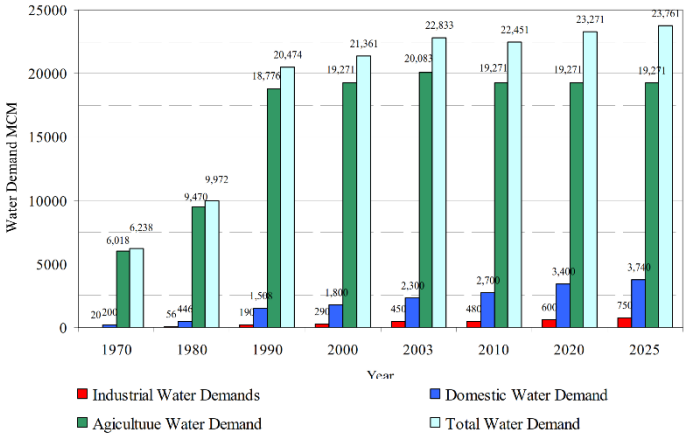

Figure 3: water demand in Saudi Arabia- (source: water research institute)

3. RESEARCH METHOD

This paper attempted to take recognizance of the sustainable approach of natural resources conservation. In addition to performing analysis for the disposed of natural water resources in Jeddah, to develop an argument about conserving a significant water resource in the city by addressing urban stormwater reusing as a raw water source for large-scale non-potable water supply. The adaptation of stormwater reuse for irrigation presents the potential 'mainstream' Water management discipline while minimizing the associated risks and allowing for catchment development. The demonstrated capacities for wadi Bani-Malek site in Jeddah worth land reclamation and development of the study area.

3.1. Why Jeddah

The high potential hydrological sitting of Jeddah city, where it is located within four central basins; al kura', Bani-Malek, braiman and south basin. With Wadi Fatimah to the south and Wadi Khulays to the north. The primary source of stormwater is from rainfall over the Eastern hills series drainage sloping towards Jeddah. so it is a significant water catchment site Figure 5. (Amin, A, M. 2000)

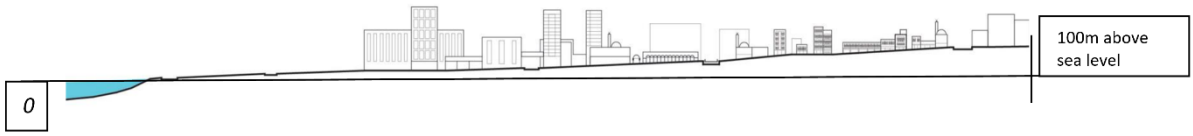

Figure 4: Section showing Jeddah city's' land slope (source: Amin, A, M. 2000)

The potential growth of Jeddah in development areas requires adequate infrastructure planning in addition to the way many farming areas disappeared in the current plan because of the lack of irrigation. Figure 4. Therefore, the significant effort also must be applied for supplying the agriculture and plantation watering demands; (Aldakheel, 2003). Wadi Bani Malek is the largest basin that discharge stormwater into Jeddah.

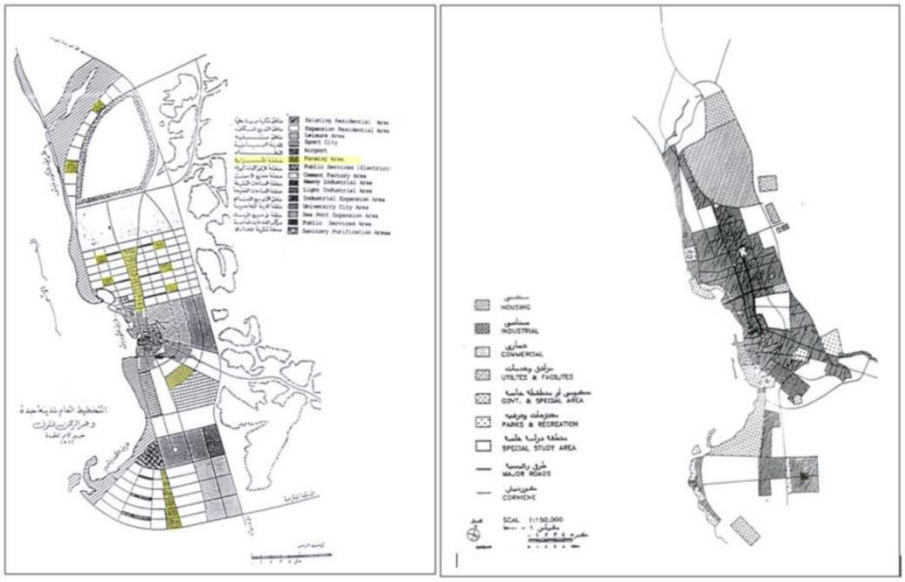

Figure 5**:** Master plan Jeddah 1962 -- Master plan Jeddah 2000 (Source: Jeddah Municipality.2013.Jeddah strategic plan)

4. STORMWATER MANAGEMENT - CASE OF CITY OF JEDDAH

Rainwater harvesting has been used for several thousand years as a way to take advantage of seasonal precipitation that would otherwise it will be lost as runoff or evaporation. While rainwater can provide water for many uses, the most common use is for agricultural irrigation and residential potable water. Most applied definitions of rainwater collection or rainwater harvesting typically provides for numerous detailed methods for collecting, storing, and conserving runoff from an assortment of sources for unlimited purposes in arid and semi-arid regions.

Future decisions to divert water to irrigation use depend on two factors. These are the cost of harvesting and the cost of transporting the water from the harvesting site to the specific urban center. The further investigation related to the cost of water supply pipeline provides for added values to the overall capacity of expenditures against consumption in this sector.

4.1. Rainwater resilience and adaption paradigm shift

In Jeddah city during a single rainstorm, millions of gallons of rainwater can run off to the sea out fills, as shown in figure 2. The biologist Buckminster Fuller remarked, "Waste is merely a resource in the wrong place." Also "stormwater" is continuously ejected out of cities instead of being kept and put back to work. Fig 6 shows an example of Jeddah sea discharge channels. While these massive stormwater management projects may preserve natural floods resources consumption, It will not be the sustainable solution in long-term development.

The more ecologically sustainable solution must be implemented by applying rainwater harvesting and reuse to provide a significant water supply for greenery watering needs. Passive rainwater harvesting strategies include directing the rainwater to landscape area to be preserved for irrigation uses.

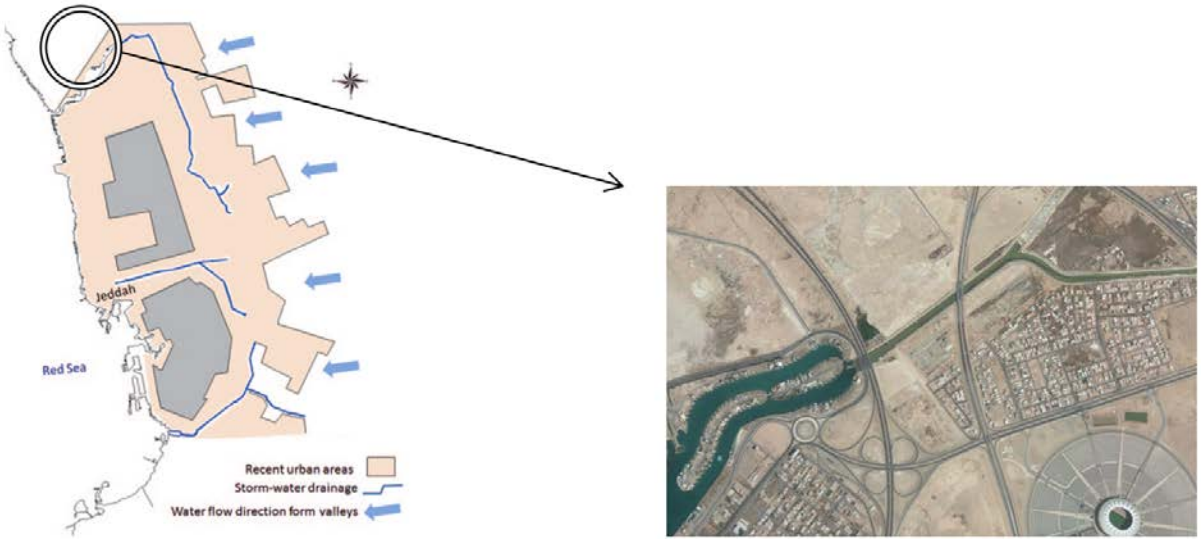

Figure 6: Rainwater drainage in Jeddah and North Sea out fill (Source: Author)

Researchers recognize that rainwater harvesting is a big part of the answer to the water crisis the world faces. The current research studied one of the most recognized rainwater harvesting sites in Jeddah as a limited scale context study to highlit the possibility of reusing the rainwater captured behind the dam for plant irrigation. The site also is featured with surrounding land that has fertile soil and high potential for cultivation and agriculture works (Brown et al. 1963).

4.2. rainfall data and surface water information

The selected study site is known as Bani-Malek valley. It captures stormwater from al Asli valley in the eastern side, which covers the area of 1136 km2 (Sefry, F. 2013) with annual precipitation on the eastern hills about 40 mm. Resulting in 45,300,000 m3 of runoff water that reaches Bani-Malek valley. Figure 7. This water is ejected directly to the North Sea out fill. Now the lake is dry. The existing deactivated dam should be efficient regarding expended reuse. (Hatem, 2010).

Figure 7: Drainage basins and networks as well as open channels of Jeddah area.

5. DATA ANALYSIS AND DISCUSSION:

The proposed solution is subject to be verified through extensive studies must are undertaken to define the process and the required techniques. Previous research has documented that The amount of water demand for plant irrigation is roughly rounded to 5,420,000 m^3/hectare per year. That means Bani-Malek valley runoff water could cover the application of nine hectares of land. A considered option is to directing back the stored rainwater behind the dam to reclaim the old mined dry land. This action will achieve water conservation for plant irrigation that consumes the most substantial amount of water in the city. On the other hand, fields covered by trees were estimated to reduce flood damage by absorbing stormwater. Figure 8. It also serves as local water storage reserves providing services totaling 25,000 SAR/hectare/year.

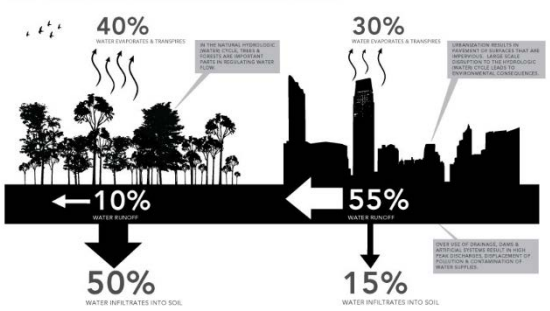

Figure 8: surface water runoff between built-up site and site covered with trees

Using rainwater for irrigation will save 20.0% to 32.5% of potable water consumption. This reduction in potable water use will save $6.3 million per year (Ouda, 2013). In addition to the environmental benefits. "One hectare of trees annually consumes the amount of carbon dioxide equivalent to that produced by driving an average car for 11,000 miles. That same hectare of trees also produces enough oxygen for eight people to breathe for a year. (*Mcaliney)* From these estimations, we can conclude that results are in a good agreement with previous studies, which have shown that using rainwater for plant irrigation is very efficient. Results show the total net revenue in addition to its substantial environmental benefit as shown in figure 9.

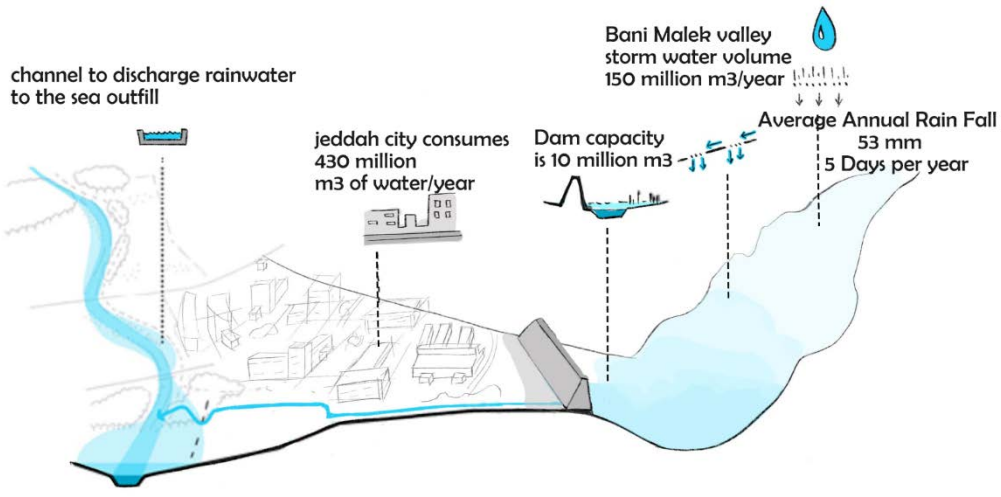

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Figure 9**:** Water Catching Systems (Source: Author)

6. CONCLUSION AND RECOMMENDATIONS

Based on the previous study the application of water reuse recommends a detailed review, which this research lacks due to limited time and specialized knowledge. On the other hand, expected city development moving toward resiliency actively favors the undertaking of large-scale land reclaiming projects, while raising public awareness, as it is considered the watershed point between theory and practice. Finally, strategic development plans should elaborate on potentials for solving inherent problems explicitly critical step toward a sustainable, resilient city as well as responsibility to contribute public awareness in solving these problems. More extended term control is needed by the strategic power of the water dumps within the framework of the ongoing projects of wetlands. Integrated management for stormwater is the key to reducing the negative consequences on the environment and achieving economic welfare

REFERENCES

1. Collymore, Y. 2003. Saudi Arabia faces population pressures.
2. World Environmental and Water Resources Congress 2008, edited by Roger W. Babcock, and Raymond Walton, ASCE, 2008.
3. Ahmed Ewea A. S. Hatem. (2010). Hydrological Analysis of Flooding Wastewater Lake in Jeddah, Saudi Arabia. King Abdul-Aziz University.
4. Killion Shannon M. 2011. Design and Modeling of Infrastructure for Residential and Community Water Reuse. University of Nebraska – Lincoln.
5. lamoud, A. and Aldakheel, Y. 2003. The importance of renewable water in agricultural development in Saudi Arabia (in Arabic). Presented at the Symposium on Water as a Strategic Challenge Facing Humanity.
6. A new case for wastewater reuse in Saudi Arabia: bringing energy into the water equation.
7. Saudi geological survey
8. http://www.sgs.org.sa/English/Pages/Default.aspx
9. Jeddah municipality: http://www.jeddah.gov.sa/English/index.php
10. National water reuse database: https://watereuse.org/water-reuse-101/national-water-reuse-database/
11. Crook, James. Innovation application in water reuse. 2004. Massachuttes.
12. Aldossary, Afrah Farhan Misfer. 2016. Geomorphology of al-Fasl sabkha in Jubail and its environmental characteristics. King Saud University.
13. Saleem, Hassan M., Subyani Ali M., and Elfeki, Amro. 2017. Environmental Impacts on Groundwater of Wadi Bani Malik, Jeddah, Saudi Arabia. International Journal of Scientific & Engineering Research Volume 8, Issue 9.
14. Y. Basmaci and M. Al-Kabir. (NA). Recharge Characteristics Of Aquifers Of Jeddah-Makkah and Taif Region. King Abdulaziz University
15. Amin, A. Bull Eng Geol Env (2000) 58: 265. https://doi.org/10.1007/s100649900029.
16. Ouda, Omar. 2013. Towards Assessment of Saudi Arabia Public Awareness of Water Shortage Problem. Prince Mohamed Bin Fahd University
17. Water Conservation, Reuse, and Recycling: Proceedings of an Iranian-American Workshop, National Academies Press, 2005. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/effatuniversity/detail.action?docID=3377905.
18. Nair, Jaya, et al. Technologies and Management for Sustainable Biosystems, Nova Science Publishers, Inc., 2010. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/effatuniversity/detail.action?docID=3020857.

19. Lassiter, Allison. 2013. Sustainable Water: Challenges and Solutions from California. University of California Press.
20. Shougi Suliman , Arun Kumarb, Firoz Alam,, and Roesfiansjah Rasjidin. 2013. Disaster Planning and Management in Jeddah, Saudi Arabia. MIT UNIVERSITY, Melbourne, Victoria, Australia.
21. Mcaliney, Mike. [na].Arguments for Land Conservation: Documentation and Information Sources for Land Resources Protection, Trust for Public Land, Sacramento, CA,
22. L.K, Heather. 2007 Design for Water: Rainwater Harvesting, Stormwater Catchment, and Alternate Water Reuse, New Society Publishers.
23. ProQuest Ebook Central, http://ebookcentral.proquest.com/lib/effatuniversity/detail.action?docID=316343

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BIOSWALES AS ELEMENTS OF GREEN INFRASTRUCTURE – FOREIGN PRACTICE AND POSSIBILITIES OF USE IN THE DISTRICT OF THE CITY OF NIŠ, SERBIA

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ABSTRACT

The experience in stromwater management shows that traditional stormwater systems are often unable to absorb and process all of the excess water runoff, resulting in frequent flash flooding in urban areas. Contemporary approaches suggest the implementation of vegetated swales as green infrastructure that is an alternative or a supplement to traditional storm sewers. Bioswales are cost-effective and attractive, and in addition to improving the treatment of stormwater runoff, they restore the ecosystem, improve visual identity and environmental quality and provide long-term sustainability. The goal of this paper is to exlore the concept of bioswales and to suggest potential locales for their implementation in the case of a residential district of the City of Niš. Therefore, the experiences of three typical foreign best practice examples are presented. The use of vegetated swales in the case of Niš is recommended in various types of urban fabic: residential streets, vast surface parking lots and unorganized green areas in waterfront zones. This is especially important for post-socialist cities that underwent significant urban densification and cannot afford more loss of public open space nor green areas. The results of this research should help in promoting the implementation of bioswales in both urban planning theory and practice.

Keywords: stormwater management; vegetated swales; residential streets; parking lots; waterfront zones; urban denisification

1. INTRODUCTION

Increasing urbanisation and especially urban densification have resulted in the increase of paved surfaces in urban areas, which are ususally impervious. Impervious land cover alters the quantity and quality of surface runoff water (Xiao and McPherson, 2011). Large volumes of excess stormwater runoff in a short amount of time can not only cause flash flooding, but also result in water pollution and destroyed habitat in urbanized areas (USEPA, 2005). Certain strategies and Best Management Practices (BMP) have been developed in the

world in the last couple of decades in order to mitigate the impact of stormwater runoff and pollutant loading. Bioswales or vegetated swales are one of those BMPs and represent elements of green infrastructure that are used for stormwater management.

This research investigates the concept of bioswales and explores their potential use in the case of the City of Niš. With a population of approximately 260.000 inhabitants (2011 Census), the City of Niš is the third largest city in Serbia and a typical post-socialist city of medium-size. Post-socialist development period had significant implications upon the urban landscape of Niš, with the urban densification and loss of public open space/green areas being one of the most remarkable features of transition (Dinić Branković et al., 2018a). Urban densification and increase of paved surfaces had significant environmental impacts in Niš, including flash flooding, waterway pollution and degradation of the ecosystem. Traditional stormwater system is often unable to absorb and process all of the excess water runoff, resulting in flooding of various parts of urban area. However, modern stormwater management approaches have, to date, not been implemented. It is the standpoint of this research that the use of bioswales as elements of green infrastructure could significantly improve stormwater management in Niš. Therefore, this paper discusses the main urban design principles of bioswales, investigates typical urban environments that use these elements of green infrastructure, and examines the possibilities of their implementation in the case of a residential district in the City of Niš.

2. BIOSWALES: CONCEPT, DESIGN, BENEFITS AND BEST PRACTICE EXAMPLES

Bioswale or vegetated swale is a linear form of bioretention used to partially treat water quality, attenuate flooding potential and convey stormwater away from critical infrastructure (University of Florida, 2008). Bioswales are designed as gently sloping depressions planted with dense vegetation or grass and they treat stormwater runoff from rooftops, streets and parking lots (ES-CPO, 2004). The slope enables the water to flow efficiently through the system. Bioswales absorb low flows or carry runoff from heavy rains to storm sewer inlets or directly to surface waters (NRCS, 2005). As conveyance systems, bioswales can represent an alternative or a supplement to traditional storm sewers. According to the NRCS (2005), bioswales should be sized to convey at least 11 cm in 24 hours.

The vegetation of the swale slows the runoff water, filters it and then allows it to infiltrate into the ground or into a storm drain, thereby improving water quality. Most water runoff nowadays contains hard metals from roads, roofs and hard surfaces, as well as lawn chemicals from fertilization. Filtering these hard materials before they enter our drinking water system is of crucial importance for the sustainability of rivers and streams. The way of functioning of a bioswale is illustrated in Figure 1.

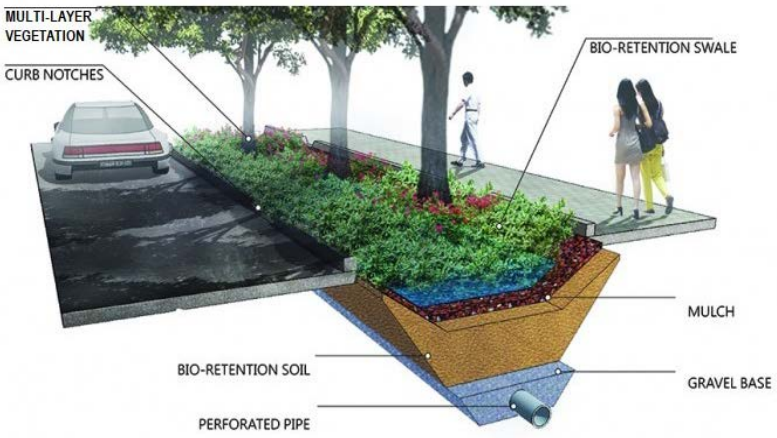

Figure 1. Bioswale concept diagram: (1) Dirty and polluted water from rooftops, roads and parking lots enters the bioswale; (2) Water is slowed down by various plants and rocks, pollutants settle out, clean water infiltrates the soil; (3) Water enters the perforated pipe and is slowly absorbed into the ground; (4) Excess stormwater exits the bioswale and flows through the pipe into the recipient, cleaner then when it entered and in the amount significantely reduced. Source: http://www.cranejapan.co/grass-bioswale-diagram.html

Bioswales are engineered with gravelly soil, so stormwater is absorbed quickly and deeply. An underdrain pipe is not necessary in naturaly well drained soils (Univeristy of Florida, 2018). In cases where soils do not drain well, bioswales are typically lined and convey runoff to a dry well or soakage trench (ES-CPO, 2004). The site

where bioswales are applied should be designed so that runoff water is directed or drained into the swale. In bioswales in the streets or parking lots, this can be acheived by using curb cuts in planting areas (Figure 2C). Swales should be used to serve areas less than 4 hectares with slopes no greater than 5%, while total surface area of the swale should be 1% of the area from which it is receiving stormwater (University of Florida, 2008). For slopes greater than 5% swales can include check dams to help slow and detain the flow and extend time for infiltration (Figure 2D).

Bioswales can be planted with a variety of vegetation, including trees, shrubs, wildflowers and grass. Thicker and heavier grass in the bioswale can filter out contaminants better, while deep-rooted native plants are preferred for infiltration and reduced maintenance (NRCS, 2005). It is also very important that a bioswale can be designed as a decorative greening element, which greatly enhances its landscaping potential. Regarding the maintenance, biowswales should be inspected periodically, especially after major storm events. Irrigation may be required in dry summer months. However, with proper construction and maintenance, bioswales can last indefinitely.

Besides reducing the total volume of stormwater runoff, the main value of bioswales lies in the fact that they infiltrate and filter nearly all of the water that comes from frequent, small rain events (NRCS, 2005). In this way, bioswales reduce the strain on city's municipal sewer system, which ultimately leads to cleaner rivers and waterways. Bioswale conveyance systems can treat and dispose of stormwater runoff from an entire site, thus reducing the number and cost of traditional storm drains and piping (ES-CPO, 2004). They are less expensive than traditional curb and gutter treatment or unederground strormwater systems (University of Florida, 2008). Bioswales also increase infiltration and groundwater recharge (University of Florida, 2008). Bioswales keep the water from flooding nearby structures and infrastructure, where it can create puddles and swamps. Another benefit of bioswales is that they also represent a favorable habitat for wildlife and may very well enhance biodiversity. Importantly, even though construction costs may vary, bioswales typically cost less than a standard piped, drainage system (ES-CPO, 2004). Last but not least, bioswales as greening elements can help improve the visual identity and aesthetics of space.

Bioswales are usually applied in parking lots, along residential roads and highways, in landscape buffer zones, in waterfront areas, in residential parks or other public spaces and in residential plots. Some best practice examples on the use of bioswales are presented in the following sections.

2.1. NE Siskiyou Green Street, Portland, Oregon, USA

The NE Siskiyou Green Street is one of Portland’s best green street stormwater retrofit examples and the first of its kind anywhere (ASLA, 2007). Built in 2003, this simple, cost effective and innovative project promotes the principles of sustainable stormwater management. The 80 year-old residential street was remodeled by carving out a portion of the street’s parking zone and converting it into two landscaped curb extensions that capture, slow, cleanse and infiltrate street runoff. The project disconnects the street’s rainwater runoff from the City’s combined storm/sewer pipe system and manages it on-site using a landscape approach.

According to project description of American Society of Landscape Architects (2007), stormwater runoff from 930 m2 of NE Siskiyou Street and neighboring driveways (Figure 2A) flows downhill along the existing curb until it reaches curb extensions (size 2,1 m x 15,2 m each) (Figure 2B). Water enters each curb extension through a 46 cm wide curb cut (Figure 2C), where it is retained to a depth of 18 cm by a series of checkdams (Figure 2D). Depending on the intensity of a rain event, water will cascade from one "cell" to another until plants and soil absorb the runoff or until the curb extensions reach their storage capacity. The bioswale system infiltrates water at a rate of 7,6 cm per hour. If a storm is intense enough, water will exit the landscape area through another curb cut at the end of each curb extension and will flow into the existing street inlets. In this way nearly all of NE Siskiyou’s annual street runoff (estimated at 10,000 hectolitres) is managed by its landscape system. Simulated flow tests have shown that the curb extensions at NE Siskiyou Street have the ability to reduce the runoff intensity of a typical 25-year storm event by 85 percent.

Figure 2. NE Siskiyou Green Street project: (A) Stormwater curb extensions plan; (B) Stormwater curb extensions flow diagram; (C) Curb cut in a bisowale for stormwater runoff; (D) Series of checkdams made from packed earth and river rock. Source: https://www.asla.org/awards/2007/07winners/506_nna.html

The author of the project is a landscape architect Kevin Robert Perry, who worked together with city officials and local community members. The City and neighborhood residents have agreed to share responsibilities in maintaining the landscaped stormwater curb extensions. The NE Siskiyou Green Street project has achieved three primary goals (ASLA, 2007): (1) *Low-cost design and execution* - the project was relatively simple to construct, maintenance friendly and cost effective since it was built for less than 20.000 dollars; (2) *Benefits the environment and embodies community livability* - aside from being aesthetically pleasing, this landscaped stormwater solution brings natural hydrologic functions back into the city; and (3) *Provides a model for other national and local stormwater regulations* - the creative and positive partnership of various stakeholders resulted in a widespread community acceptance of the project, and inspired similar landscaped stormwater facilities in other residential streets.

2.2. Edwards Gardens Parking Lot Retrofit, Toronto, Ontario, Canada

The largest parking lot in the City of Toronto's park system, with a total area of 15.045 m2, is located at the botanical garden Edwards Gardens, and also serves Wilket Creek Park and Toronto Botanical Garden. Before the retrofit, deteriorated asphalt parking lot was a major source of urban runoff to Wilket Creek during storm events, contributing to erosion, elevating flooding risk, and degrading downstream water quality and aquatic habitat (STEP, 2016). Wilket Creek Valley was also affected, resulting in damage to bridges, trails and park amenities and impacts to the valleyland ecosystem (STEP, 2016). The prime objective of the retrofit project was to mitigate stormwater impacts on Wilket Creek, while improving pedestrian access, safety and circulation, conserveing water and energy, and promoting alternate forms of transportation (CSLA, 2013).

Retrofit project was designed by landscape designers Schollen&Company Inc and implemented in 2012 (Figure 3A). General retrofit idea was to capture stormwater runoff and convey it through stormwater biofilters - combined bioretention and infiltration trenches with native plantings (Figure 3B). A bioswale lined with loose stone was constructed to convey flows from the parking lot to an existing stormwater outet that discharges to Wilket Creek. A network of stormwater biofilters totaling 880 m2 area, that are situated in traffic islands, capture, infiltrate and convey runoff (STEP, 2016). Water enters the biofilters through gravel inlets (Figure 3C), while excess water is directed to an outfall via perforated exfiltration pipe. Bioswales are landscaped using a diverse selection of native trees, shrubs, and grasses that are drought tolerant (Figure 3D). The plantings increase evapotranspiration, reduce of the urban heat island effect of the parking lot, enhance biodiversity and improve the overall impression of the area (STEP, 2016). Tall plant material helps to further absorb pollutants

while providing shade (Schollen&Company, 2018). Permeable pavement was also implemented in parking areas and pedestrian paths. The project enhances infiltration, reduces runoff rates, limits the amount of pollutants that are contained within stormwater runoff and increases groundwater recharge.

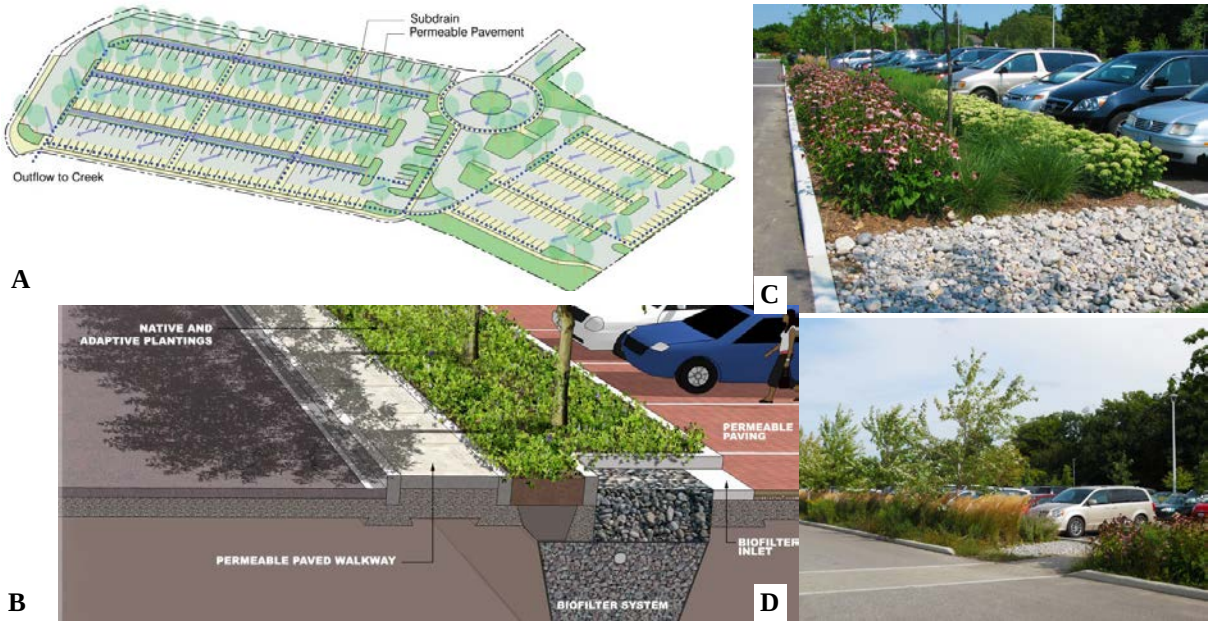

Figure 3. Edwards Gardens Parking Lot Retrofit: (A) Stormwater flow plan; (B) Bioswale concept diagram; (C) Bioswale stormwater inlet with loose stone; (D) Native plantings in the bioswale. Source: http://schollenandcompany.com/projects/edwards-gardens-parking-lot/

The total cost of the new green parking lot was 1.8 million dollars. Even though this investement was initially higher than standard asphalt surfacing, in the long run it is considered cheaper than total costs associated with repair of erosion and flood damages (STEP, 2016). The retrofitted parking lot has received positive feedback from all partners and the public. The use of bioswales within the project was successful in fulfilling three main objectives: (1) *Transformation a deteriorated parking lot into an inovative sustainable design while maintaining the original parking capacity*, (2) *Significant reduction in the amount of stormwater run-off being released to the Wilket Creek subwatershed* and (3) *Enhancement of urban biodiversity and tree canopy through native tree, shrub and grass plantings*.

2.3. Harold Simmons Park along Trinity River, Dallas, Texas, USA

After the great flood of 1908, Trinity River was moved away from downtown Dallas to the west, and levees were built to protect the city from future flooding. This left Trinity River disconnected from the public by long stretches of undeveloped land and a general lack of access (MVVA, 2016). In an effort to connect the river with the city, Dallas is nowadays creating an 115ha-park named after Harold Simmons, as a part of the Trinity River Corridor Project[1] (Figure 4A). The Harold Simmons Park project is set to be completed by 2021.

The designer, Michael Van Valkenburgh Associates (MVVA), envisions the space of the Harold Simmons Park as a network of trails, meadows and lakes along Trinity River. The concept of the park is based on two main elements: civic spaces and naturalistic landscapes. Civic spaces, such as playgrounds, fountains, plazas and lawns, are located in 5 access parks at the upper level of the river's levees, connecting the urban fabric to the floodplain. These amenities are therefore protected from flooding. Naturalistic landscapes along the river are supposed to restore the ecological function and natural beauty of the channel. The design enables rich river habitat with thriving wildlife and diverse landscapes from prairie to wetlands. However, the main purpose of the park is to provide protection from major flood events. The park is accessible even during 10-year storms,

[1] Large nature district Trinity River Corridor Project began in the early 2000s. This 4046ha-nature area includes trails, a predestrian bridge, a horse park, a golf course and a community center, with plans to build shops, restaurants, housing and offices in the near future. The City plans for the park to become a catalyst for urban growth and economic development.

ensuring the adaptability of the space even under extreme circumstances (MVVA, 2016). During the Trinity River's wet season, low-lying parts of Harold Simmons Park will receive flood waters from the Trinity River, redirect and absorb them into storage areas using sloped bioswales (Figures 4B, 4D) (Water Environment Federation, 2017). During the more arid months, the river bottom and plants will be exposed, allowing views and access to Trinity River habitat (Figures 4B, 4C). In this way, the park will naturally flood only in controlled areas, while the overflow water will drain into bioswales.

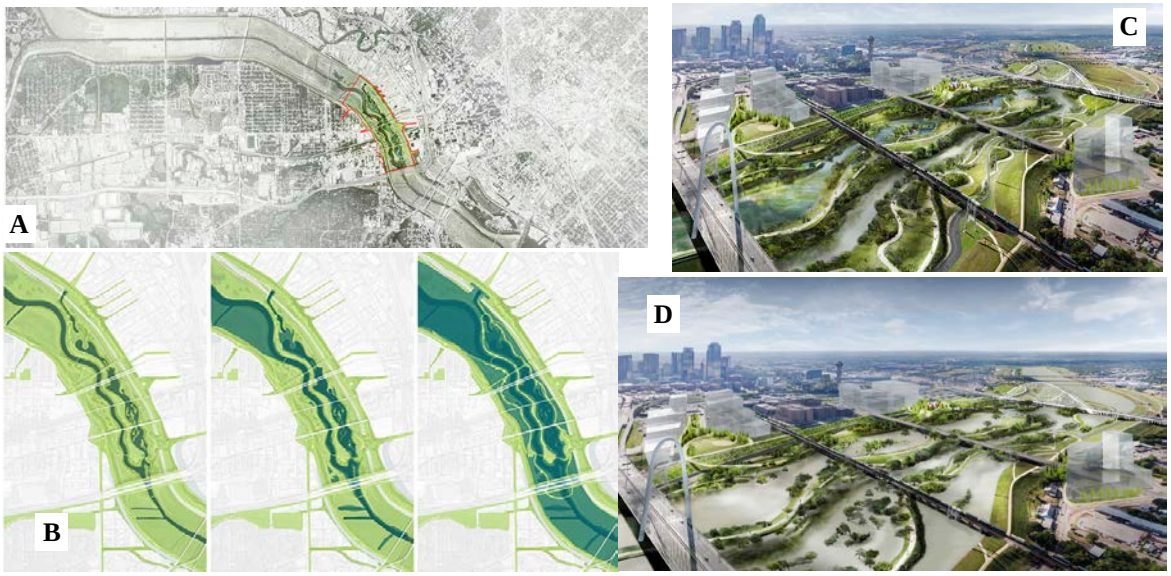

Figure 5. Harold Simmons Park project: (A) Location of the park. Source: https://network.thehighline.org/projects/trinity-river-park/; (B) Floodplane in a normal flow channel, 1-year flood event and 3-year flood event; (C) Park design. Source: http://www.mvvainc.com/project.php?id=114; (D) Park during a 3-year flood event. Source: https://www.businessinsider.com/dallas-trinity-river-park-project-2016-12#before-the-harold-simmons-park-breaks-ground-the-us-army-corps-of-engineers-will-need-to-approve-the-plans-since-its-in-a-flood-zone-4

This project for Trinity River Park achieves three main goals. By using region-specific native flora and natural features, as well as bioswales as elements of green infrastructure, Harold Simmons Park will: (1) *Provide recreational opportunities for people*, (2) *Restore the ecosystem* and at the same time (3) *Preserve the floodplain's resilience against river overflow to surrounding structures*. The true impacts of this waterfront revitalization will be determined once the project is completed.

3. POSSIBILITIES OF USE OF BIOSWALES IN DUVANIŠTE DISTRICT, CITY OF NIŠ, SERBIA

Duvanište district is located in the Municipality of Medijana, at the periphery of Niš urban area. It was developed in the 60's as a planned settlement, equipped with modern communal and infrastructure facilities. Original construction involved mostly housing on individual plots, and was intensified in the 80's when multi-storey residential development became dominant. Duvanište district was planned and designed with high ecological standards and significant housing value. During socialism, planning regulations favoured public interest and the area was well-planned for all necessary urban functions.

After the fall of the socialist regime, due to changed market conditions, as many as three revisions of the Master Plan (MP) of Niš 1995–2010 occurred, affecting directly the area of Duvanište and causing intensive transformations in the late 90's (Dinić Branković et al., 2018b):

(1) *The waterfront area of Nišava River became eroded with postsocialist commercial development, while the sports-recreational use was significantly reduced*. The First revision (2001) of the MP of Niš 1995–2010 provided for a commercial strip in the part of green area east of Proleterska Street, changing the recreational land use to a 'settlement center'. Then, the Third revision (2007) of this MP added the use 'settlement center' to the vast green area west of Proleterska Street, while further elaboration of this area within the urban project provided for a shopping center. Formely planned extensive sports and recreational facilities have not been provided until today. The current MP of Niš 2010–2025 and the Plan of General Regulation of the Municipality

of Medijana enabled further loss of recreational use, and a new megamarket and a church were built in the waterfront area.

(2) *Decentralization of retail resulted in changes in land use and new construction of big-box retail fomats, auto-oriented and surrounded by vast surface parking lots, thus reducing open and green space.* The Second revision (2004) of the MP of Niš 1995–2010 changed the land use from a former school complex in Duvanište to an 'urban residential zone with business'. This enabled the construction of a megamarket and large-scale shops that occupy large surface area for both structures and parking. In 2009 another big-box store was constructed in the northeast part of Duvanište district, in the former storage/services zone, with a huge building setback and a parking lot facing the street. One more new suburban form, a retail park, opened in 2016 in the location of the former tourist complex Medijana (Dinić Branković et al., 2016). Retail area encompasses a megamarket and variuos shops surrounding a vast surface parking lot.

Post-socialist trandsformations in Duvanište district resulted in significant urban densification and loss of public open space and green areas. At that point in time, none of these new developments considered the increase of paved surfaces and its implications upon stormwater treatment. However, due to numerous transformations of urban structure and several flash flooding events in the past couple of decades, the impression is that modern approaches could help significantly in improving the current treatment of stormwater runoff. From the standpoint of this research, several urban forms and various sites are identified and suggested as potential locales for the implementation of bioswales (Figure 5):

(1) *Street grid*. Streets that could accomodate bioswales as elements of green infrastructure were chosen based on the following selection criteria: the rank of residential streets only (low traffic flow), minimum 10 m of total regulation width of the street (1x5,0 m driveway, 2x1,5 m sidewalk and 1x2,0 m bioswale) and slope of terrain no greater than 5%. In these residential streets, aside from stormwater treatment, bioswales would also bring the benefits of traffic calmming (intermittent or opposite layout of bioswales depending on street width) and improvement of pedestrian safety (position of bioswales between the driveway and the sidewalk).

(2) *Parking lots.* There are six parking lots[2] with paved area ranging from 4.500 to 15.000 m2 that could benefit from bioswale application. Only one of them is a socilalist legacy and is associated with residential use (F), while all the others were designed in the post-socialist period. The use of bioswales would also contrubte to a reduction in air temperature and to minimizing of heat island effects of the parking lot, as well as to the improvement of overall aesthetics of space. The use of bioswales is recommended but not limited to large parking lots, and smaller parking areas in residential zones are also potential implementation sites.

(3) *Waterfront.* The riverside open green area of Ništava River was significantly reduced in the transition period due to new developments. However, the remaining undeveloped area in the waterfront zone has significant potential for the use of bioswales. The main purpose of bioswales would be flooding control, but they could also help restore the ecosystem and improve the visual identity of the area.

[2] Number of parking space (p.s.) and paved surface area (m2) of selected parking lots are as follows: A – 210 p.s., 15.000 m2; B – 120 p.s., 4.500 m2; C – 180 p.s., 7.500 m2; D – 290 p.s., 5.800 m2; E – 300 p.s., 10.800 m2; F – 300 p.s., 8.200 m2;.

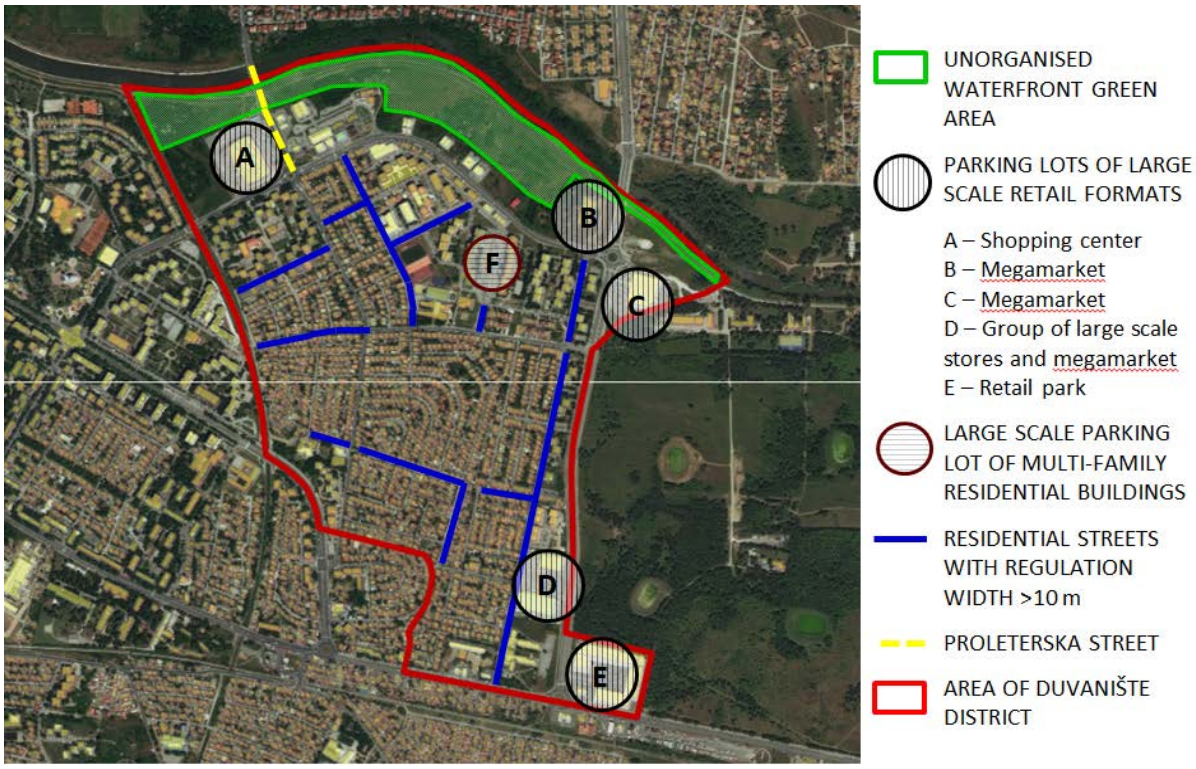

Figure 5. Potential locales for the implementation of bioswales in Duvanište residential district, City of Niš. Source: https://www.google.rs/maps, drawing by Milena Dinić Branković

4. CONCLUSIONS

It can be concluded that bioswales are a very topical issue in modern stromwater management. Analyzed examples confirm that the implementation of bioswales as elements of green infrastructure can significantly improve stormwater treatment as well as the design of various urban forms, resuting in more favourable environmental impacts. The NE Siskiyou Green Street retrofit project demonstrates how both new and existing streets can be designed to provide direct environmental benefits and be aesthetically integrated into the neighborhood streetscape. Sustainable green design of the parking lot in Edwards Gardens not only improves stream stability and water quality through inovative stormwater management strategy, but also promotes green initiatives and serves as a prototypical demonstration project for other similar developments. An ambitious project of the Harold Simmons Park along Trinnity River uses naturalized river landscape and public open spaces to create a new urban hub in a natural environment, preserving at the same time the role of protecting the city in case of flooding.

This paper suggested some potential locales where bioswales could be applied as green infrastructure for the treatment of stromwater runoff in the case of a residential district of the City of Niš. A more detailed examination is necessary to determine the exact locations, size and design of bioswales and to investigate the benefits of their use. The options of bioswale use in residential plots of single-family housing and public open space of multifamily housing should also be explored. Further studies are suggested to investigate the potential use of bioswales not only in Duvanište district, but in other parts of urban territory. However, it is the conclusion of this research that bioswales require more attention in both planning documents and in plannning practice of the City of Niš, since their implementation brings multiple benefits to the urban environment.

Vegetated swales are cost-effective, attractive and can provide wildlife habitat and visual enhancements. By introducing bioswales into retrofit projects and new developments urban areas achieve long-term sustainability. This is especially important for post-socialist cities that underwent significant urban densification and cannot afford more loss of public open space, green areas nor deterioration of environmental quality.

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REFERENCES

1. American Society of Landscape Architects (ASLA), 2007. https://www.asla.org/awards/2007/07winners/506_nna.html [Accessed: 04th September 2018].

2. Canadian Society of Landscape Architects (CSLA), 2013. http://www.csla-aapc.ca/awards-atlas/edwards-gardens-sustainable-parking-lot-retrofit [Accessed: 12th September 2018]

3. Dinić Branković, M., Bogdanović Protić, I., Mitković M., Đekić, J., 2018a. Urban densification of the post-socialist city and its implications upon urban structure: a study of Nis, Serbia. Proceedings of the 5th International Academic Conference on Places and Technologies, Belgrade, Serbia. pp. 25-34.

4. Dinic-Brankovic, M., Djekic, J., Mitkovic, M., Mitkovic, P. and Markovic-Brankovic, J., 2018b. Postsocialist Restructuring of City Subcenters and the Role of Shopping Centers in Nis, Serbia. *Journal of Urban Planning and Development*, 144(2): 04018009

5. Dinić-Branković, M., Bogdanović-Protić, I., Đekić, J., Mitković, P., 2016. Post-socialist suburbanization and sprawl development patterns – Niš case study. *Facta universitatis, series Architecture and Civil Engineering*, 14(3), pp 355-366.

6. Environmental Services-City of Portland Oregon (ES-CPO), 2004. Stormwater solutions handbook. https://nacto.org/wp-content/uploads/2012/06/City-of-Portland-Bureau-of-Environmental-Services.-2004.Stormwater-Solutions-Handbook..pdf [Accessed: 22nd August 2018].

7. Michael Van Valkenburgh Associates Inc (MVVA), 2016. http://www.mvvainc.com/project.php?id=114 [Accessed: 08th September 2018]

8. Natural Resources Conservation Service (NRCS), 2005. Bioswales. https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs144p2_029251.pdf [Accessed: 22nd August 2018].

9. Schollen&Company Inc, 2018. http://schollenandcompany.com/projects/edwards-gardens-parking-lot/ [Accessed: 12th September 2018]

10. Toronto and Region Conservation Authority's Sustainable Technologies Evaluation Program (STEP), 2016. Edwards Gardens Parking Lot Retrofit Case Study. https://sustainabletechnologies.ca/app/uploads/2016/08/Edwards-Gardens.pdf [Accessed: 12th September 2018]

11. University of Florida – Program for Resource Efficient Communities, 2008. Florida field guide to low impact development. http://buildgreen.ufl.edu/Fact_sheet_bioswales_Vegetated_Swales.pdf [Accessed: 03rd September 2018].

12. United States Environmental Protection Agency (USEPA), 2005. National management measures to control nonpoint source pollution from urban areas. Washington, DC: Office of Water.

13. Urban Planning Institute of Niš, 1995. Master Plan of Niš 1995-2010. Official Gazette of the City of Niš no. 13/95, Niš, Serbia.

14. Urban Planning Institute of Niš, 2011. Master Plan of Niš 2010-2025. Official Gazette of the City of Niš no. 43/11, Niš, Serbia.

15. Urban Planning Institute of Niš, 2012. Plan of General Regulation of the Municipality of Medijana. Official Gazette of the City of Niš no. 72/12, Niš, Serbia.

16. Water Environment Federation, 2017. http://stormwater.wef.org/2017/03/trinity-river-floodplain-set-become-one-nations-largest-greenest-urban-parks/ [Accessed: 08th September 2018]

17. Xiao, Q. and McPherson, E. G., 2011. Performance of engineered soil and trees in a parking lot bioswale. *Urban Water Journal* 8(4), pp 241-253.

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REVITALIZATION OF DEVASTATED RURAL AREAS IN THE REGION OF SOUTHERN AND EASTERN SERBIA: A REVIEW OF EXISTING DEVELOPMENT PATTERNS, POTENTIALS AND PLANNING POLICIES

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ABSTRACT

Rural areas represent significant percentage of world's territory, but still their development is in stagnation, especially in developing countries. These areas are underdeveloped in economic, social, cultural and technological terms. There are many strategies and programs for their sustainable development, but many of them are not having comprehensive approach. This paper systematizes the key factors that led to the devastation of rural areas by using a review of relevant literature, and discusses potential directions for their revitalization in the case the Region of Southern and Eastern Serbia, as one of the least developed Serbian regions. Creating rural areas "more competitive" on the market and creating resilient rural settlements can promote sustainable rural development, increase quality of life in rural settlements and general wellbeing of residents and can also help in achieving more balanced regional development.

Keywords: devastated rural areas; rural development; Region of Southern and Eastern Serbia; revitalization of rural areas; quality of life

1. INTRODUCTION

There are many definitions of rural areas according different criteria. In past times, territory outside of the city walls was considered as rural. Today if we take into account **economic** aspect, rural areas are areas where economy is oriented towards agriculture and food production, poverty is on a high level and residents incomes are lower than in the other areas. From the **social** point of view, rural areas are areas that are characterized by expressed stagnancy in terms of technological and cultural development. Regarding **demography**, rural areas

are characterized by negative demographic growth, sparsely populated settlements and with very low population density. **Spatially**, territory with mainly agriculture land and different land use than urban represents rural (Milić, 2011). In Serbia, rural areas are defined as areas where the main physical and geographical characteristics are land use for the needs of forestry, livestock and agriculture (*Ministry of Agriculture, Forestry and Water management, 2009*). According this definition, about 2/3 of our country can be defined as rural where over 40% of total population lives. By the definition of OECD - *The Organization for Economic Co-operation and Development*, rural areas are defined as areas with the population density less than 150 inh/km^2. According to this criterion, 85% of the territory of our country is defined as a rural area and with approximately 55% of the total population and the average population density is about 62 inh/km^2. In Serbia there are 6,158 settlements, of which 193 are urban (3.1%) and 5,965 are "other settlements", which are considered as rural villages and which have rich natural resources (*Ministry of Agriculture, Forestry and Water management, 2014*).

Rural areas in Serbia were marginalized for long period of time and their stagnation and degradation is consequence of various factors. These areas represent more than a half of territory of Serbia and they are on the territory with mainly agriculture activities. Politics of economic, spatial and social development were concentrated on urban development and urban territory, while rural territory was „left aside". First stategy was developed in 2009. where classification of rural areas was suggested and also territorial divisions, and detailed analysis of the current limitations and potentials of Serbian villages were published (Todorović & Drobnjaković, 2010). This paper discusses rural areas in the Region of Southern and Eastern Serbia, which represents underdeveloped part of the country territory. Part of this Region are border municipalities which are completely marginalized. Due to uneven regional development this Region is devastated, characterized by negative demographic growth, spatially insufficiently connected and the most underdeveloped region in Serbia. Therefore, this paper analyzes existing development patterns and polices and discuss possible directions for revitalization of devastated rural areas in this Region. When defining a model for revitalization of rural areas, modern spatial planning should consider the adaptation of settlements to climate change, in order to overcome, among other things, existing environmental problems and reduce pollution of the environment.

2. REGION OF THE SOUTHERN AND EASTERN SERBIA – RURAL AREAS, CURRENT STATE AND MAIN PROBLEMS

In Serbia, there are five Regions: Region of Vojvodina, Region of Belgrade, Region of Šumadija and Western Serbia, Region of Southern and Eastern Serbia and Region of Kosovo and Metohija (*Fig. 1*) *(Government of Republic of Serbia, 2015*). Insufficiently developed regions, where the value of the gross domestic product (GDP) is below the values of the Republican average are Region of Šumadija and Western Serbia and Region of Southern and Eastern Serbia. Region of Southern and Eastern Serbia occupies about 1/3 of the total Serbian territory and within lives approximately 25% of the residents. Region of Southern and Eastern Serbia consists of 9 districts and according data of Statistical office, it occupies territory of 26.248 km^2, within this Region there are 1.973 settlements with 1.521.081 inhabitants. This Region is characterized by negative demographic growth and the average age of the population is 44 (*Statistical office of the Republic of Serbia, 2018*). This area is characterized with very diverse topography, rich hydrographic network, natural landscape and flora and fauna and very fertile land. Map on figure 2 shows level of development of local economy in this Region, where it is obvious that except cities of Niš and Bor all other municipalities are underdeveloped in terms of economy and investments. Lack of workplaces and educational institutions network are causing migrations of residents and contributing to negative age structure. Due to specific topography – dominantly highhilly and mountainous terrain, large surface of the territory is poorly populated and most of the settlements in the eastern part are declared as "weak – remote" with density less than 50 inh/km^2(Fig. 3).

Figure 1: Regions in Serbia

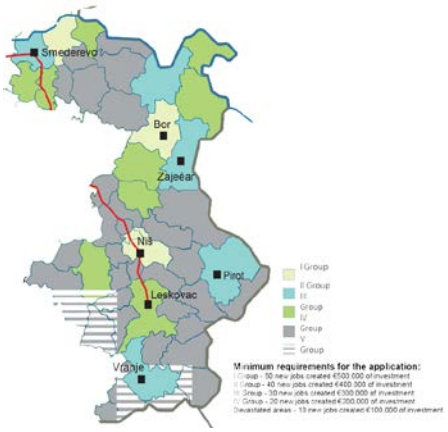

Figure 2: Level of development of local economy

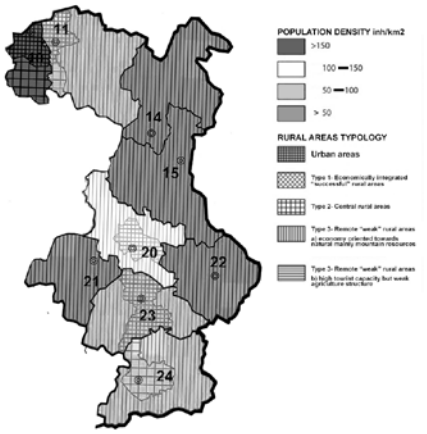

Figure 3**:** Typology of rural areas

Sources: f1: https://upload.wikimedia.org/wikipedia/commons/b/be/Statistical_regions_of_Serbia.png

f2: http://ras.gov.rs/uploads/2016/03/mapa-razvijenosti-sa-minimalnim-uslovima-za-aplikaciju.pdf

f3: http://www.rapp.gov.rs/sr-Latn-CS/content/cid310/prostorni-plan-republike-srbije

Region of Southern and Eastern Serbia consists of 9 districts where the city of Niš territory represents the most developed district. Territory of this Region has very diverse natural landscape and fertile land which provides possibilities for economic development in fields of tourism and agriculture, but still unemployment rate is very high. One of the problems is that there are not enough residents that have professional skills for the working places on the labor market. Large number of unemployed residents with university degrees are migrating from this Region to bigger cities – Belgrade, Niš, Novi Sad or out of the country (*Golubović & Golubović, 2016*). Disparities between regions are consequence of disparities in relation of urban – rural settlements which are very expressed in Serbia. Globally, stagnation and devastation of rural areas started in last two decades of past century along with urbanization process. In Serbia, disinterest of government on state and local level led to neglecting of rural areas and to increasing urban rural disparities. Regions on the north of the country, especially Belgrade Region, always had advantage over other regions because of the foreign and state investments and also because of very developed industry. Southern territory and border areas are underdeveloped with very difficult possibilities for even development. Process of deindustrialization, privatization and very fast development of the countries in region affected Serbia which is in crisis and it is running for EU membership (Čoček, 2010). Period of transition also had huge impact, because it marked period of stagnation regarding rural areas, and in periods of rapid transitional reforms, regional and social inequalities increased. Due to increasing disparities in regional and social structure of Serbia in the first decade of XXI century, macroeconomy in entire country became vulnerable especially in less developed regions where led to increase of unemloyment rate, migrations that caused depopulation and negative demographic growth (Jakopin, 2014).

The main problems of rural areas in the Region of Southern and Eastern Serbia are their marginalization and degradation - stagnation of their economic, demographic, social and cultural development. Undeveloped network of settlements with, sometimes completely absent traffic infrastructure is also one of problems for their further development. Rural areas within this Region are facing many problems that are more and more pronounced. Settlements are not connected functionally and spatially between themselves and network of rural settlements is not developed. Uncontrolled and unplanned spreading of settlements territory, caused by illegal construction and often in protected areas of natural landscape or water resources areas, is increasing. Rural areas, in general, are faced with lack of main infrastructure systems in settlements and with illegal construction this problem is greater. With all these actions, soil is polluted and many landfills are formed in areas of great natural value. This Region has huge potential for using Renewable Energy Sources (RES) but undeveloped systems for using them. Negative depopulation trend which creates misbalanced aging structure with highest percentage of elderly residents causes abandonment of houses and settlements are extinguishing slowly. There is large number of unused existing public property fund - wine cellars, cooperative homes which are completely neglected due to unsolved legal and property issues.

In this Region, agriculture production was one of the main activities and main „industry“ for economic development. Because of negative population growth, which caused aging of the residents, agriculture

production is decreasing because elderly are not capable of working and there is no enough working force. Many fields are deserted and there are numerous of new meadows and non cultivated land. Aging and decreasing of agriculture activities are more pronounced in hilly and mountanious areas than in lowland territory (Pantić & Živanović Miljković, 2010). Due to technological development in field of agriculture, there are new methods and technics for agriculture production in order to increase yield. Unfavorable aging structure and lack of experts in agronomy represent great threat to future agriculture development and improvement. Existing agriculture is facing many problems: deserted and devastated atar roads that prevent access to private possessions in certain parts, inadequate machinery for processing and maintenance of agricultural land which often causes crops diseases, undeveloped irrigation system that threatens water supply and lately very expressed uncontrolled use of natural resources and very frequent illegal logging and hunting of protected animal species.

3. IMPACTS OF CLIMATE CHANGES ON RURAL AREAS

Climate changes are mainly consequences of direct human impact because of intensive harmful emissions caused by rapid urbanization and uncontrolled land use. Because of that, urban environment has different bioclimatic factors than rural areas and process of urbanization changes natural environment and atmospheric conditions (*Zelenakova, et al., 2015*). In the area of South and East Europe, as a consequences of climate change, there are various types of meteorological hazards, while geophysical hazards are not much expressed. Agriculture, which is the leading activity of the economic sector of these areas, is endangered by negative impacts of climate change, and at the same time, quality of life in rural settlements is disrupted. Disparities are primarily caused by different topography – geomorphological characteristics, demographic changes and infrastructure – traffic connections (*Bunjak et al, 2013*). Because of highly vulnerability on climate changes of rural areas and its negative impacts on urban and natural landscape, poverty is increasing and it is followed by poor social services and public infrastructure.

In 2013, European Union (EU) has adopted Rural Development Programme for period 2014-2020 within which six priorities were defined (Fig 4.). All the state members are developing their own strategies for rural development in accordance with EU strategy. Aim of this document is to meet the challenges, faced by rural areas, and contribute to their sustainable development and help rural areas to connect with different types of funds depending on a variety of challenges – economic, environmental and social. In the (Fig 4.) priorities defined within this document are shown and one of them is regarding climate change and resilient economy as one of the greatest threat for rural development. Development policies are partly financed through European Agricultural Fund for Rural Development (EAFRD) and it is defined that minimum 1/3 of the fund sources must be invested in climate change mitigation and adaptation as well as environmental issues (*European Commission, 2013*).

Western Balkans represents one of the very exposed parts of Europe, climate extremes and natural hazards are much expressed and they are followed by decreasing of water resources availability and increasing negative effects on human health. Serbia has adopted Efficient ways for GHG emissions reductions within the post - Kyoto framework in Serbia in 2011 and Nationally Appropriate Mitigation Actions (until now there are 12 developed projects), where main focus is on the reduction GHG emissions, as well as the selection of targeted sectors - energy production, industry, transportation, buildings, agriculture, waste and forestry - clearly indicating where the focus for future actions should be placed (*Ministry of Environment, Mining and Spatial Planning of Serbia 2010,2011*). As the very first document regarding climate change issues is The Initial National Communication of the Republic of Serbia from 2010 (*Ministry of Environment and Spatial Planning, 2010*). Another report: Second National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change, was published in 2017 (*Ministry of Environmental Protection, 2017*). This document was result of a project for period 2012-2015 and within this document there are some projections for short term period until 2030 for every 5 years and long term projections by 2050. In 2010, Agency for energy efficiency was established with main goal to improve energy saving and energy exploitation – consumption in general, and until now, Agency has published three Action plans regarding energy consumption. (*Agency for energy efficiency, 2016*). At the moment *Strategy for climate change together with Action plan* is being in the preparation process.

EU Rural Development policy Focus Areas in the 2014-2020 programming period	
PRIORITY 1	Knowledge Transfer and Innovation
PRIORITY 2	Farm Viability and Competitiveness
PRIORITY 3	Food Chain Organisation and Risk Management
PRIORITY 4	Ecosystems
PRIORITY 5	Resource-efficient, Climate-resilient Economy
PRIORITY 6	Social Inclusion and Economic Development

PRIORITY 5 /Resource-efficient, Climate-resilient Economy/	
FA 5A	Increasing efficiency in water use by agriculture
FA 5B	Increasing efficiency in energy use in agriculture and food processing
FA 5C	Facilitating the supply and use of renewable sources of energy
FA 5D	Reducing greenhouse gas and ammonia emissions from agriculture
FA 5E	Fostering carbon conservation and sequestration in agriculture and forestry

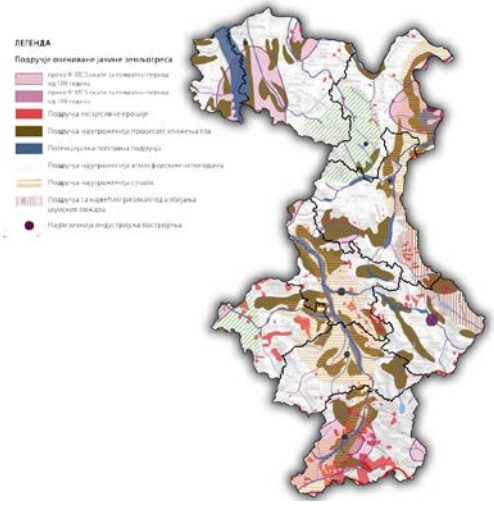

Figure 4**:** Priorities within rural Development Programme 2014-2020 **Figure** 5**.** Natural Hazards in the Region of Southern and Eastern Serbia
Sources: f5: https://www.researchgate.net/publication/235986025_Natural_Hazard_Assessment_for_Land-use_Planning_in_Serbia
f6: https://enrd.ec.europa.eu/policy-in-action/policy-framework_en

In 2015. Ministry of Agriculture and Environmental Protection published *Serbia's first National adaptation plan* which represents synthetic review of the proposed adaptation measures in sectors that have been identified as the most vulnerable - water resources, agriculture, forestry and biodiversity. In order to prevent disasters caused by climate change and to reduce negative impacts on human lives and built and natural environment it is necessary to conduct a disaster risk assessment for the country through National Risk Assessment Framework on a state level and also for each region. One of the activities should also be establishing of the National Risk Information System in order to collect data about disaster/emergency preparedness and response. Due to increasing value of temperatures, droughts are very common appearance and they are direct threat to agriculture which is main economy in rural areas. On the other hand, rising temperature values are causing heat vawes and as a consequence there are more often forest fires. Water level in the rivers is extremely decreasing during summer months which makes irrigation of fertile land very difficult. Precipitation is decreasing and rainfalls are not that often. But due to very extreme weather conditions, hailstorms became more often and they are destroying crops. Also, there are increasingly expressed floods on the entire territory, both river and torrential floods of mountain springs and rivers – especially in the end of winter and the beginning of the spring. Often floods are causing landslides on the entire country territory, and the large number of landscapes started after floods in 2014. Because of heavy rainfalls, excessive erosion is present – especially in southern part of the country. Entire territory is also endangered by seismic activity. In 2011 integral map of natural hazards in Serbia was published and it represents the first multi-hazard assessment map where different types of hazards were analyzed. (Dragićević et al, 2011, Lukić et al, 2013).

4. POSSIBLE DIRECTIONS FOR REVITALIZATION OF RURAL AREAS IN REGION OF THE SOUTHERN AND EASTERN SERBIA

In order to accelerate sustainable rural development in southern and eastern Serbia, create „competitive" rural areas on the market in terms of their economy and achieve resilience of settlements, it is necessary to define programs for revitalization. Programs – strategies, must be defined based on their local strenghts and potentials, but all the possible obstacles and threats must be taken into account. This Region has very favorable geomorphological characteristics of the terrain, fertile and unpolluted land, large water resources, moderate climate. Development of the settlements at all heights and the exploitation of natural resources is not limited by vertical distance wich is suitably for creating settlements network. There is traffic network which is not developed enough but it is used frequently and some parts are in relatively good condition. This area has very rich and diverse construction fund - traditional architecture, strong traditional identity and cultural heritage, large number of public buildings - wine cellars, cultural centers, self-service shops, mills ... This Region is also famous by traditional crafts and food production which are slowly dying out. Area of Southern and Eastern Serbia have already developed agricultural production, husbandry and vegetable production, existing family farms and "home" production but only for domestic – local and not for wide market. Entire territory has large areas of land under forests with numerous species of flora and fauna, rich biodiversity - river valleys and mountainous regions, untouched eco system and also thermo-mineral springs in some settlements.

First of all, it is necessary to prevent demographic decline of population in rural areas and to create environment that will be sustainable and attractive to all. Because of lack of main infrastructure systems – water supply, sewage, internet and telephone connections, markets and basic healthcare facilities, many settlements are not having primary life conditions. To prevent people to migrate it is obligatory to provide minimum of infrastructure and basic life conditions within every settlement. By creating better and more developed educational network, which will follow needs of market labour in rural areas, it is possible to retain younger population in rural areas and promote opening of new working places in order to retain working population. Rural territory in this Regiom has large number of settlements 1.973, but they are not connected properly and network of settlements is not developed. By creating hierarchically structured network of settlements, it is possible to have more even spatial organization of settlements and to prevent creating of remote – weak settlements in border municipalities. This way, balanced settlement network can be organized and distribution of diverse activities within different types of settlements will be possible.

Sustainable development of these areas is possible only if all resources are activated. Activation together of both natural and created resources can accelerate development because these areas have both resources but they are not used adequately. Development of infrastructure will prevent growing migrations and also will create main life conditions in existing settlements. Activation of the population in rural areas will directly help activation of the deprived economy and sustainable development. There are many potentials of these areas that can be activated, at the first place agriculture because there are large surfaces of fertile land which is underused and also there are many autochthonous species that can be cultivated. By implementing modern technologies and engaging of educated experts in production and land use, it is possible to increase yield and develop agriculture production. Also, this area is well known by some traditional foods which can be base for production and promoting of traditional crops and foods, but also for starting organic production on unpolluted land with moderate climate and local resources.

This area has huge potential in tourism development. Local resources, natural –large surface of mountains with exceptional natural landscape and created - architecture, cultural and historical heritage sites are one of the greatest powers for developing tourism in this area. This area has long history and during centuries many different cultures have left „marks“ on this territory which can be interesting for tourists. Mountain areas, with possibilities for winter sports and recreation during entire year can be also activated. Tourism can be developed together with traditional food production and traditional crafts. This will ensure economic activity in rural settlements, activate local residents and ensure employment of the local population which will contribute to overall economic sustainability of the area. Local initiatives will be promoted and one of the possibilities is development of entrepreneurship within settlements. This way, many of organizations can apply for foreign funds which could provide necessary investments for further development of local businesses.

Rural areas in Serbia have huge potential of Renewable Energy Sources (RES), and according data unused energy potential of RES in Serbia is estimated at more than 3.83 million toe. Due to very low awareness of residents, especially in rural areas, long and complicated administrative process and lack of state stimulations, RES potentials are used very little. As one of the possibilities for climate change mitigation would be certainly increased use of RES, rational use of energy – increased energy efficiency because energy sector represents one of the greatest polluters. Using RES for energy production is one of the best ways to comply with requests of EU regarding climate changes and sustainable development (Božić et al, .2015).

As the other part of the country, these areas are also affected by negative impacts of climate change. Increasing values of temperature and heat waves are causing drought which is destroying crops, decreasing water level in rivers and springs which are used for irrigation and also cause forest fires. This area has very rich land under forests and forest fires are not only destroying plants, but also soil which needs many years to regenerate. Extreme hail storms cause heavy precipitation which also damages crops and causes floods both river and torrential. This area is known by great flood in 1960-ies when few villages were submerged and Zavoj lake was created. There are also numerous of landslides sites which are endangering life of residents. By adapting rural areas to climate change it is possible to improve the quality of life and reduce the trend of depopulation and also reduce health issues that people are facing with. Adaptation to climate changes must be done in all fields, especially in agriculture and water resources. By creating efficient irrigation systems, negative effects of drought can be avoided. Adapting crop cultures for certain climate and land quality, and use of adequate agro-technical measures can increase yield. Efficient use of water and water management system can help in peserving water during summer months, which is very important for irrigation systems. It is also important to have system for wastewater which will prevent pollution of drinking water and soil in general.

Developed network for protection of forests and natural landscape from fires and pollution is obligatory because these disasters can make enormous damage and also they can destroy many protected species. Determing map of natural hazard for every region is state priority, because it can help prevent disasters, stop illegal construction on landslides, protected areas and flood territory.

5. CONCLUSION

Rural areas within one country, and also within one region, differ from one another in terms of economic, social, demographic, technological, spatial and demographic characteristics, which is difficult for definition of uniform measures and strategies. All the decisions must be done on local level according regional or state documents but it is impossible to define uniform document for entire country and to have visible results. Even within one Region there are many different districts, with different geo-morphological structure that have their specific characteristics that must be taken into account in order to efficiently use all the resources and overcome all threats. Planning documents must be done also for rural areas on all levels. Today, many municipalities have different level of plans both spatial and urban for many settlements, but often some villages are threated only through general urban plans.

Possible directions for revitalization of rural areas should be oriented towards exploitation of all resources – natural and created in order to reduce negative depopulation trend caused by migrations and decreased birth rate. In order to achieve „sustainable economy“ it is important to improve competition of agricultural, forestry and food processing sectors and to develop tourism based on local resources. Development of local entrepreneurships can promote local initiatives and help rural economy to become more competitive on the market. By starting new businesses it is possible to increase diversification of activities in rural areas and to attract young people to rural areas. Protection of natural environment is mandatory, and also exploitation of local RES can help creation of sustainable and healthy living environment. It is also imoptant to improve quality of life in rural areas and reduce occurrence of health diseases caused by negative impacts of climate change and lack of basic infrastructure. For further and even development of rural areas it is necessary to take into account also climate change impacts on both natural and built environment. If we consider percentage of people living in rural areas – only in Serbia about half of total population, it is obligatory to research rural areas in light of climate change also. Adaptation plans and strategies to climate change are obligatory because their effects are increasing and having negative influence on humans and both built and natural environment.

Creating resilient settlements is one of the key factors for sustainable devlopment and rising quaity of life in rural areas. In process of revitalization local residents must be included in order to successfully participate in implementation process and to develop awareness of residents for sustainable development. It is imoprtant to organize seminars and lectiures in all settlements and to encourage dissemination of knowledge in terms of new technologies.

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REFERENCES

1. Agency for energy efficiency, 2016. Third Action Plan for Energy Efficiency of the Republic of Serbia for the period until 2018. Official Gazette RS, No. 1/17
2. Božić V., Cvetković S., Živković B., 2015. Influence of Renewable Energy Sources on Climate Change Mitigation in Serbia. *Thermal Science*. Vol. 19, No. 2, pp. 411-424
3. Bunjak K., Pešić M., Panić V., 2013. Metodologija kreiranja obrazaca za adaptaciju ruralnih područja Srbije na klimatske i kontekstualne promene - Atlas srpskih sela, In book: Uticaj klimatskih promena na planiranje i projektovanje III. Kreiranje strategija i obrazaca. Faculty of Architecture, University of Belgrade Editors: Vladan Đokić, Zoran Lazović, pp. 76-94
4. Čoček L., 2010. Patterns of Regional Development in Serbia: A Multivariate Statistical Analysis. Geographica Pannonica, Vol 14, Issue 1, pp. 14-22

5. Dragićević S., Filipović D., Kostadinov S., Ristić R., Novković I., Živković N., Anđelković G., Abolmasov B., Šećerov V. & Đurđić S., 2011. Natural Hazard Assessment for Land-use Planning in Serbia. *International Journal of Environmental Research*. Vol 5(2), pp. 371-380

6. European Commission. 2014. Rural Development Programme 2014-2020. available on web: https://ec.europa.eu/agriculture/rural-development-2014-2020

7. Golubović N. & Golubović S., 2016. Characteristics of unemployment in the Region of Southern and Eastern serbia. Facta Universitatis, Series: Law and Politics, Vol 14, No1, pp.449-461

8. Government of Republic of Serbia, 2015. Law on regional development. Official Gazette RS, No. 89/2015, p. 4.

9. Jakopin E., 2014. Regional inequalities and transition: the case of Serbia. Ekonomika Preduzeća. Vol 62, Nr 1-2, pp. 117-133

10. Lukić T., Gavrilov M., Marković S., Komac B., Zorn M., Mlađan D., Đorđević J., Milanović M., Vasiljević Đ., Vujičić M., Kuzmanović B., Prentović R., 2013. Classification of natural disasters between the legislation and application: experience of the Republic of Serbia. Acta geographica Slovenica, Vol. 53, Nr 1, pp. 149-164

11. Mijačić D. & Paunović B., 2011. Regional disparities in Serbia. Ekonomika preduzeća, Vol 58, pp. 379-389

12. Milić B., 2011. Ruralni razvoj - praktikum za lokalne aktere. Stalna konferencija gradova i opština SKGO. Belgrade, Serbia

13. Ministry of Agriculture, Forestry and Water management, 2009. Plan for the Rural Development Strategy of Serbia for the period 2009-2013. available on web: http://www.agrif.bg.ac.rs/files/events/38/Plan%20strategije%20ruralnog%20razvoja%202009-20013.pdf

14. Ministry of Agriculture, Forestry and Water management, 2014. Strategy for Agriculture and Rural Development of the Republic of Serbia 2014-2024. Official Gazette RS, No. 85/2014, p. 36.

15. Ministry of Agriculture and Environmental Protection, 2015. Serbia's first National adaptation plan. available on web: *http://www.klimatskepromene.rs/wp-content/uploads/2017/04/NAP-UNDP-2015.pdf*

16. Ministry of Environment and Spatial Planning, 2010. The Initial National Communication of the Republic of Serbia. available on web: *https://unfccc.int/resource/docs/natc/srbnc1.pdf*

17. Ministry of Environment, Mining and Spatial Planning of Serbia, 2010. Nationally Appropriate Mitigation Actions – NAMAs. Ministry of Environment, Mining and Spatial Planning of Serbia, Republic of Serbia.

18. Ministry of Environment, Mining and Spatial Planning of Serbia, 2011. Efficient ways for GHG emissions reductions within the post - Kotyo framework in Serbia

19. Ministry of Environmental Protection, 2017. Second National Communication of the Republic of Serbia under the United Nations Framework Convention on Climate Change. available on web: *http://www.klimatskepromene.rs/wp-content/uploads/2017/12/SNC-Eng_Serbia.pdf*

20. Pantić M. & Živanović Miljković J., 2010. Regional differences between rural areas of Serbia in population aging and agricultural activities: case studies of the Inđija and Knjaževac municipalities. Spatium, Nr. 22, pp. 29-37

21. Statistical office of the Republic of Serbia, 2018. Profile of the Region of the Southern and Eastern Serbia. Statistical office of the Republic of Serbia, available on web: http://devinfo.stat.gov.rs/SerbiaProfileLauncher/files/profiles/sr/1/DI_Profil_Region%20Juzne%20i%20Istocne%20Srbije_EURSRB002002.pdf

22. Todorović M. & Drobnjaković M., 2010. Peripheral rural areas in Serbia – the result of unbalanced regional development. Geographica Timisiensis, Vol. 19, Nr. 2, pp. 207-219

23. Zelenakova M., Purcz P., Hlavata H., P. Blištan, 2015. Climate Change in Urban Versus Rural Areas. *Procedia Engineering*, Volume 119, pp 1171-1180

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THE TREATMENT OF GREENERY IN URBAN PLANNING DOCUMENTS: RESIDENTIAL AREAS IN NIS, SERBIA

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ABSTRACT

The process of creating adequate environment for high quality life in urban residential areas is very complex and requires careful analysis and integration of different elements that form city structure – architectural structures, infrastructure, open spaces and greenery, etc. In this structure all of the elements are connected and interdependent, and under the great influence of political, social and economic factors that are constantly changing through time. That is why all of these elements that define quality of residents life must be carefully considered and implemented.

Analysis of the development of residential areas in the city of Nis, Serbia in recent decades indicates that the approach to this problem had not been adequate, especially considering implementation of green areas. It is necessary to locate the problem and define adequate model for the improvement. This model should stimulate increase of the quality and quantity of greenery in urban residential areas. Introducing a new parameter defining greenery on the plot – greenery index, instead of minimal greenery percentage that appears in current urban planning documents, could be a viable improvement model for the better quality of implementation of greenery in residential areas.

Keywords: urban planning; residential areas; greenery

1. INTRODUCTION

The quality of life in residential urban areas depends on multiple factors that need to be analyzed and integrated. The quality of architectural structures, functional organization of the apartments, construction and provided infrastructure are very important aspects that define the quality of residential area. But, the quality of public open spaces (POS) and created ambience are very important in achieving overall quality of life. These factors are often neglected in contemporary residential developments in the Republic of Serbia, despite the fact that the quality of public open spaces is very important factor in overall housing environment quality (Vasilevska, 2012).

The importance of green areas in urban structures is recognized by a large number of authors. Researchers indicate significant positive effects of greenery in urban areas: positive impact on residents' health (M. E. van Dillen et al., 2011), recuperation from physical and mental stress (De Vries, Verheij, Groenewegen, & Spreeuwenberg, 2003; Grahn & Stigsdotter, 2010; Korpela & Hartig, 1996), longevity (Takano, Nakamura, & Watanabe, 2002), their role as urban lungs – absorbing pollutants and releasing oxygen (Hough, 1984, cited in Haughton&Hunter, 1994), regulation of air temperature of urban areas in the summer - cooling effect (E. Bowler, 2010), etc.

Considering the importance of quantity, but also the quality of green areas in the urban structure of the city, it is necessary to develop and apply adequate tools for their implementation. Urban planning documents, as the basis for the development of urban structures, have very important role in the process of implementation of green areas in the cities. Greenery is often neglected in urban plans in the Republic of Serbia, and there is potential for significant improvement in this area, and thus the improvement of quality of urban environment.

2. RESEARCH FRAMEWORK AND METHODOLOGY

The city of Niš is one of the largest cities in the Republic of Serbia, and could be considered as a typical representative of contemporary Serbian city and a relevant environment for the research on problems of greenery treatment in urban planning documents and the potential for the improvement in this area.

In recent decades significant degradation of urban environment considering green areas and ambient value can be observed. This process reflects in gradual reduction of urban green areas, both public and on private building plots, and should be a cause for great concern for the direction of urban development in Serbia.

In the first phase of the research it is necessary to analyze urban plans and identify existing methodology of implementing greenery in city residential areas. This research will consider only the aspect of implementing green areas into residential areas of the city. Then, the effects of existing methodology should be considered and analyzed. The aim is to identify the problems that exist in practice by on site observation. Final phase of the research is to define the models for the improvement in future urban planning documents, as well as to define potential guidelines for further research.

3. GREEN AREAS IN THE EXISTING URBAN PLANNING DOCUMENTS IN NIŠ

It is necessary to analyze existing urban plans in Niš to identify urban parameters related to greenery. Although there are some general notes concerning greenery in some of the plans, the only legally binding parameter is minimal percentage of greenery on plot. This parameter is quantitative, with total disregard to type or quality of greenery. The review of this plan in different urban plans is given in Table 1.

Table 1: Minimal Percentage of Greenery in Residential Areas Required by Urban Planning Documents in Niš

Urban Planning Document	*Minimal Percentage of Greenery on Plot in Residential Areas*		
	Low Density	*Middle Density*	*High Density*
General Urban Plan of Niš 2010 - 2025	*10%*	*10%*	*10%*
General Regulation Plan of City Municipality Medijana	*10%*	*10%*	*10%*
General Regulation Plan of City Municipality Crveni Krst – First Phase	*10%*	*10%*	*10%*
General Regulation Plan of City Municipality Crveni Krst – Second Phase	*20%*	*20%*	*20%*
General Regulation Plan of City Municipality Palilula – First Phase	*10%*	*10%*	*10%*
General Regulation Plan of City Municipality Palilula – Second Phase	*20%*	*15%*	*10%*
General Regulation Plan of City Municipality Pantelej – First Phase	*10%*	*10%*	*20%*
General Regulation Plan of City Municipality Pantelej – Second Phase	*15%*	*15%*	*15%*
General Regulation Plan of City Municipality Pantelej – Third Phase West	*15%*	*15%*	*15%*

Nine urban plans covering urban city area of Niš were selected for this research. First of them is General Urban Plan of Niš 2010 – 2025 (GUP), as higher ranking document covering whole city area. Other eight are general regulation plans (GRP) covering parts or whole city municipalities.

General Urban Plan of Niš 2010 – 2025 defines greenery through minimal percentage of greenery on plot. As highest ranking plan it defines minimal 10% greenery in residential areas. This plan defined residential areas divided into zones of different density, and formulated detailed building regulations for each of those zones. Minimal percentage of greenery is the same for all of the zones and is not dependent of housing density and height. Since this document covers very large urban area this approach of defining detailed zones and building regulations is often criticized. All of the lower ranking plans should be synchronized with higher ranking plan. Since higher ranking plan defined not only general guidelines but detailed zones and building regulations, a very rigid urban framework had been created for a very large urban area. Consequently, due to large scope of the plan and lack of detailed elaboration of zones of the city with their specificities, many problems arise in further urban elaboration through regulatory plans.

Regulatory plans, as lower ranking plans, must be in accordance with GUP. The parameter of minimum 10% of greenery is taken from GUP to GRP-s of municipalities Medijana, Crveni Krst First Phase and Palilula First Phase that cover most of the central area of the city. GRP of City Municipality Crveni Krst – Second phase increases minimal percentage of greenery to 20%, GRP-s of City Municipality Pantelej – Second and Third Phases to 15%. GRP of City Municipality Palilula – Second Phase established a logical correlation between housing density and minimal percentage of green areas. This percentage varies from 10% in high density areas, 15% in middle density areas to 20% in low density areas. Due to the fact that the land in central city zone is much more valuable and requires higher housing densities, higher plot ratio and thus lower greenery percentage is expected. Lower density areas are characterized by much smaller physical structure, leaving much more space for open spaces and greenery. GRP of City Municipality Pantelej – First Phase defines minimal percentage of 10% in low and middle density, and 20% in high density areas. The reasons for that are unclear, since lower density implies larger open spaces and larger greenery percentage. Table 1 shows inconsistencies in treatment of green area percentage in GRP-s. The reasons for that are unclear and this is probably a reflection of different attitudes of different urban planners.

4. ANALYSIS AND EVALUATION

Second phase of research was the evaluation of the effects of existing urban planning documents parameters to the implementation of greenery to central urban areas. The sample of 24 new residential urban projects was selected, designed in the period 2016-2018. Most of them were not realized yet, but it is a valid sample to determine percentage of greenery in urban design phase of residential projects.

Table 2: Minimal Percentage of Greenery in Residential Areas Required by Urban Planning Documents in Niš

Urban Planning Document	*Urban Project*	*Percentage of Greenery*
General Regulation Plan of City Municipality Medijana	*Jug Bogrdanova 36-38*	*7.50%*
General Regulation Plan of City Municipality Medijana	*Jovana Ristića*	*10.01%*
General Regulation Plan of City Municipality Medijana	*Cvijićeva 20-22*	*10%*
General Regulation Plan of City Municipality Medijana	*Vardarska 29*	*11%*
General Regulation Plan of City Municipality Medijana	*Ivana Gundulića 10*	*10%*
General Regulation Plan of City Municipality Medijana	*Ivana Gundulića 12*	*10%*
General Regulation Plan of City Municipality Medijana	*Stanka Vlasotinčanina 3*	*15%*
General Regulation Plan of City Municipality Medijana	*Jablanička 16-18a*	*10%*
General Regulation Plan of City Municipality Medijana	*Vojislava Ilića 15*	*10%*
General Regulation Plan of City Municipality Medijana	*Milentijeva 24*	*10%*
General Regulation Plan of City Municipality Medijana	*Sestre Baković 5*	*10.34%*
General Regulation Plan of City Municipality Medijana	*Vojvode Tankosića 14*	*10.99%*
General Regulation Plan of City Municipality Medijana	*Cvijićeva 45*	*10%*
General Regulation Plan of City Municipality Medijana	*Bulevar Nemanjića*	*10.76%*

General Regulation Plan of City Municipality Medijana	*Stefana Prvovenčanog 15*	*10%*
General Regulation Plan of City Municipality Medijana	*Ćirila i Metodija 33*	*10.33%*
General Regulation Plan of City Municipality Medijana	*Zetska 43*	*10%*
General Regulation Plan of City Municipality Medijana	*Cvijićeva 29-31-33*	*11%*
General Regulation Plan of City Municipality Medijana	*Vožda Karađorđa 104-106*	*12.63%*
General Regulation Plan of City Municipality Medijana	*Sićevačka 9*	*10.15%*
General Regulation Plan of City Municipality Crveni Krst – First Phase	*Cetinjska 2*	*10%*
General Regulation Plan of City Municipality Crveni Krst – First Phase	*Kej Mike Paligorića 18*	*10%*
General Regulation Plan of City Municipality Pantelej – First Phase	*Pantelej 6493-4*	*19%*
General Regulation Plan of City Municipality Palilula – Second Phase	*Mokranjčeva 9424*	*10.56%*

Tendency to reduce greenery percentage to required minimum is obvious. Sixteen of twenty four urban projects define greenery percentage that is under 10.50%, with only 0.50% margin above minimum. One of them is under minimal value of 10%. Only three projects are above 1% more than minimum margin.

On the other hand, the situation in realized residential complexes in recent years is even more unfavorable. By on-site observation on 5 randomly selected residential developments, not only lack but often complete absence of green areas was determined.

(a) (b)

Figure 1: Open spaces in residential developments: Vojvode Tankosića 16 (a) and Prešernova (b) (photos by S. Kondić)

Four, out of five, developments that were observed do not have green areas – Vojvode Tankosića 16 (Fig. 1a), Prešernova (Fig. 1b), Cvijićeva 18a (Fig. 2a), Generala Bože Jankovića (Fig. 2b) and Cvijićeva 20-22 (Fig. 2c). Although minimal percentage of green areas existed in the design of these developments, it had not been implemented on site. The greenery that can be observed in photos is on neighboring plots.

The only development that had certain, but not adequate, percentage of greenery within the scope of this observation was Cvijićeva 23 (Fig. 3). It has minimal 10% greenery on the ground, within private yards of ground level apartments.

These results are clear indicator of the problem, but since this is not the problem that could be solved in urban planning and design phase, detailed analysis of this phenomenon is not in the scope of this paper and could be the topic of future researches.

Figure 2: Open spaces in residential developments: Cvijićeva 18a (a), Generala Bože Jankovića (b) and Cvijićeva 20-22 (c) (photos by S. Kondić)

Figure 3: Open spaces in residential developments: Cvijićeva 23 (photos by S. Kondić)

5. IMPROVEMENT MODELS

The results show significant degradation in green areas quantity and quality in central city residential areas. Following groups of factors that cause this phenomenon can be identified:

- factors related to urban planning documents,
- factors related to control mechanisms for the implementation.

Existing mechanisms for implementation of green areas are not stimulating for the investors. The investors don't have any benefits from the implementation of greenery, so they only tend to meet only minimal requirements. If the goal is to increase quantity and quality of green areas it is necessary to devise design and implementation models that would be stimulating for the investors. The interests of the investors must be recognized by all of the actors in the process of residential development as a primary driving force. This especially implies to city authorities that often have negative attitude towards the investor. The key is in finding compromise between the interest of the investor and public interest.

The first step in this process is deep and essential understanding of contemporary, profit driven and market based residential development. Considering that Republic of Serbia recently came out of socialist period, many actors of the process still have problems adapting to new circumstances. During the transition period, a number of investors appeared, who tried to misuse the fact that the construction was not regulated in order to maximize profit. They became synonym for the corruption and contributed to a great extent to negative attitude towards the investors. Although situation is changed this negative attitude is something that does not change according to the changed circumstances.

Urban planners should develop viable models for motivating investors to implement greenery in residential areas. Unlike city authorities that often confront the investors, urban planners often realize basic fact that without the investors residential development would not exist. It can be assumed that is the reason why required percentage of greenery in urban planning documents is reduced to 10%. But this approach compromises public interest and degrades the amount and quality of green spaces, thus degrading the quality of life in residential areas.

In February 2018 GRP of City Municipality Medijana had been changed and revised. In this process general public could make suggestions and remarks to draft version of the plan. Group of architects, led by representatives of Faculty of Civil Engineering and Architecture in Niš and regional board of architects of Serbian Chamber of Engineers formulated following suggestion: “Forming green roofs, vertical greenery (that can be calculated in 2:1 ratio in the percentage) or trees (that can be calculated in ratio 1 tree of minimum 4m treetop equals 10% of greenery on the ground) in order to meet required minimal percentage of greenery”. Although it lacks clear methodology that led to proposed parameters, and even logical explanation for tree parameter of one tree equals 10% of greenery on the ground regardless of lot size, this initiative was positive attempt to make some improvement in urban planning regarding green areas. Urban planner and city Committee for urban planning partially accepted this suggestion. They accepted that it is possible to implement other types of greenery on the plot, but it would not be included into minimal 10% greenery percentage. Since this was already possible partial acceptance of the remark was false and had no effect. This formulation would not motivate the investors to implement greenery in other forms than minimal 10% on the ground, so there was no improvement. This is indicative, as it shows the scope of the lack of understanding of the essence of the problem by these important actors of this process.

It is necessary to develop a model that would increase the amount of greenery, but would also take into account the interests of the investors and motivate them to implement more green areas into residential developments. This could be achieved by introducing new parameter into urban planning legislative that would define greenery in a better and more comprehensive way. This parameter could be defined as greenery index, and would take into account all of the greenery on the building plot. Existing minimal greenery percentage acknowledges only green areas on the ground, covered in grass. Trees and high density greenery like bushes are totally neglected.

In order to improve the quality and quantity of greenery in urban residential areas, and thus the quality of residents’ life, this greenery index should increase the required amount of greenery on building lots. But, on the other hand, it should not compromise economic interests of the investors and should include some stimulating effects for them. This index should include all of the forms of greenery on the lot. This includes green areas on the ground level (lawns), trees, green roofs, green facades, fixed planters and other forms. Greenery index could be calculated by following formula:

$$I_g = I_{gl} + I_{tr} + I_{gr} + I_{fp} + I_{gf} + I_{og}$$

I_g – greenery index, I_{gl} – ground level greenery index (greenery in direct contact with the ground), I_{tr} – trees index, I_{gr} – green roofs index, I_{gf} – green facades index, I_{fp} – fixed planters greenery index, I_{og} – other greenery index.

Individual indexes calculation models should be a topic of further research of landscape architects. They should be very well formulated simple calculations, easily applicable in the process of urban and architectural design. Some of the indexes in this formula could have their own minimal value, for other reasons, e.g. ground level greenery index of minimal 0.1 (or existing 10%) for the reason of ensuring sufficient level of rainwater infiltration to the ground, since rainwater sewage network in Niš does not have sufficient capacity to accept total amount of rain water. Total greenery index, including all of the greenery forms, could be increased, e.g. to 0.2, 0.4 or some other larger value. It is questionable if this index should be dependent on housing density, since other forms of greenery than ground level green areas would be included in its calculation. This could stimulate investors to build these other forms of greenery, and would improve the quality of life in the cities.

The importance of all of the forms of greenery in urban tissue is recognized by many authors (Gupta, Kumar, Pathan & Sharma, 2012) but they are not recognized by urban planning documents and planning and construction legislative in the Republic of Serbia. It is necessary to change that fact, possibly by changing the model for calculation of greenery on the plot and introducing greenery index.

Figure 4 shows theoretical model of implementation of greenery on the plot. The amount of greenery on Fig. 4a is shown in accordance with the current requirement of 10% of greenery on the ground. Percentage of greenery in the model shown in Fig. 4b tends to zero, but this model is reach in other forms of greenery, not recognized by current legislative. It would have much larger greenery index than 0.1 (index of the first model) although percentage of greenery (defined in current legislative) is much lower and tends to zero. The effects are obvious, as well as the fact that second model of calculation of the amount of on-plot greenery much better corresponds to reality.

(a) (b)

Figure 4: Comparison of two greenery implementation models – 10% greenery on the ground (a) and under 1% greenery on the ground combined with trees and other forms of greenery (b) (model and render by V. Nikolić)

Of course there are other potential stimulating models like subsidies for the construction of green roofs or green facades, for example. Positive effects of greenery to microclimate, retention of rainwater, thermal insulation etc. justify application of these measures.

Factors related to control mechanisms for the implementation of greenery are not within the scope of this research. It is obvious that many projects that have minimal 10% of greenery in the design phase do not have green areas in realized complexes. This is the problem of supervision, technical acceptance of the building and use permit, and corruption and lack of professionalism of participants in this phase of the project. This problem cannot be solved in urban planning and design phase and should be resolved by competent authorities that would enforce stricter control mechanisms.

6. CONCLUSIONS

The important role of greenery in urban residential area is well known and recognized by many authors. But the results of the analysis show significant degradation of greenery in urban areas in the Republic of Serbia, both quantitative and qualitative. The reasons for that can be identified in control mechanisms for implementation, but also in current legislative and urban planning documents. Required amount of greenery is defined through percentage of greenery that is often reduced to minimal 10%.

There are often contradictory requirements that need to be met and harmonized. On one hand, there are the interests of investors that need to be satisfied in order to enable residential development, and on the other, the public interest - the higher quality of this development and its positive impact on the environment. Required min. 10% can be observed as an attempt of compromise, leaving enough space for other necessary content on the plot, but providing some greenery to improve the environment. But this parameter takes into account only greenery on the ground, while other types of greenery are neglected. It also disregards type and quality of greenery on the ground. Since they do not have any benefits from it, the investors are not interested

in implementing other types of greenery on the plot that could drastically improve the environment and ambience quality.

A key factor for improvement could be introducing new methodology for calculation and implementation of greenery in urban planning documents that would take into account all of the greenery on the plot and increase required amount of greenery (thus quality of ambience) without compromising the interests of the investors. Greenery index that would include green roofs, facades, fixed planters, trees and all other forms of greenery, combined with improved control mechanisms for the implementation of greenery, could drastically improve quality and quantity of green areas in urban residential areas, and thus the quality of life in cities.

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REFERENCES

1. De Vries, S., Verheij, R. A., Groenewegen, P. P., & Spreeuwenberg, P., 2003. Natural environments – Healthy environments? An exploratory analysis of the relationship between green space and health. *Environment and Planning* A, 35(10), pp 1717–1731.

2. E. Bowler, D., Buyung-Ali, L., M. Knight, T., S. Pullin, A, 2010. Urban greening to cool towns and cities: A systematic review of the empirical evidence. *Landscape and Urban Planning,* 97, pp 147–155

3. Grahn, P., Stigsdotter, U. K., 2010. The relation between perceived sensory dimensions of urban green space and stress restoration. *Landscape and Urban Planning*, 94, pp 264–275.

4. General Urban Plan of Niš 2010-2025

5. Gupta, K., Kumar, P., Pathan S.K., Sharma K.P., 2012. Urban Neighbourhood Green Index – A measure of green spaces in urban areas. *Landscape and Urban Planning,* 105, pp. 325-335

6. Haughton, G., Hunter, C., 1994. Sustainable cities. London: JKP.

7. Hough, M., 1984. City form and natural processes. London: Croom Helm.

8. Korpela, K., Hartig, T., 1996. Restorative qualities of favourite places. *Journal of Environmental Psychology*, 16, pp 221–233.

9. M E van Dillen, S., de Vries, S., P Groenenwegen, P., Spreeuwenberg, P., 2011. Greenspace in urban neighbourhoods and residents' health: adding quality to quantity. *Journal of Epidemiology and Community Health,* 66:e8, pp 1-5

10. Takano, T., Nakamura, K., & Watanabe, M. 2002. Urban residential environments and senior citizens' longevity in megacity areas: The importance of walkable green spaces. *Journal of Epidemiology & Community Health*, 56, pp 913–918.

11. Vasilevska, Lj., 2012. Towards more user-friendly public open space in low-rise high density housing areas. 1st International conference on architecture & urban design proceedings, Tirana: EPOKA University, Department of Architecture, Albania. pp. 855–865

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VARIABLE SCALES OF ARCHITECTURE – FROM OBJECT TO THE TERRITORY: NOTES FOR THE MANIFEST

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ABSTRACT

For the future development of the cities in the light of climate change it is necessary to have clear guidelines (some kind of manifest) that would include principles of resilience on different scales. These principles must vary in size, from micro to macro scale. In order to achieve the resilience of the city in its various scales (micro and macro), it is necessary to provide the possible approaches for the operation within the variable scales of architecture – from micro to macro scale, from object to the territory. This is precisely in accordance with the aim of this research paper – to give Notes for the future manifest for the formation of these principles. The manifesto is viewed differently from the strategy – it should serve like a guideline, but not the instruction. Therefore, the principles that maintain openness, flexibility, and capacity for adapting to different conditions (which is one of the basic characteristics of resilience) are examined. For purpose of this research, the territory of Belgrade was selected as an experimental field of activity, or even more precise, zones of dominant naturalness, such are Zvezdara Forest, Košutnjak and/or Park Ušće.

Keywords: micro and macro scale of architecture; city and nature; resilience; sustainability.

1. INTRODUCTION

The dynamic context in which contemporary architecture develops is manifested through the divergence of all aspects of a contemporary society, such are impermanent social and economic conditions, globalization, rapid technological development, diversity of cultural discourse and, one of the most important, negative effects of climate changes. As a result of growing environmental problems, the fact is that both architectural and urban design practices actualize topics of resilience and sustainability. The concept of resilience has been used as a conceptual framework in multiple disciplines to evaluate the ability or capacity of a person, object, entity, or system to persist in the face of disruptions or difficulty. In the context of architecture, it refers to a diverse range of different mechanisms to manage risks and vulnerabilities, to disaster and disruption of normal life (Fannon, Laboy, 2016). Continuous need for adaptation, is one of the effects of the aforementioned processes indicated by this research. As a result, contemporary cities should aim to gradually increase capacities for changes in order to give answers to the future demands (Maas, 2007).

In these circumstances when the design is produced in the disappearing natural landscape within urban environment, seeking for a new architectural paradigm represents a particular challenge (Nikezić, Janković, 2014). Besides that, potential energy collapse and current awareness of renewable energy sources initialize the new architecture transformation and create the conditions for setting up a new global ideological platform of sustainability, which includes a wide range of ideas, program goals and attitudes that affect the current trends within the scientific and practical architectural work (Parežanin, Pantović, 2012). Architectural interventions on micro scale, such temporary structures can be, allow isolation and research specific questions, setting hypotheses and testing them, as well as defining results which can be transposed into projects of permanent architecture (Parežanin, Pantović, Kavran, 2013). In that context, over the past few decades, various concepts

of sustainable development are being imposed as a global approach to the development and adjustment to alterations.

In order to propose some of the concepts of sustainable development goals of this research relate to the formation of certain recommendations/principles – notes for the future manifest with the aim of increasing the resilience of cities. These recommendations will be examined through the application of different dynamic and adaptable principles in selected projects, both at the micro and macro level.

In this context, the method of the case study is used as the specific research methodology. The selected locations (Zvezdara Forest, Košutnjak and/or Park Ušće) are specific locations in Belgrade with dominant natural environment, and therefore, they represent very interesting polygons for experiments. Since these locations are not linked, it is also interesting to analyse them on macro level, because, of their potential of linking into unique macro system.

2. VARIABLE SCALES OF ARCHITECTURE IN THE CONTEXT OF SUSTAINABILITY AND TRANSFORMATION PRINCIPLES

Evolvement of dynamic and transformable concepts in architectural discourse was initially introduced in manifesto, ideology, and works of avant-garde groups which designed in the early years of the 20th century. If we further analyse the conceptual framework defined by transformation, regarding relevance and the amount of use, we can highlight the following dynamic principles: mobility, ephemerality, modularity, prefabrication, perceptive transformation, universality, open plan, interaction, and improvisation (Pantović, 2016). The listed classification of transformation principles should serve as an indicator for further examination and analysis of the specific application of these principles in the context of micro and macro scale.

Design in the context of sustainability, including all levels of interventions (micro and macro), means respecting certain economic, social and environmental principles. In order to adapt, architecture needs certain design mechanisms which are defined through the idea of a change as a continuous process, or more specifically through idea of metamorphosis of the existing. That enables transformation principles to be considered as a complex mechanism, i.e. methodological apparatus which simultaneously advocates different dynamic principles that carry the potential of change.

The impact of any architectural gesture, reluctant to its size, in the context of resilience, sustainability and climate change, varies, and must be observed both on micro and macro level. Because of this, the range of architectural activities ranges from small-scale projects (art installations, assembly platforms, pavilions, temporary housing) to territorial involvement and large urban interventions. Architecture as a discipline longs for adaptation which is demonstrated through the development of different flexible strategies, and transformation principles, simultaneously on micro and macro scale.

3. EXPERIMENTAL FIELD

The aim of this research is the development of principles for the adaptation to various aspects of climate change. In this context, Belgrade stands out as a testing ground and polygon, for specific possibility of experimenting at micro and macro levels. Also, the focus will be on researching unbuilt, and nonurban zones in the city, or to be more precise, zones with dominant naturalness. The main locations, for interventions and research will be Košutnjak, Zvezdara and park Ušće, mainly because of above mentioned characteristics.

Through questioning ways in which architect can direct development of sustainable natural environment as an integral part of life and how both, nature and architecture can be used to their full potential without being detrimental or destructive to each other, research starts from the fact that natural landscape can become a resource of contemporary life in the city where leisure demands new sanctuaries over and over again. Nature with its complex phenomena can become an inspiring part of the architectural discourse. During each architectural intervention in the natural landscape, it is necessary to reconsider the position, scope, program, and its measure in the context of contemporary city life, which will inevitably be viewed from the ratio of materiality of both, architecture and landscape. In that sense, nature does not stop at the physical, but also affects the process of urban living, through intersecting and intertwining architecture and nature, making a new "cultural landscape" (Djokic, Nikezic, Jankovic, 2014).

It is important to emphasize that experimenting on micro and macro scale will create very specific relation between nature and urban environment. It will not be a form of new urbanism, but a network of open spaces at macro scale, which are activated and intensified by carefully designed micro interventions at particular

places. The network will be coherent and multifunctional, based on existing morphology, local context, and landscape qualities. One of main ideas behind these interventions, is also to play and experiment with transitions between urban context and natural landscape.

3.1. Micro scale example

CULTURE/NATURE PIT STOPS: case study Belgrade (Zvezdara, Košutnjak, Ušće)

The contemporary way of living means satisfying of the usually "contradictory" needs and styles of life – such as being in nature and "consuming" culture. Belgrade lacks both cultural spaces and attractive open public spaces (especially those with dominantly natural characteristics). The proposed design principles aim at "reconcile" these different "styles" of life by making their interaction through overlapping, what will be used as a methodological framework for the small scale spatial interventions. Architecture as a discipline incorporates technological, artistic, but also humanistic aspects of intervention enables changes in the structure and way of functioning of the urban environment. In this regard, design principles for the micro scale interventions propose small scale spatial interventions at specially selected locations in order to improve the overall cultural scene of the city. The main aim of these interventions:

1. UPRISING OF THE CULTURAL SCENE
2. ENVIRONMENTAL IMPROVEMENT OF THE SELECTED LOCATIONS
3. INCREASING ATTRACTIVNESS OF THE OPEN SPACES WITH NATURE IN THE CITY / affecting the quality of life / wellbeing and gives opportunity for the holistic approach of the urban change intervention

Culture/nature pit stops formed as small scale urban change interventions increase the attractiveness of these locations for both local users and the wider environment (through the city) through the retention of passers-by. In this way, both cultural (through the new spatial interventions for the event), but also the sports-recreational scene of the city (through the improvement of the network of paths and places of retention) could be improved. The proposed sites were selected with the idea of reducing the usual dichotomy between nature and culture, more precisely in order to create a cultural landscape through punctual urban change interventions within the city structure. Through these interventions, the goal is to form pulsating spots (pit stops for re-charging both culture and nature) whose further networking would improve the overall structure of the city.

- OBJECTIVES: Culture/nature pit stops are small scale interventions (transformable / temporary pavilions, scenery, events) that enable cultural, artistic or educational events in nature (in the city). Main key objectives are:

1. Improving the cultural map of the city by establishing new "pulsating stops" for the culture
2. Programmatic improvement of the space of dominant naturalness through the introduction of cultural content
3. Increasing the attractiveness of different trajectories in Belgrade through their program improvement

- IMPACT:

Level: Urban space. One of main impacts that we are trying to achieve is to reduce dichotomy between culture and staying in nature. The urban space reconnects with nature in a specific way, in order to improve quality of life. Also, one of specific impacts is increasing the attractiveness of certain places in the city, and their activation.

Level: Natural environment. Putting the place of naturalness on the cultural scene of the city.

Level: Community and other actors involvement. The flexibility in approach brings the possibility of constant change according to specific need of different users. At the same time, the realization of project has a great impact Improving the process of architectural education. The participation of different actors impacts the development of different program scenarios and creates a participatory framework for a city in which design and planning tools can be utilized to improve cultural scene, ecological vitality, and economical sustainability.

- SUSTAINABILITY:

If interventions stay at some of the location, it becomes place of identity and gathering for the local community. It is possible to relocate intervention, it is transformable and movable.

This kind of small scale urban change interventions with specific program may serve as social activators for future cross sector cooperation and collaboration with local communities and different associations. We will use the model of participatory and collaborative local urban development to stimulate the dialogue among competent local decision-makers and stakeholders on the state of Belgrade's public spaces, but also on the reform of current local urban development procedures. Also, the intervention beside environmental awareness will be based on ecological awareness by using local and recyclable materials which brings special quality to the interventions.

3.2. Macro scale example

CULTURE/NATURE TOUR: case study Belgrade (Zvezdara, Košutnjak, Ušće)

In order to link culture/nature pit stops, the aim is to create a permeable and coherent tissue which is based on two main interventions: the integration of a different cultural stops and generation of a park with different and multifunctional scenarios of use. The intervention is used to create a network which integrates culture and nature, and transforms park into specific open public space. The system of transversal corridors for pedestrians and cyclists operates on micro and macro levels. On territorial (macro) level, the aim is to create a connection and at the same time it attracts people to the several landscape territories. The main aim of macro scale interventions:

1. CREATING A COHERENT NETWORK OF CULTURAL CONTENTS
2. LARGE SCALE ACTIVATION OF THE SELECTED LOCATIONS
3. QUESTIONING TRANSITION FROM URBAN TO NATURE

- OBJECTIVES:

CULTURE/NATURE TOUR

Culture/nature tour are large scale interventions (transformable / cycling and hiking trails, skate parks) that enable cultural, artistic or educational events in nature (in the city). Main key objectives are:

1. Improving the cultural map of the city by establishing new cultural networks
2. Programmatic improvement of the space of dominant nature through global integration of cultural contents

- IMPACT:

These kind of interventions generates a network, which is activating a whole territory, with wide range of cultural activities.

- SUSTAINABILITY:

Only after a holistic and systematic approach that covers the whole territory we can talk about improving the overall quality and sustainable aspect of cities development in the light of climate change.

4. THE POTENTIALS OF ARCHITECTURAL INTERVENTIONS – EXPERIENCES AND NOTES FOR THE FUTURE

It is a contemporary belief that the scope of architecture is not a neutral and isolated area, but rather an integrated part of a wider social reality. The idea of "real" architecture is no longer based on buildings that are spectacular, non-contextual and non-sensitive to their surroundings, but is directed towards those buildings that protect the environment from and for the people. Peter Eisenman believes that the role of architecture is not to address social, economic and environmental problems, but to improve its own discourse and paradigms (Locke, 2004). He believes that causes of environmental problems, as well actions taken to mitigate and resolve them, should be sought primarily within the fields of economics, sociology and politics. The route Eisenman has for these claims is that architecture deals with regulating and designing spaces, not society, and that it is a footprint of a culture in physical space, the materialization of all general and specific social values, problems and conflicts. By wondering what sustainability means in the architectural arena, Soria-Lopez (2006) argues that really sustainable and simply good architecture must satisfy simultaneously all dimensions: logical (scientific, technical, functional), ethical (security, low impact, protection, good use) and aesthetic (beauty, meaning, emotion). In that way sustainability becomes a means to achieving better quality of life for the society as a whole, not a goal in itself, just for architecture or nature. So, the role of the architect is to incorporate this dialogue into the project by listening-understanding-responding to the "voices of the natural

and cultural context" and interlock it with the experience of the users of the real place (Djokic, Nikezic, Jankovic, 2014).

The focus of this kind of architectural intention is not to incorporate landscape as a part of architectural creation, but to observe and translate landscape as an appropriate tool for thinking about architecture. The main principle behind this kind of approach is that architecture can be guided by people's experience of landscape (Djokic, Nikezic, Jankovic, 2013). Architects should incorporate the natural in a fundamental manner into their project in order to affect mind and body as a way to improve and intensify our relationship with nature, through architecture - an experience that might increase society's awareness and responsibility of the urgency to preserve and respect nature. We think that it is possible to balance landscape and architecture through responsibility, as a way of thinking as a part of the architectural concept. Through incorporating the new architectural paradigms as an integral approach toward vital and smart architecture it is possible to form a socially responsible place (Djokic, Nikezic, Jankovic, 2013).

5. CONCLUSION

The idea of these interventions on the different scales try to overcome the separation between people and nature by creating a new type of sublime experience, where values of new humanism are translated to the everyday life. These principles deal with distance between post-modern ideas of sustainability presented by political or educational institutions and the everyday sublime by revealing dynamic natural cycles and intersecting social routines. The main aim is to create hyper nature as a combination of the art and science and juxtapose man and nature in order to form experience, connection or emotion between people and the surroundings which leads to empathy and care for the environment (Jankovic, 2012 in Nikezic, Jankovic, 2013).

And for the final conclusion – for the resilient development of cities, it is necessary to take into account dynamic architectural principles, which can apply both to the micro and macro level in order to adapt to a constant change. In order to form notes for the manifest, we examined the extreme situations from micro, to macro, and from them we tried to emphasise some universal principles considering sustainability:

Considering the micro scale interventions their biggest potential considering sustainability would be in their active role in raising awareness of the environmental and ecological issues through their active use by the society based on its program development, while the macro scale interventions through their careful choice of the spatial and program aspects leads towards systematic approach for the future development of the resilient cities.

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REFERENCES

1. Djokic, V., Nikezic, A., Jankovic, N., 2013. Learning from the Landscape: Toward Socially Responsible Architectural Education. Proceedings of 2013 International Conference on the Modern Development of Humanities and Social Science (MDHSS2013), Hong Kong: Hong Kong Applied Science and Technology Research Institute, pp. 166–170.
2. Djokic, V., Nikezic, A., Jankovic, N., 2014. Socially Responsible Architect – Toward Creating Place. Proceedings of International Conference on Social Science and Management (ICSSM2014), (Ed. Narayanasamy, S.), USA, Lancaster: DEStech Publications, Inc, pp. 169–176.
3. Fannon, D. and Laboy, M., 2016. Resilience Theory and Praxis: a Critical Framework for Architecture. *The* ARCC Journal: ENQUIRY, 13(1), pp. 39-53.
4. Lopez, F.J. S., 2006. Architecture and Nature at the end of the 20th Century: Towards a Dialogical Approach for Sustainable Design in Architecture, in Eco-Architecture – Harmonization Between Architecture and Nature (Eds. G. Broadbent, C.A. Brebbia). WIT Press, Southampton, pp. 23-33.
5. Locke, R., 2004. Peter Eisenman: Liberal Views Have Never Built Anything of any Value.,

http://archinect.com/features/article/4618/peter-eisenman-liberal-views-have-never-built-anything-of-any-value. [Accessed: 21st October 2018]

6. Maas, W., 2007. Five Minutes City. Architecture and (Im)mobility Forum & Workshop Rotterdam. Ram Distribution, Rotterdam, Netherland
7. Nikezic, A., Janković, N., 2013. (Re)creating Urban Landscape: New Belgrade Riverfront. Proceedings of 2nd International Scientific Conference Regional Development, Spatial Planning and Strategic Governance Conference Proceedings. (Eds. Vujošević M., S. Milijić). Belgrade: Institute of Architecture and Urban & Spatial Planning of Serbia, pp. 1070–1081.
8. Nikezic, A., Jankovic, N.,2014. Seeking A New Architectural Paradigm. International Journal of Design & Nature and Ecodynamics, 9/1, 47–56 (ISSN 1755-7445)
9. Pantović, K., Parežanin, V., 2012. Nova ideološka paradigma-energetski odgovorna arhitektura. Proceeding of Planning, design, construction and building renewal, iNDis 2012, (Eds. Radonjanin, V., Folić, R. And Lađinović, Đ.). Novi Sad: Faculty of Technical Sciences, Department of Civil Engineering and Geodesy pp. 398-404.
10. Pantović, K.; Kavran. J.,2016. Uloga principa transformacije u arhitektonskom projektovanju. in Prostorni, ekološki, energetski i društveni aspekti razvoja naselja i klimatske promene; (Eds. Pucar, M.; Nenković-Riznić, M.) Institut za arhitekturu i urbanizam Srbije (IAUS): Belgrade, Serbia, pp. 33-46.
11. Pantović, K., 2016. Uloga principa transformacije u razvoju projektantskih modela u arhitektonskom projektovanju. Ph.D. Thesis, University of Belgrade, Belgrade, Serbia

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THE DESIGN OF SCHOOL GROUNDS GREENERY: INTERNAL AND EXTERNAL INFLUENCING FACTORS

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ABSTRACT

Modern principles of urban planning of school grounds completely exceed the former needs of constructing the school building itself. The current role of the elementary school aims to implement innovative educational activities in the school building but also to apply certain functions in the open space of the school grounds.

The paper discusses possible application forms of greenery in the process of planning and organization of the school grounds. Special attention has been paid to the importance of linking the pedagogical process with the natural environment, and emphasized the importance of functional and ambient quality not only within the school grounds, but also wider, at the level of the corresponding segment of the urban environment.

By analyzing external and internal influencing factors as key elements for the integration of green spaces in school grounds, the key guidelines for urban planning and the organization of school grounds are defined based on a complex of favorable natural predispositions and the possibilities of optimal organization of school buildings and associated open spaces.

Keywords: *school grounds; urban planning; greenery; space*

1. INTRODUCTION

School buildings and their position in the urban environment are an important segment of urbanization of the modern society. The organization of school facilities in the urban design of a city is an inseparable part of urban planning and one of the basic preconditions of their adequate architectural organization. Based on the fact that they are classified as the primary part of “urban equipment”, the central position is taken by objects for elementary education - elementary schools. The importance of urban planning of elementary schools is particularly seen in the fact that elementary schools are built in greater amount than other types of schools. Also, in addition to the pedagogical role they have, elementary schools in a wider spatial and aesthetic sense represent one of the main landmarks in the local urban-architectural environment. The complex role of elementary schools presupposes an interdisciplinary approach in the process of studying the conceptual basis

of urban planning, the possibilities of their placement, as well as the specificity of providing optimal conditions and connections in the structure of the school grounds and the immediate environment. In particular, the role and importance of greenery and natural attractiveness are emphasized in the aspect of connecting the pedagogical process with the natural environment. (Jansson and Mårtensson, 2012)

Introduction to the analysis of natural factors of urban spaces is also a way in which, in the framework of existing ecological trends, their essential characteristics will be degraded to a minimum. Natural conditions (Thaiutsa et al., 2008), rapid urbanization, landscape history (Kabisch and Haase, 2013; Zhou and Wang, 2011), and the evolution of planning ideas regarding the role of green space (Tudor et al., 2013; Wolch et al., 2014) are important drivers to be considered. (Iojă et al., 2014) Especially if we take into account the functions of the school and the corresponding functions in the open space, respecting natural factors will be one of the indicators of the quality of the school grounds as well as the quality of the created conditions in the given urban environment. Few previous studies have applied child perspective on urban green spaces with focus on their management. It has been found that the management of school grounds is important for children's play and learning (Malone and Tranter, 2003) and that managers need more insight into the perspectives of children and young people in their use of green spaces (Bell et al., 2003). (Jansson, Sundevall and Wales, 2016) School grounds are the most accessible outdoor environments for many children and grounds development is an effective strategy for promoting healthy practices in schools and everyday habits in children (Van Sluijs, McMinn and Griffin, 2007; Jansson and Mårtensson, 2012).

The aim of this paper is to define the key guidelines for urban planning and the organization of school grounds based on the whole complex of favorable natural predispositions and the possibility of optimal organization of the school building and the associated open spaces.

2. RESEARCH FRAMEWORK

Site conditions include factors which are necessary to analyze, in accordance with the basic criteria of the educational process, the advantages and limitations of individual models of planning and architectural organization of the school building and school grounds.

In addition to program requirements, the specifics of planning and organization of school grounds are mainly of a contextual character. They particularly emphasize the effects of natural factors, as well as the conditionality of the existing physical structure. By analyzing the natural characteristics of a site, a group of significant factors is formed that can influence the way of functional and spatial structuring.

The framework of this research is limited to identifying possible application forms of greenery in the process of planning and organization of the school grounds. In addition, the assumption is that the concept of greenery in school grounds has an extrovert character. It emphasizes the importance of linking the pedagogical process with the natural environment on one side, while on the other hand it underlines the functional and ambient qualities not only within the school grounds, but also at the level of the corresponding segment of the urban environment. In this regard, external and internal influencing factors are considered as key elements for the integration of green spaces in school grounds.

3. EXTERNAL INFLUENCING FACTORS

The planning and urban organization of elementary schools in the narrower sense can be seen from the aspect of their relationship with the immediate environment. Although the potential position of the elementary school building on the site is relatively central, very often surrounded by the widely developed belt of open spaces, it is necessary to bear in mind its relationship with an environment that, to a greater or lesser extent, can affect the overall urban functionality as well as the spatial disposition of certain functions.

Elementary schools are planned, first and foremost, with the housing groups, centrally or peripherally in the block of residential areas, accepting the direction from which school children predominantly come. The spatial organization of residential units uses positive theoretical principles on the function of housing: an open block building system and placement of objects in the green areas of the block space, segregation of pedestrian and motor traffic, and the hierarchical concept of a network of traffic. In doing so, special attention is paid to the traffic treatment of elementary schools and kindergartens as the accompanying functional elements of housing, as well as their most favorable location, for all residents of housing units.

External influential factors, or immediate environment factors, represent one of more important indicators not only when selecting a location, but also during the planning and organization of content at the selected location. The influence of the immediate environment relates, in the first place, to the position of the school grounds and the construction of a school building, as well as the organization of accompanying functions

in the open space of the school grounds, in relation to the surrounding traffic, adjacent structures and areas of greenery and recreation.

In recent urban projects, increasing importance is given to the clear separation of pedestrian traffic from the motorway, the introduction of a special network of pedestrian streets, which do not cross the flow of motor traffic. Based on the ideas of the linear city, Le Corbusier gives its proposal for a residential zone plan, simple geometric forms, with clearly differentiated traffic. In the central part of the housing block there is a school and a kindergarten, while the rest of the free areas are in greenery. (Bogdanović, 1990) It is possible to create a system of pedestrian movement in a green space, protected from traffic and noise, by reducing the public transport in the internal areas of residential blocks.

In this way, it is possible to create safe, optimal and comfortable pedestrian movements of school children, through green areas that can be occupied with a variety of urban mobility, attractive and educational objects. In the endeavors of the complete separation of pedestrian movement and the network of motor traffic, it is striving for those solutions in which the school grounds only tangentially accepts the provision of motor roads, while the other connections with the school building and the school grounds are realized by pedestrian corridors. In general, it is necessary, to the optimum extent, to withdraw the school building from the surrounding streets (Auf-Franić, 2004), and plan the formation of a high-green protective zone.

One of the basic tasks of planning elementary schools in the urban environment is to provide space in a peaceful area (Anđelković, 1995), in places surrounded by greenery, so that industry and traffic, potential sources of noise do not create disturbances to teaching and extracurricular activities in the school grounds. In accordance with the general definitions of urbanism, the need for an adequate integration of housing with other functions, according to a certain hierarchy of importance of connections, elementary schools as a complementary function of housing, will be in functional connection with urban planning organization of work zones and areas of recreation and greenery.

The high compositional value of the idea of the proposed scheme (Figure 1) is in the widely developed green and recreational areas, which relies directly on the school grounds, with the elementary school within that zone, according to which the housing groups are equally gravitating.

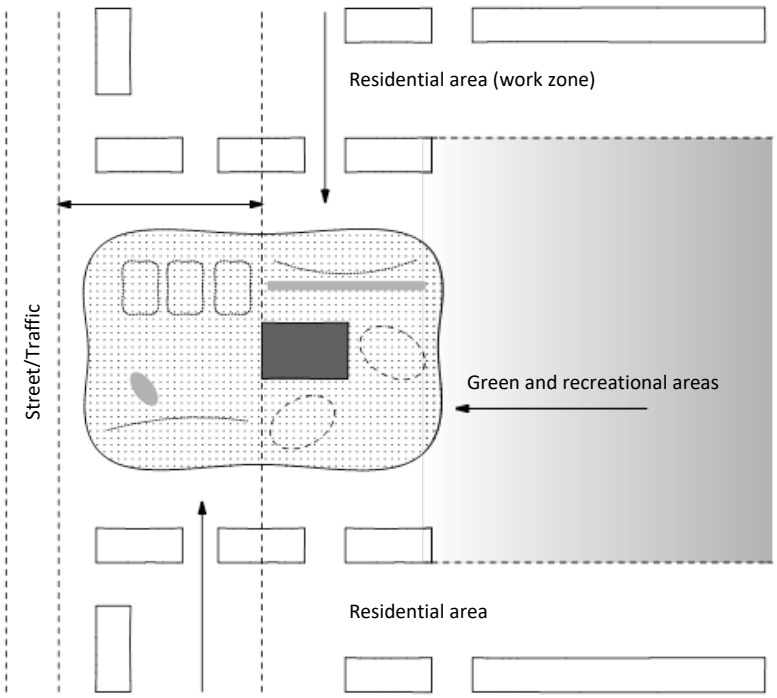

Figure 1: Elementary school, school grounds and immediate environment - residential areas (work zone), green and recreational areas, street/traffic (Author's drawing)

The system of green and recreational areas, its role and significance for the life of the city, is closely connected with the organization of urban systems, and is a significant factor for the planning of school grounds within and outside residential zones. Connecting the natural and created environment is one of the basic prerequisites for sustainable urban development and design. (Bajić-Brković, 2009).

Modern principles of organization of urban systems point to the importance of the appropriate connection of residential areas with centers with special facilities and functions that serve a greater number of inhabitants (green area, recreation, rest ...). Especially in the field of education, with adequate content and with a successful urban and architectural design, such centers significantly complement life in the residential unit, and at the same time, they are an important link in addition to the higher order centers.

In addition to the internal areas of greenery and recreation, in the school grounds itself, it is very convenient if the elementary schools are located near the city park (Figure 2) or sports fields. By organizing school grounds around larger green areas, parks and recreational facilities, positive principles of modern urban planning are used in terms of achieving the most favorable microclimate conditions for schools and playgrounds, and maximizing the use of city free spaces.

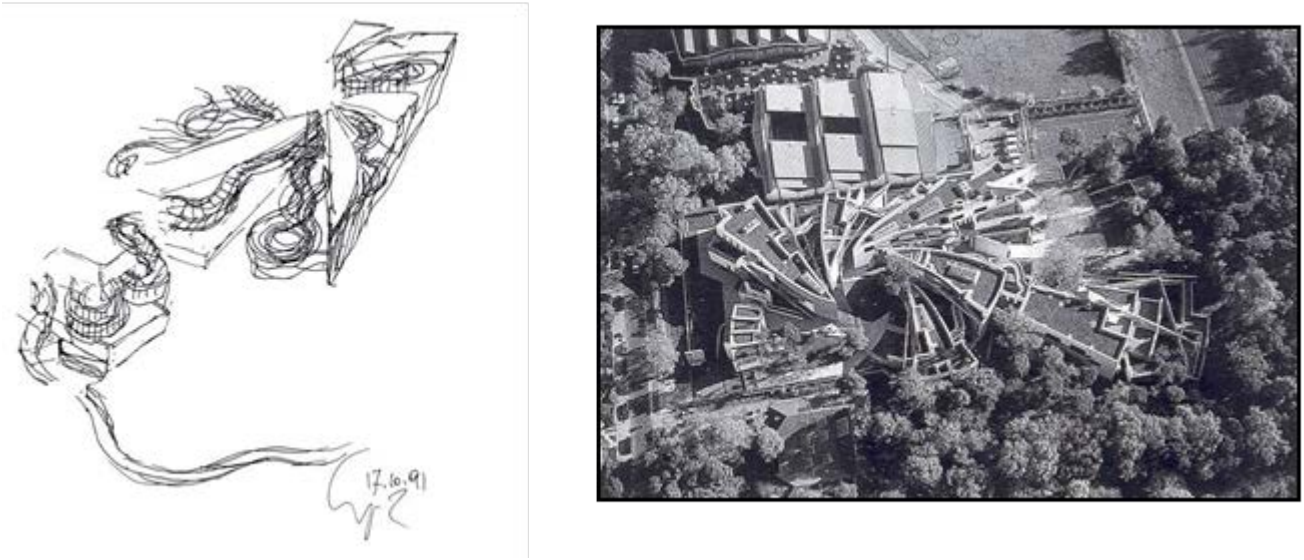

Figure 2: Planimetry of the school grounds - close connection with the green areas
Heinz Galinski School, Berlin, Germany, 1995. Zvi Hecker (Dudek, 2008)

By implementing the principles of greenery connectivity through the system of greenery continuity within the framework of school grounds and residential zones, protective greenery between working and traffic zones and greenery in large recreational zones and other macrourban elements of the city, the conditions for a sustainable urban organization are ensured.

4. INTERNAL INFLUENCING FACTORS

The specificity of the elementary school and the diversity of its functions require that the level of urban planning of elementary schools be rounded up by the spatial concept of the site itself. This type of spatial organization implies clear separation of different school functions, as well as their harmonious connection in the form of a unique structure of the school grounds. The ambient value of school grounds at the level of microlocation, gravitating areas of housing units and other primary urban functions are the starting indicators in estimating their use value.

With the appropriate setting and the formation of a school building, the organization of complementary and supporting functions in the open space of the school grounds is of utmost importance. Thus, the internal influencing factors for design and the adequate integration of greenery in the school grounds are particularly important. A survey conducted in Danish schools found that outdoor school teachers mainly used school grounds and local green space for their outdoor teaching, and a majority of them used the same place or mostly the same place. (Bentsen, Schipperijn and Jensen, 2013)

The starting phase in solving the spatial structure of the school grounds represents the breakdown of its surface into individual parts, each of which will be predominantly intended for one function. This ensures that

objects and spaces, according to their basic purpose, are grouped and interconnected to form appropriate functional and spatial units. In addition to the school building as a primary resource, contemporary perceptions of the organization of the pedagogical process include more functional units for the stay and diverse activities of school children in the open space of the site. Key functional units that stand out are open classrooms, a schoolyard, sports grounds, a school garden, as well as other green areas. In addition to the basic functional value of these spaces, the role and importance of greenery and natural attractiveness are especially emphasized by the aspect of linking curriculum activities with the natural environment. The imaginative use of school grounds and their potential for curriculum activities is, for obvious reasons, rarely mentioned by overworked classroom teachers (Dudek, 2000).

The synergy of functional units in the open space and potential application forms of greenery should aim at achieving a high level of overall ambient values of the school grounds.

Open classrooms, as a rule, appear on the ground floor, in direct relation to the classrooms in the school building, so that the work of one class does not interfere with teaching in other areas. (Figure 3) The evident problem of visual and sound protection can be mitigated to a great extent by placing a high living fence or by placing partition panels. (Anđelković, 1995) Some authors point out the need for conceptualization of the outdoor classroom and school ground as sites of ecological, pedagogical and social transformation, in terms of pedagogical and learning theory. (Dyment and Reid, 2005)

The school yard, with its content and composition, is used for gathering, playing, relaxing and recreating pupils during the break. (Figure 4) Spacious and regular shape, the school yard is set up directly next to the main entrance with such a position that eventual student activities do not interfere with teaching in the school building. (Auf-Franić, 2004)

The playground space can also be organized in several places, which is desirable due to the difference in the age of the students, and at the same time avoiding the gathering of a large number of children in one place. One part of the yard should be paved, and the other part should be a park, with greened pergolas and deciduous trees that will provide sunscreen and protection.

Figure 3: Detail of the classroom in the open space
Elementary School in Vienna, 1997. Helmut Wimmer (DETAIL 3/2003)

Sports fields are designed for the teaching of physical education, and they are an integral part of the gym. It is desirable to provide a protective green areas around these surfaces.

The school garden is designed for the practical work of students. In terms of arrangement, it includes the following subcategories: vegetable garden, orchard, greenhouse garden and the zoo. It may be organized in a more isolated part of the school grounds, which is sunny and protected from the wind, usually on the east side of the school ground. School gardens provide experiences with nature and its processes that are now absent from the lives of many children (Dudek, 2008).

Figure 4: Amphitheatrical plateau within the school yard
Haute Vallée School, Jersey, Channel Islands, England, 2002. Architecture PLB (Curtis, 2003)

Elementary schools must provide students with a close touch with nature through widely developed areas of greenery, gardens and parks. The benefits of the presence and use of green school grounds are evident and complex for children. They generate positive effects on health by favoring moderate physical activity (Dyment et al., 2009) and improving „motor fitness“ (Fjørtoft, 2001, 2004) as a consequence of various play activities (Iojă et al., 2014). Depending on the size of the envisaged green areas, a variety of amenities can be designed in the form of park arrangements, seating and gathering, amphitheater in the nature, surface with water flows (Figure 5), swimming pools and similar.

Figure 5: School grounds - the presence of modest water surfaces more as an artistic motive
Kaiho Elementary School, Himi, Japan, 1996. Itsuko Hasegawa (Curtis, 2003)

The function and purpose of the content in the open space of the site confirm the necessity that in the process of their planning the same level of cautiousness as in the architectural design of the school building must be achieved. This is supported by the fact that the school facility can have a broader role in the environment in which the school is built and, if necessary, represent a significant spatial resource for the local community level.

5. CONCLUSION

The role of the natural environment is very important because it contributes to a qualitative continuity in the existing urban structure, while retaining the feature of a spatially harmonious whole, which, along with other urban constellations, enables their simple and comfortable use.

As the key elements for the integration of green areas in school grounds, external and internal influencing factors have been considered. Adequately evaluating and analyzing these influential factors can contribute to the level of ambient values being high not only within the school grounds that are the subject of research, but also within the overall urban environment.

In the process of urban planning and organization of the school grounds, the preliminary identification of potential locations should be determined based on the available natural predispositions of the urban environment (green areas, recreational zones, green areas in the residential zones, parks ...).

After the preliminary identification of the appropriate locations, the second stage includes additional comparative parameters and allows selection within the chosen potential locations. In addition to the comparative parameters relating to pupils (school capacity), radii of gravity and other parameters, it is especially important to consider the potential of the site from the aspect of size and shape on one side, and the possibilities of integrating greenery in the internal organization of the school grounds. This implies a previously defined synergy between the location program, or the functional units in the open space of the school grounds, and the potential application forms of the greenery.

The ambient value of so designed school grounds at the level of microlocation, gravitating areas of housing and other primary urban functions will be one of the starting indicators in assessing their usable value, but also an important segment of sustainable urban development.

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REFERENCES

1. Anđelković M., 1995. Školske zgrade. Građevinski fakultet u Nišu, Niš.
2. Auf-Franić, H., 2004. Osnovne škole. Golden marketing – Tehnička knjiga; Arhitektonski fakultet sveučilišta u Zagrebu, Zagreb.
3. Bajić-Brković, M., 2009. Does the creative economy provide a sustainable urban form?: Some European experiences. Arhitektura i urbanizam, (24-25), pp 47-60.
4. Bell, S., Ward Thompson, C., and Travlou, P., 2003. Contested views of freedom and control: children: teenagers and urban fringe woodlands in central Scotland. Urban For. Urban Green., 3, pp 87–100.
5. Bentsen, P., Schipperijn, J., and Jensen, F. S., 2013. Green space as classroom: Outdoor school teachers’ use, preferences and ecostrategies. Landscape Research, 38(5), pp 561-575.
6. Bogdanović, R., 1990. Urbanizam: urbane forme, urbanističko planiranje. Saobraćajni fakultet, Beograd.
7. Curtis E., 2003. School builders. John Wiley & Sons, Chichester, England.
8. DETAIL 3/2003 – Schulbau/Konzept
9. Dudek, M. (2000). Architecture of schools: The new learning environments. Architectural Press, Oxford.
10. Dudek, M., 2008. Schools and Kindergartens - A Design Manual. Birkhäuser Verlag AG, Basel.
11. Dyment, J. E., and Reid, A., 2005. Breaking new ground? Reflections on greening school grounds as sites of ecological, pedagogical and social transformation. Canadian Journal of Environmental Education, 10(1), pp 286-301.
12. Dyment, J.E., Bell, A.C., and Lucas, A.J., 2009. The relationship between school ground design and intensity of physical activity. Child. Geogr., 7, pp 261–276.
13. Fjørtoft, I., 2001. The natural environment as a playground for children: the impact of outdoor play activities in pre-primary school children. Early Child. Educ. J., 29, pp 111–117.

14. Fjørtoft, I., 2004. Landscape as playscape: the effects of natural environments on children's play and motor development. Child. Youth Environ., 14, pp 21–44.

15. Iojă, C. I., Grădinaru, S. R., Onose, D. A., Vânău, G. O., and Tudor, A. C., 2014. The potential of school green areas to improve urban green connectivity and multifunctionality. Urban forestry & urban greening, 13(4), pp 704-713.

16. Jansson, M., and Mårtensson, F., 2012. Green school grounds: a collaborative development and research project in Malmö, Sweden. Children Youth and Environments, 22(1), pp 260-269.

17. Jansson, M., Sundevall, E., and Wales, M. 2016. The role of green spaces and their management in a child-friendly urban village. Urban Forestry & Urban Greening, 18, pp 228-236.

18. Kabisch, N., and Haase, D., 2013. Green spaces of European cities revisited for 1990–2006. Landsc. Urban Plan., 110, pp 113–122.

19. Malone, K., and Tranter, P., 2003. Children's environmental learning and the use, design and management of schoolgrounds. Children Youth Environ. 13 (2), pp 87-137.

20. Thaiutsa, B., Puangchit, L., Kjelgren, R., Arunpraparut, W., 2008. Urban green space, street tree and heritage large tree assessment in Bangkok, Thailand. Urban For. Urban Green. 7, pp 219–229.

21. Tudor, C.A., Iojă, C.I., Hersperger, A.M., and Pătru-Stupariu, I., 2013. Is the residential landuse incompatible with cemeteries location? Assessing the attitudes of urbanresidents. Carpathian J. Earth Environ. Sci., 8, pp 153–162.

22. Wolch, J.R., Byrne, J., and Newell, J.P., 2014. Urban green space, public health, and environmental justice: the challenge of making cities 'just green enough'. Landsc. Urban Plan. 125, pp 234–244.

23. Zhou, X. and Wang, Y.-C., 2011. Spatial–temporal dynamics of urban green space inresponse to rapid urbanization and greening policies. Landsc. Urban Plan. 100, pp 268–277.

24. Van Sluijs, E. M., McMinn, A. M., and Griffin, S. J., 2007. Effectiveness of interventions to promote physical activity in children and adolescents: systematic review of controlled trials. British Medical Journal, 335(7622), p 703.

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