HafenCity Universität Hamburg

RESOURCE EFFICIENT PLANNING IN NIŠ, SERBIA:

New Housing Post-Socialism

RESOURCE EFFICIENCY IN ARCHITECTURE AND PLANNING MASTER'S PROGRAM
11TH GENERATION WINTER SEMESTER 2020/21

IMPRINT

Written and published by the 11th Generation of the REAP Master's Program

HafenCity Universität Hamburg

Publisher: HafenCity Universität Hamburg, Prof. Dr.-Ing. Wolfgang Dickhaut

Distributor: HafenCity Universität Hamburg, Prof. Dr.-Ing. Wolfgang Dickhaut, Umweltgerechte Stadt- und Infrastrukturplanung

Contact: Maya Donelson, Tim Fettback

E-mail: maya.donelson@hcu-hamburg.de, tim.fettback@hcu-hamburg.de

ISBN (print): 978-3-947972-27-2
ISBN (digital): 978-3-947972-28-9

Cover Design: Joaquín Guerra Ayala

Design and Layout: Matawee Li, Iva Stefani, Joaquín Guerra Ayala

References: María Jiménez Arreola

Revised by: Jacob Yanachek & Rajesh Kumar

Chief Editors: Jasmin Hiller & Tara Bahari

Publication coordinator: Raj Singh Bais

Print coordinator: Anica Bauer

ACKNOWLEDGEMENT

We would like to pay special regards to Prof. Dr. Ing. Ljiljana Vasilevska, Dipl. Ing. Arch. Jelena Dekić, Milica Igić, Magdalena Vasilevska, Mihailo Mitković and to recognize the invaluable assistance provided by the students from the University of Niš. We offer our sincere appreciation for their valuable help and to provide us with the opportunity of knowing the overall scene of the post-socialist development of Niš, Serbia.

We are deeply thankful to our instructors Maya Donelson and Tim Fettback for organizing this challenging project, as well as their vital guide to find the most suitable solutions for the current scenario of the city of Niš. We would furthermore like to thank our tutor Jon Young for his insights and thoughtful collaboration. The present work is the result of a joint effort that could not have been possible without the sponsoring of DAAD and the coordination from HafenCity University, to whom we express our gratitude.

Finally, a huge thanks to our fellow classmates from REAP 11th Generation, for their patience and positive attitude towards the whole semester, their companionship, and their creative work shaped what this final project is, and represents the collaboration of many research hours and constructive comments from all of us. We appreciate our time together hoping the best for each one of us and expect we can all meet again one day, with luck in Niš.

DAAD
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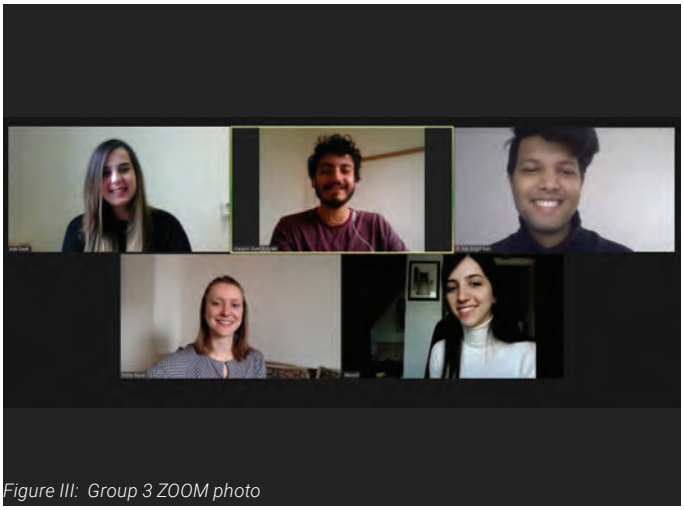

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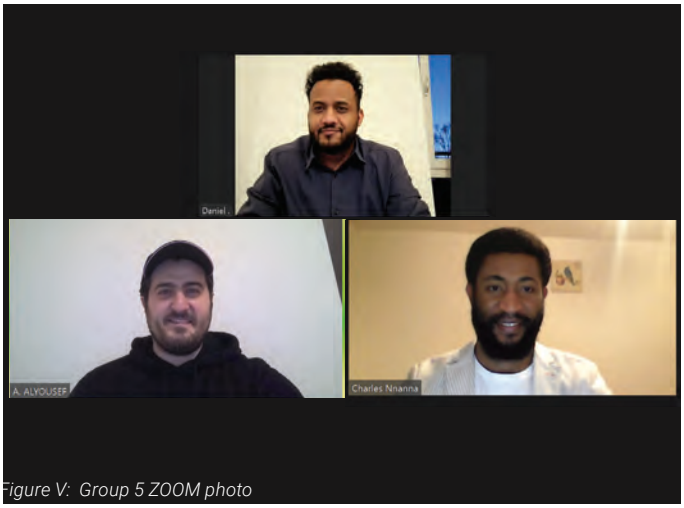

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FOREWORD

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The REAP (Resource Efficiency in Architecture and Planning) Master's Program is a multi-disciplinary and international program at HafenCity University, Hamburg, that brings together professionals from all over the world. The program's focus is on sustainable planning at various scales and in different cultural, geographical, and societal contexts. By following an integrative and multi-dimensional approach to real-world applications, the REAP program offers students opportunities to approach the challenges of today with realistic recommendations and solutions supported by the faculty with an extensive background in the field of sustainability at both, the technical and political levels.

The program consists of three core projects at different scales: the city, the neighbourhood, and the building. This brochure highlights the works of the 11th generation REAP students' third project, in the context of Resource Efficient Planning in Niš, Serbia - New Housing Post-Socialism.

The projects and essays on the following pages aim to give the reader an understanding of the challenges and opportunities affecting the housing sector after the post-socialist transition period in the city of Niš, Serbia.

Thank you for reading!

Figure 02: Niš fortress (MrPanyGoff, 2011)

Introduction

by Shefali Nayak & Talitha Grahl Stortz

This collaborative project was initiated between the department of REAP at HafenCity University, Hamburg, Germany with the architecture department of Technical University of Niš, Serbia. Due to the restrictions imposed by the COVID-19 pandemic, this joint project could not be conducted in the conventional fashion. Hence, both universities managed to work together during a virtual workshop in November, 2020. The ZOOM online platform was used to introduce a research assessment of Somborska Boulevard, the largest new post-socialist housing development in Niš (Vasilevska et al., 2014). It was then compared to a housing development in Neuallermöhe, Hamburg. The workshop also consisted of the exchange of information, expert lecture series (participatory planning, housing development, effects of post-socialism, etc.) on the topic of resource efficiency.

For the study, each group from Hamburg worked with multiple groups from Niš in exchange for site information such as pictures, interviews, and insights of the local situation. The knowledge gained through the workshop demonstrated that the residents of the Somborska Boulevard are unhappy and dissatisfied with the current living conditions of the neighborhood, especially with regards to mismanagement of resources. This helped the groups to further brainstorm and propose solutions towards five different scopes focusing on aspects related to sustainable development.

In the closing of the workshop, a virtual exhibition was conducted where all the groups from both universities participated in a poster presentation of the Somborska Boulevard. After the virtual workshop, the students from the Master Program REAP continued with their research proposals for the neighborhood in Niš.

The aim of Project III was to develop strategies and design interventions to support the resource efficient planning of Somborska Boulevard and to solve some of the issues of the residents. The results of this study are presented in this brochure, which highlight various facets of resources (water, mobility, waste, energy, and open spaces) and the recommendations for achieving efficiency within the neighborhood.

Figure 03: Map of Niš (Google earth, 2021)

Niš Context

by Shefali Nayak

Serbia, one of the Balkan countries has been part of Yugoslavia for most of the 20th century. It was the dominant part of the multiethnic union. However, after World War II, the non-aligned communist government of Josip Broz Tito attempted to balance contending interests by dividing the national administrative responsibilities (e.g. for intelligence and defense) along ethnic lines. Naturally, Tito's death was followed by the collapse of communism and the separation into different countries right after the civil war in early 1990s (Encyclopædia Britannica, n.d.).

Niš is one of the oldest cities in the Balkan region, currently the third largest city of Serbia. Although it has a considerable share in Serbian economy and social development, it has managed not to be in the limelight for researchers. This city is an outstanding case for assessing the influence of change in policies upon urban fabric after a political shift in the region. During socialism, the growth of Niš heavily depended on industrialisation and urbanisation. The city experienced massive escalation of population from 122,100 residences in 1953 to 232,563 in 1981. This led to a rise in housing demand and an upsurge in the production of mass social housing. Post-socialist transition for the city has been challenging in adopting market-driven urban models towards housing, energy, etc. It has suffered from a continuous economic downturn since the mid-1980s, with a peak unemployment rate and noticeable stagnation in population growth. Privatization of real estate is evident followed by numerous systemic changes such as wholesale privatization of properties and redefinition of property rights which led to co-ownership of land (Vasilevska et al., 2014).

Belgrade has managed to acquire most of the attention from researchers about the effects of post-socialism and civil war upon an industrialized country. This assessment elaborates the scrutiny that Niš deserves a focus on one of its post-socialist neighbourhoods, Samborska Bulevard, that suffered from "Investor Urbanism", essentially a market- driven approach towards the neighbourhood highlighting the challenges and solutions towards unregulated privatization of real estate.

REAP SCOPES

Figure 04: Park in Niš (Young, 2019)

ENERGY
WASTE
MOBILITY
PUBLIC OPEN SPACES
WATER

Figure 05: Map of Nis (Google earth, 2021)

REAP SCOPES

ENERGY

by Guvanch Rejepov

With a population of nearly 7 million, Serbia is a country with a high energy demand located in the Balkan region. While most of the country's energy demand can be met through domestic production, most of this energy still comes mainly from fossil fuels. This can be observed in the latest figures provided by the International Energy Agency (IEA) on the Serbian energy sector (Macura, 2017).

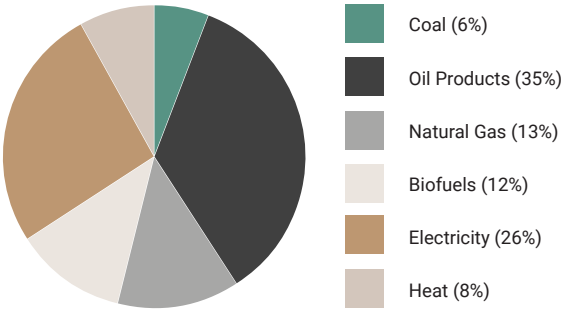

Figure 06: Shares of fuels in final energy consumption in Serbia (IEA, 2019, redrawn by Hiller, 2021)

Nearly 78% of electricity and heat production is based on coal and gas, while only the remaining 22% is generated by the key renewable energy source in Serbia, hydropower (IEA, 2019).

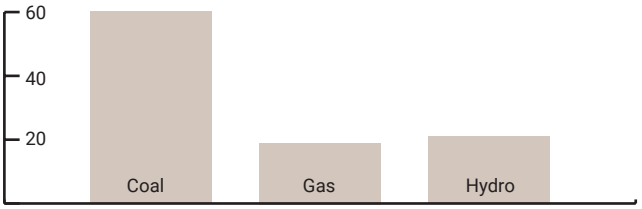

Figure 07: Share of resources in electricity and heat generation (IEA, 2019, redrawn by Hiller, 2021)

The main reason for fossil fuel domination in the energy industry is the availability of large coal reserves in Serbia – with 4.5 billion tons of proven lignite deposits 1. The energy market is regulated by the "Electro-Power Industry of Serbia" (EPS), which owns all large generation capacities and supplies most of the customers (Bankwatch, 2020).

The energy infrastructure in Serbia faces a variety of challenges, ranging from the inefficient utilization of primary energy supplies to the inefficient delivery of power to the final consumers (Jocic, 2020).

According to studies conducted, most of the thermal power plants (TPP) are more than 35 years old with net efficiencies of only 30% , with the highest energy losses in electric energy transmission and distribution networks in Europe (Macura, 2017). In addition, 57% of the population lives in houses without access to central-district heating systems, with wood being the single dominant source used mostly in devices with an efficiency below 40% (Jocic, 2020).

All of these challenges are observable in our project site located in the city of Niš. Inadequate energy efficiency in the residential, public, and commercial sectors constitute nearly 41% of final energy consumption (IEA, 2021).

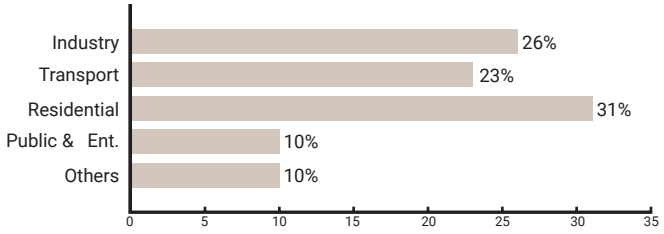

Figure 08: Shares of individual sectors in final energy consumption (IEA, 2021, redrawn by Hiller, 2021)

High concentrations of buildings constructed as massive concrete blocks during the post-socialism era in the 1990s, result in substantial heat and energy losses due to insufficient insulation in walls, facades, doors and windows (Jocic, 2020).

In order to achieve a transition into a more efficient energy managing scheme, the city of Niš and Serbia together must resolve the factors listed above. By doing this, authorities will not only provide their residents with the required quantities of electricity and heat, but also protect the natural environment.

Figure 09| Map of Niš | Google earth 2021

WASTE

by Tara Bahari

The Republic of Serbia is dealing with a pile of challenges with regards to environmental preservation and protection, namely waste management. Jovanović writes in the Balkan Green Energy News, in February 2019, that, following the negotiations of the Serbian authorities with the European Commission on the topic of environment protection, Serbia would presumably reach its agreed goals in the waste sectors by 2025. Though, no reliable data is provided by the waste sector about the progress. In other words, the local governments in Serbia do not make enough reliable or complete information available which would reflect the quantities of generated municipal waste. Lack of data provided by the local governments leads to incomplete datasets or unreliable assumptions (Jovanović, 2019).

In Serbia, similar to the other fellow countries in Southeast Europe, which are remnants of the previous Eastern Block under communism, the number of private sector waste collection companies is relatively low. This number, as of 2016, accounts for approximately 11% of the total, while the rest are public utility companies under the ownership of each city. Such public companies are very inefficient and are run by redundant workers. Also, since not all citizens can afford to pay the waste collection fees, the service quality is relatively very low (Vujic, 2016).

Unfortunately, Serbia proceeds with landfilling the waste as its main strategy towards waste management. This is considered to be the least preferred strategy compared to waste generation prevention, reuse, recycle, incineration and conversion to heat energy. In numbers, as of 2019, only around 3% of the total waste generated and landfilled in the Serbian republic is recycled (Jovanović, 2019).

In Niš, due to lack of separation of the domestic and commercial waste, there is little recycling in an organized or systematized framework either. The main landfill that Niš used for dumping its municipal waste, Bubanj, is not equipped with any sanitary features such as waterproof base or treatment process for the outflowing wastewaters (ELAIN, 2014). Moreover, the highly concentrated and un-treated LFG (landfill gas) in the Bubanj landfill is a total threat to the locals and the environment in terms of remarkable pollution and fire hazard (Mihajlovic et al, 2016).

Waste, as a major contributor to environmental pollution, not only threatens the lives of human beings as well as the flora and fauna, but also is the driver to cause many social challenges. Therefore, reducing or eliminating the waste generation and its adverse effects is a top priority issue that environmentalists and scientists are dealing with today.

In the case of Serbia, although a waste management action plan is in place, there is no satisfactory performance visible in the context of waste separation, collection and recycling. Since the mentioned program is to be administered by local governments in Serbia, each city is responsible for the implementation of the law. Currently, The Public Utility Company Mediana (PUE Mediana) is in charge of the waste management and sanitation of the city of Niš (Miltojević et al., 2017).

Today, some of the top important challenges that Niš is dealing with in terms of municipal waste, are the lack of a sanitary landfill (the current one is at risk and meets no standard despite reclamation and rehabilitation measures) and the existence of up to 71 illegal dumps in the city according to the Local Waste Management Plan of Niš (Miltojević et al., 2017).

MOBILITY

by Talitha Grahl Stortz

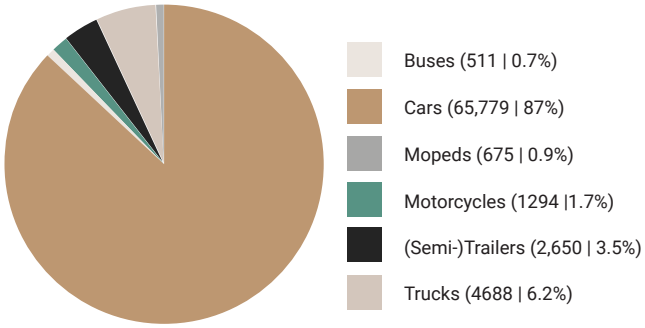

Figure 10: Number of Registered Road Vehicles in Niš (Statistical Office of the Republic of Serbia, 2018, redrawn by Hiller, 2021)

Niš has a unique monocentric structure, which is the outcome of its geographic position and composition. Because of that, there is a great concentration of people in the central area of the city. Externally, Niš is in a strategic position as it is located on the European Corridor X, which connects the Balkans with Central and Western Europe (Podovac, 2019).

During the 1960s, the tram system in the city was replaced by the public bus network. In the same period, the number of automobiles in Serbia increased significantly. Later, in the 1990s crisis, fuel was scarce, and the ability to commute decreased, making the people living in Serbia feel more restricted to travel. Consequently, the beginning of the 21st century has been the period of recovery (Simic, 2014).

The national goal of Serbia is to enhance transport and urban mobility and provide safe, affordable, accessible, and sustainable transport systems for all by 2030. This is expected to be done by integrating urban development strategies and defining priorities (Trkulja, Colic, & Maksin, 2018).

The current scenario in the city of Niš, according to the Statistical Office of the Republic of Serbia (2018), is that the traffic is dominated by private cars (Figure 10), at the rate of approximately 1 car for 4 persons.

In 2008, the National public transport network implemented a tariff system divided into four zones. The network operates 15 city and 36 suburban lines, with 130,000 passengers commuting by 124 buses every week during working days (GetByBus, 2021). Moreover, Niš is well-connected to the Serbian and European railroad network and has an international airport, 5km away from the city center, as shown in Figure 11 (GetByBus, 2021).

The main goals and strategies, which are described in the planning documents for a more sustainable development of Niš, are in line with the national goals. However, there is still a lot more to be done, to transform it into an urban center with better environmental quality, communal services, and transport links (Trkulja, 2010).

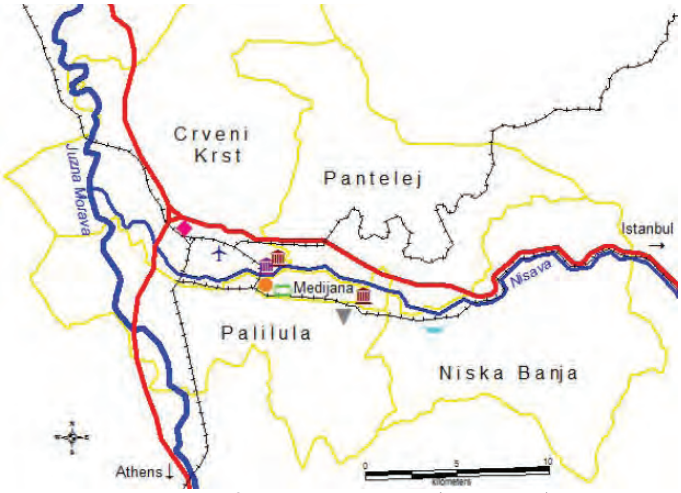

Figure 11: Spatial structure of mobility network in Niš (Trkulja, 2010)

Figure 12: Map of Niš - Google earth 2021

PUBLIC OPEN SPACES

by Ada Dauti

This summary about the REAP scope of Public Open Spaces (part of Sustainable Urbanism) is written based on a site investigation as well as interviews and photos provided by Niš students.

During the socialist period, large housing estates were characterized by three main factors: repetition of monotonous urban ensembles, low construction standards in order to reduce the costs of the constructions and the plan for the construction of lavishly open spaces (Bogdanović Protić et al., 2020). However, these large open spaces between buildings were treated as intact landscapes and were not equipped properly, which came as a result of the lack of financing, present because of the absence of regular maintenance and inadequate management. The monitoring and maintenance of the large open spaces were responsibility of the municipal public utility companies. If the socialist period would be described in two words regarding the building field, than the two appropriate words would be the presence of egalitarianism and uniformity (Bogdanović Protić et al., 2020).

During the post-socialist period, a boom of construction took place identified by rooftop extensions, placing new buildings on former green spaces and the transformation of the ownership which passed from public owned to 98% privately owned. One of the most affected fields from this boom of construction was the degradation of public open spaces. This was replaced by parking spaces and poor urban design which came as a result of the financial issues and the change of the ownership status – where the privatization of the land turned the focus of the owners more profit-oriented. What affected the degradation of public open spaces were the changed legislative frameworks which were dominated by an absence of regulations, standards and forms as well as inefficient enforcement of laws (Bogdanović Protić et al., 2020).

The characteristics of post-socialism period described in the previous paragraph, were also noticed in the current site of Somborska Boulevard, where one of the first things to notice from site investigation is the lack of open spaces. This restricts the public engagement, encourages random car parking occupying most of the empty spaces in the neighborhood, unconstructed roads with undefined sidewalks or bike lanes, as well as absence of communal spaces, green areas, parks and playgrounds for children. The lack of all these components led to a neglect of the residents to take care of the common areas, leading to a lack of responsibility for the environment and of the sense of belonging in the neighborhood.

As an insight to the in-depth analysis for the site regarding public open spaces, a research from Bogdanović Protić et al. came with some statistics in the city of Niš such as: green space usage, where 78.16% of the people in Niš don't use green spaces; 64% of the residents don't have interaction in public spaces in comparison to 36% of them who do have interaction; 81.25% of the residents are dissatisfied with the public open spaces; and 58.62% of the users of public open spaces are dominated by children, while 41.38% of them are used by other ages (Bogdanović Protić et al., 2020).
These statistics and site investigation by students suggest that public open spaces bear lack of attention in Niš and in the Somborska Boulevard neighborhood. However, the area shows potential to improve the underutilized open public spaces in the neighborhood, develop new green areas and increase the interaction and sense of the responsibility to the residents who live in this area.

WATER

by Charles Nnanna

The delivery of drinking water to homes and businesses, removal of wastewater and sewage, and removal or reuse of stormwater are all attributes of water resource management. Swift urbanization, along with increasing urban population, and other rising environmental issues compel us to give utmost attention to the emerging urban water related challenges. As a result, the REAP program considers the study of the urban water cycle one of its important scopes.

In Serbia, surface water resources are correlatively significant. The Danube, Tisa, and Sava rivers are responsible for 90% of all surface water resources which make up 162 billion m³ annually. The Danube river, being the 24th largest river in the world and the second largest in Europe, covers most parts of the country, with 6,500 m³/s discharge at its outlet (Embassy of Belgium, 2017).

Serbian water regulation is under the control of the National government, through the Ministry of Agriculture, Forestry, and Water Management. There are currently three government-owned water management companies operating in Serbia namely; Srbijavode (Serbia Water), Vode vojvodine (Water of Vojvodine), and Beogradvode (Belgrade Waters) (Embassy of Belgium, 2017).

However, Serbia, like many other developing countries around the world still faces many challenges in the water sector - especially in wastewater management. Research conducted by the Economic and Trade Office of the Embassy of Belgium in 2017 shows that not more than 10% of Serbian wastewater is processed. Serbia, as an applicant country for EU membership, is required to meet the EU environmental standards. To achieve this, about 320 wastewater treatment facilities must be constructed (Embassy of Belgium, 2017).

Water supply in Niš is achieved through a supply network connected to different sources, with an overall maximum water intake of 247,968 m³/day that can be distributed to the consumers. A total of 65 out of 71 settlements in the territorial spatial plan for Niš are supplied with water from public water supply systems. Respectively, 91% of the population is connected to the water supply network of the city of Niš (USAID, 2010).

The majority of wastewater in Niš is discharged into rivers through sewage lines and other systems (ELAIN, 2014).

The sewage system is traditional and is centrally combined. In the urban area, wastewater from approximately 210,000 inhabitants is collected through a central combined sewer system. While in other rural areas, wastewater is discharged through systems for on-site sanitation such as septic tanks and cesspools (European Commission, 2018).

Currently, the Public Communal Company “Naissus” performs activities of purification and drainage of atmospheric and wastewaters within the territory of the city, as well as the purification and distribution of drinking water. The company is permitted to manage work performance in such a way that impacts constant and uninterrupted utility services supply under conditions defined by the Law (European Commission, 2018).

However, there are on-going plans for the implementation of wastewater treatment plants in Niš (Balkan Green Energy News, 2017). This project, when completed, is expected to reduce the environmental pressure on the South Morava River Basin downstream of Niš as well as save the Nišava river from pollution.

Figure 13: Nišava River (Young, 2019)

PROJECT PROPOSALS

Figure 14: Urban view from Niš. (Young, 2019)

PARK LESS, *SOMBORSKA!*
TAKE A WALK *IN SOMBORSKA*
A GREEN VISION *FOR SOMBORSKA*
WASTEWISE *SOMBORSKA*
NO FLOODING *IN SOMBORSKA*

Figure 15: Biking in Somborska (Yanachek, 2020. Adapted from Đorđević, Niš student, 2020)

INTRODUCTION

At the inception of this project, various literature sources were referred to which were relevant to the context of Niš and Serbia. In addition, several case studies were analyzed to gain insights into solutions proposed in other cities throughout the world. Based on this research, interviews with the residents of Somborska Boulevard, and an extensive site analysis, interventions were developed with the aim of improving liveability in the neighborhood.

Findings: Effects of "Investor Urbanism"

In the Somborska Boulevard neighborhood, public spaces have been completely neglected. There is a lack of benches, streetlights, playgrounds, and greenery. The provision of parking spaces takes priority over public spaces. In addition, there are low levels of safety and accessibility due to poorly designed pedestrian and automobile infrastructure (Vasilevska et al., 2014).

GROUP 1
PARK LESS, SOMBORSKA!

Importance of Open Spaces

Qualitative public open spaces can contribute to the quality of life of the residents in large housing estates by promoting a sense of community, building social connections and providing physical and psychological benefits (Bogdanović Protić et al., 2020). However, repurposing of land for public open spaces can be problematic if an area is already developed (Kaw, et al., 2020). It is in this context that the analysis of Somborska Boulevard is taking place.

RESEARCH QUESTION

The focus of this research is to answer the main question of

"How to achieve a lasting behavioral change in creating a less car dominant neighborhood?"

Sub-question 1: *What interventions could lessen the dependence on personal automobiles in the neighborhood?*

Sub-question 2: *Which interventions could optimize the streetscape and thereby promote/strengthen the social interaction in the neighborhood?*

Case Study 1: San Francisco's Places 4 People

San Francisco's *P4P* program is an example of bottom-up resident participation in place-making. *P4P* is a city ordinance which allows residents to apply for permits for "temporary, limited-term occupancy of a portion of the public right of way for activities that may include some reversible physical treatments or improvements" (City and County of San Francisco, 2016).

Goals of the program include, among others: promoting more neighborhood interaction, encouraging public safety, supporting local businesses, and encouraging non-motorized modes of transportation (Ground Play, 2020).

Case Study 2: Ottensen macht Platz project in Hamburg, Germany

Many insights were gained from Stein & Bauer's (2020) analysis of the ***Ottensen macht Platz*** project in Hamburg, Germany. In this project, around 800 meters of street was temporarily designated as a pedestrian zone, with access allowed to cyclists, taxis, and necessary local delivery vehicles.

The report included various recommendations for such a project: set aside enough time for planning (ideally 12 months), one year would be the ideal length of time for such a pilot project, input from residents is essential, and advantages of the project must be communicated from the very beginning (Stein & Bauer, 2020).

Case Study 3: EU Park4SUMP project

The inspiration for including a parking management system as part of the proposed project came from the EU funded *Park4SUMP* project. *Park4SUMP* raises money for sustainable mobility options through the introduction of parking management fees. Thus far, there have been nearly 20 cities all throughout Europe which have implemented *Park4SUMP* measures (Park4SUMP, n.d.).

Measures include the Introduction of paid parking, increased parking fees, restraining supply, introducing time limitations on parking, and implementing different parking tariffs for target groups (Park4SUMP, n.d.). In the Somborska Boulevard project, the most appropriate parking management measures would be decided upon after input from residents and an additional site analysis.

CONCEPT DEVELOPMENT

The availability of parking in Somborska Boulevard was analyzed by investigating residents' parking behaviors. 90° parking is available along the wider streets and parallel parking on narrower streets. The numbers of parking spaces were roughly counted within the neighborhood and approximately 1000 spaces were present, which was equal to 15,000 m².

Here, in the image below, it can be observed how one parking space can be used: instead of a place for one car, it can accommodate 6 bikes or alternatively 4 cart bikes. By replacing two parking spaces (around 24 m²), a parklet could be designed, which would be more essential for many people compared to two parking spaces.

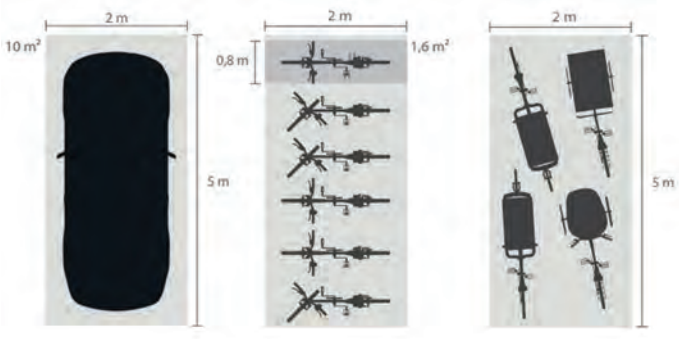

Figure 16: Equivalent car space (FGM et al., 2019)

So, the concept of the project is to transform public spaces into places for the public by optimizing streetscape, which could hopefully influence a lasting behavioral change in the long term. In order to implement this kind of measure, awareness must be raised as to rearrangement of the right of way. A bottom-up approach is then important.

Community participation would be imperative in the project from the beginning until the post implementation phase to create a sense of involvement and belonging.

Therefore, the project has been named ***Park Less, Somborska!***. The roadmap of the project can be seen below.

Figure 17: Park less, Somborska!! roadmap (Li, 2021)

The project includes 4 main phases which are:

1. Survey and information collection. Inform residents, conduct surveys, collect data, and organize workshops. Asking permission from the local authorities.
2. Strategic planning. Defining the borders of the right of way, forming rules and regulations and agreeing on the usage of the possible intervention.
3. Design development and permit. Competitions will be conducted for design and project proposals and eventually, permit drawings will be submitted.
4. Implementation of the selected interventions, monitoring and post evaluation survey.

The example of questionnaires in the brochure sent to every resident can be seen in figure 18. The brochure shows the project timeline on one side and the questionnaires on the other side. People can scan the QR code to see the roadmap and the progress of the project to keep the sense of involvement for residents. They will receive notifications of upcoming workshops, the results of the design competition and detailed information of each phase.

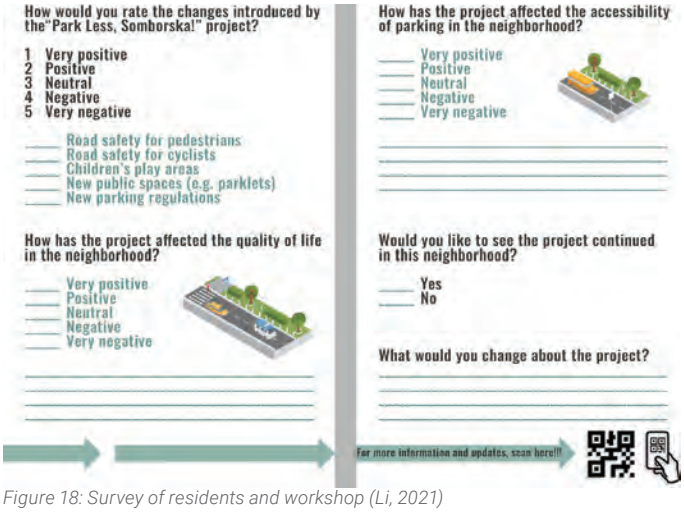

Figure 18: Survey of residents and workshop (Li, 2021)

Based on the insights gained from the surveys and evaluation phase, the parking management measures would be determined which would be most appropriate for the Somborska Boulevard neighborhood. Implementation of a parking payment system would generate revenues for project activities, serve as a disincentive towards parking in the neighborhood (short term) and also towards private automobile use in general.

INTERVENTION: PROPOSALS AND LOCATIONS

The interviews of the residents of Somborska Boulevard, conducted by students of Niš University in November 2020, were referred to, while addressing their problems.

Here, the residents say that, "We don't have enough recreational spaces and playgrounds for children." - Milica (Retired, 68), Jelena (Professor, 48).
The condition of the landscape does not seem proper. A possible solution could be to revamp these areas and convert them into children's play areas and parks.

Figure 19: Play areas and parks 1 (Bhattacharya, 2020)

In another interview, the residents say that, "There are not enough green spaces." - Jovana (Cosmetician, 25), Marijana (Freelancer, 27), Danilo (n.d., 35), Dušan (Student, 23).
A possible solution could be to design the linear strip of land into a green landscape with plenty of play areas.

Figure 20: Play areas and parks 2 (Bhattacharya, 2020)

The residents complain about, "Inaccessibility for disabled people as well as a badly developed social model of accessibility." - Danilo (n.d., 35).
A possible solution to combat this problem could be to optimize the right of way, channelize the traffic flow and segregate the different modes of transport, defining lanes for car, bicycle, parking and pedestrian to enhance safety and accessibility.

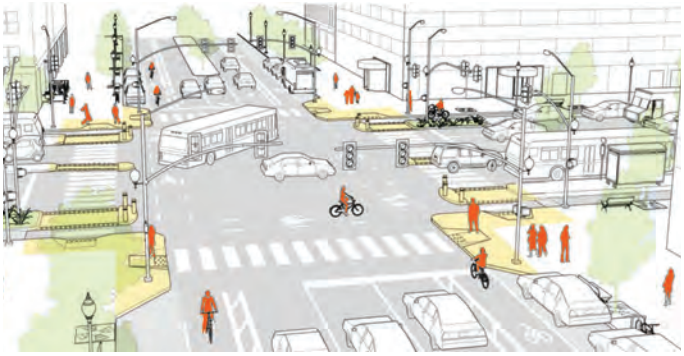

Figure 21: Optimization of the right of way (Alarcón Porras, 2021; NACTO, n.d.)

In another interview, a resident says that, "The arrangement of buildings and public spaces can affect the quality of life in a community." - Olivera (Manager, 44).
As the second research sub-question in this project talks about strengthening the social interaction in the neighborhood, some of the possible solutions could be to design interaction spaces for pop-up events and parklets in place of parking locations along the road. Temporary street furniture could be used for these interventions.

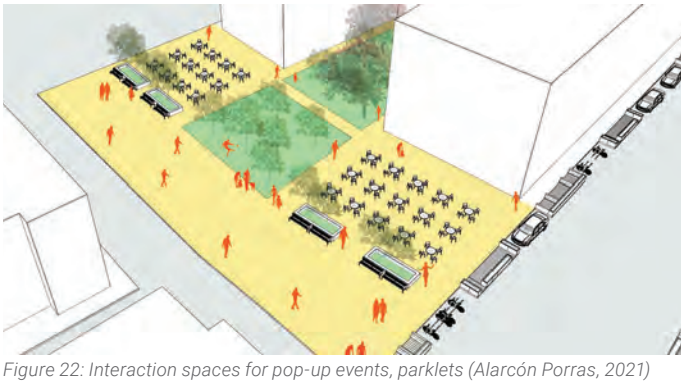

Figure 22: Interaction spaces for pop-up events, parklets (Alarcón Porras, 2021)

PROJECT IMPLEMENTATION

For the implementation of the project, an approach has been suggested which is structured in 4 stages and 30 steps.

The first stage provides the steps towards the input gathering, which is crucial to the success of the project. Important steps like the survey and workshops will happen in this stage and the results will establish the projects that will be a priority to implement.
The steps in the second stage provide a strategic planning framework which will also include the integration within the city's planning framework.
The steps of the third stage will guide the development of the key projects that were identified in the first stage, going through design competition, winner selection, permits and contracts.
The last stage structures the implementation and assessment of key projects.

Depending on the above-mentioned stages, the development will be given priority, the point of departure can vary, as some methodological steps might already be fulfilled.
The aim has been to create a process with steps that can be easily adapted to a variety of different projects, which can provide a structure but can also be easily modified. This structure will work as a solid reference framework.
The project team will guide the process through most of the steps, from the first stage to the last. The community, including the inhabitants and the local business owners, will be a crucial and integral part of the process, from giving their inputs, to helping to select the winning projects. The academics from the University of Niš will be asked for their expertise and NGOs will be engaged into facilitating and organizing the work on the field.
The local government has been identified as the most crucial stakeholder into the successful completion of the project. They seem to possess great resources to facilitate the process.

PROJECT EVALUATION AND MONITORING

At the end of the project, an evaluation process is intended to be carried out, which will be combined with the monitoring process based on on-site observation and would follow up during the whole year of implementation of the project. The evaluation process would determine whether the scopes were achieved, timeframes adhered to, the budget was met and most importantly, the satisfaction of the inhabitants' with respect to the proposal. To investigate the mentioned, an evaluation survey (available online and on paper) would be created. The results from the surveys would give valuable feedback and critique for the next steps to be followed, which when combined together with a final workshop, would decide whether the project will be continued. If successful, it can be implemented again on a permanent basis or if it can serve as an example for the future development of the neighborhood in phase 2.

CONCLUSION

The benefits and advantages of the project are as following:

Benefits of the "Park Less, Somborska!" project:
- Creation of new open spaces within the neighborhood
- Increased opportunities for social interaction
- Safer streets for pedestrians and cyclists
- Creation of children's play areas

Advantages of the methods:
- A temporary project which can be adjusted and developed further for the future
- Rather affordable than permanent new infrastructure
- Resource efficient solutions
- Room for learning and improvement
- "Bottom-up" methods of resident participation
- Replicable and adaptable in other contexts

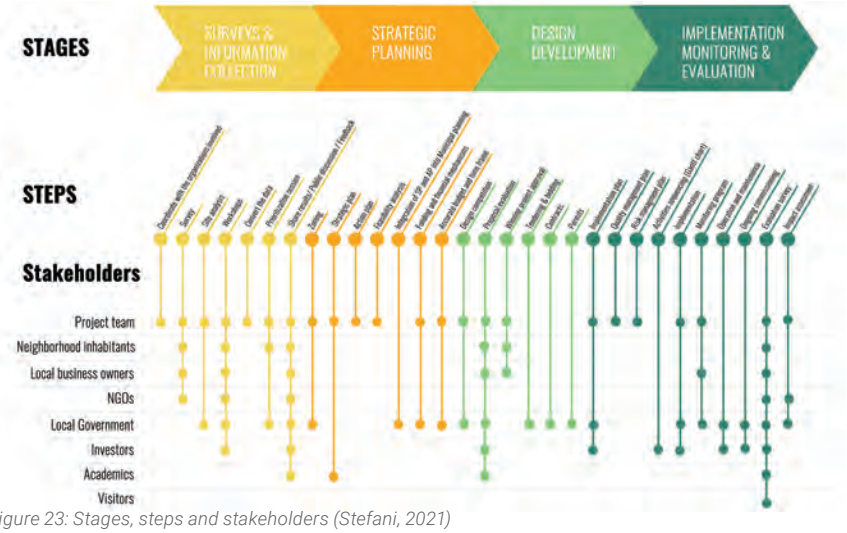

Figure 23: Stages, steps and stakeholders (Stefani, 2021)

Figure 24: Somborska street (Grahl et al., 2020)

GROUP 2
TAKE A WALK IN SOMBORSKA

After the collapse of Yugoslavia during the early 1990s, Serbia faced deprivation and the population was redistributed in the country. This led to the agglomeration of people in main cities, like Niš (Đekić et al., 2017). Not only that conflict affected the identity of Serbs, but Europeanization and globalization were introducing new challenges, forcing former socialistic cities to reshape the urban space (Jevremovic, 2011).

During the period of recovery at the beginning of the 21st century, the post-war strategy of the city of Niš consisted of the design of a general urban plan. The plan encouraged mainly the development of residential and commercial areas, neglecting the surface of urban greenery, especially within housing settlements (Đekić et al., 2017). The consequence of this is clearly seen in the new housing development along Somborska Boulevard.

The current scenario reported by the residents of the area states that buildings were raised one next to the other without considering a basic infrastructure for the users of the street, especially pedestrians. Because of this, problems seen in the neighborhood are unorganized parking spaces, unsafe pedestrians while sharing space with cars in unclear paths, lack of green and recreational areas, among others. This is leading to unsatisfied living conditions for the residents, who claim a better environment and use of the space. Nevertheless, as virtual site investigation showed, not all the area is in the same poor conditions, as sidewalks in the main street have clear paths for pedestrians, and are accessible through the bus.

With Somborska Boulevard's current state of mobility and the discouragement of pedestrians in the space being the main concern, the focus of this research was to investigate how walkability can be improved. Selected analysis tools were implemented to identify the current walkability scenario. Interventions in the street infrastructure were proposed to promote pedestrian traffic in focal routes of the area.

GENERAL ANALYSIS

To have an overview of the current situation of the neighborhood, a general analysis was made by identifying the main stakeholders in Niš, with the goal of improving walkability within the neighborhood. Furthermore, surface materials in the area were studied for lack of cohesion, few green areas, and an absence of sustainable materials. In addition, the results regarding the street network diagram analysis showed potential for pedestrian connections. This was because the number of intersections for pedestrians were twice the number of road intersections for cars. The quality gap between the infrastructure on the main and the neighborhood street was also

Figure 25: Selected routes analyzed in Somborska Boulevard (Grahl et al., 2021)

noticeable from these analyses, being the former the most pedestrian-friendly.
A last key result from the general analysis showed that the only nearby bus station connecting the neighborhood to the city center was located in the south area of the neighborhood. This presented an opportunity to increase the walkability and to connect the north and west areas where most of the commercial areas were detected (Niš-ekspres, 2021).

DETAILED ANALYSIS

The starting point to evaluate more carefully the current conditions of walking amenities and infrastructure, was a visualization analysis tool. It determines the walkability index, which was adapted from a case study conducted by Wibowo, Tanan, and Tinumbia (2015) in Bandung, Indonesia, where the walking mode is restrained because of the lack of walking amenities.

The parameters analyzed for each selected route in the neighborhood (Figure 25) for this study were :

1. Conflict with other motorized modes
2. Maintenance and pavement quality
3. Cleanliness
4. Crossing availability
5. Walking amenities
6. Walking infrastructure for disability
7. Obstruction (of pedestrian traffic)

Each parameter was then scored from 1 to 5, where 1 represented a very poor condition on-site and 5 the best condition comparing all the sidewalks in the neighborhood. Although the scoring system did not illustrate the optimal condition for a sidewalk, it was used to compare the selected routes to one another, and to determine what needed to be improved in each street.

After plotting the results of the parameters for each route into a radar chart (Figure 26), it revealed the weaknesses that each route had. In addition, it was showed that Route E was the most neglected and needed the most attention and Route D needed the least interventions.

Due to the different levels of importance from each parameter, that determined different actors' responsibility and capacity, the stakeholder analysis was conducted. In the analysis, it had been seen that the residents have the highest interest, but local authorities have the highest power. Other parties such as developers, Niš Ekspres, University of Niš, local businesses, and visitors have various scales of power and interest and have different influences on the parameters that were previously mentioned. In order to classify the level of importance of each parameter, a multi-criteria decision analysis was implemented.

Multi-criteria decision analysis (MCDA) takes advantage of previous analyses done for the evaluation of the streets. The importance of each parameter is quantified by using further sub-parameters, and the weightage of each parameter gives a final score. The score of each street represents that the street lacks the necessary intervention. The MCDA also reflects the status-quo of the present situation that can help intervene in a sustainable and resource-efficient approach.

The results of MCDA on improving walkability in Somborska Boulevard revealed that street D (main road) has better walkability in terms of infrastructure, walking amenities, and the other parameters used in detailed analysis. On the other hand, street E (green axis) has the least score, which means that it needs a higher priority in terms of interventions.

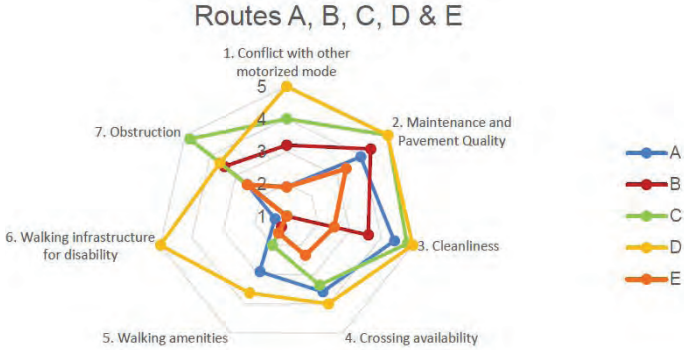

Figure 26: Radar chart with results of the parameters for each route (Grahl et al., 2021)

Based on the results mentioned from detailed analysis and MCDA, the street E, which interestingly passes through the neighborhood, is an important link between all the streets of the neighborhood. Therefore, focusing on this route, is expected to create a multifacet effect on the whole neighborhood when interventions are implemented there. Hence, the main focus of the intervention is the "Green axis" that passes through the neighborhood and is marked as street E. Other streets are also considered based on their individual needs and the specific infrastructure required for a walkable street.

CONCEPT DEVELOPMENT

Concept development is the process of developing ideas to solve a specific design problem. The concepts can be developed in phases, from formless brainstorming sessions to a complete figurative design, having visuals as well as structural content (Hass, 2019). In this project, the concept of walkability stands at the core along with sustainability, livability, and resource efficiency. These concepts are fulfilled with other goals such as reduced car dominance, increased pedestrian safety, infrastructure for residents with special needs, and a sense of enclosed community.

To shape this concept, the design can be divided into phases of infrastructure, activity, and priority. The infrastructure can ensure a physical space and design that promotes walking. Infrastructure such as sidewalks, crosswalks, and signs are used to ensure safety as well as comfort. The street activities are meant to bring people close enough to walk in a safe and lively environment, and amenities such as seating, shade, lighting, and garbage bins can attract more users and provide an enjoyable experience while walking. At last, giving preference to walking, cycling, and bus transit over private cars is a sustainable solution to encourage walkability. Measures such as accessible bus stations, small street widths, and a slower speed for traffic can also provide a more enjoyable and safer walking environment.

PROPOSAL

As mentioned before, the result of the analysis led to selecting the central axis of the neighborhood (Route E) as the "center of walkability" of our proposal (Figure 27). Although most of the local businesses are located in the south and west area of the neighborhood, an intervention on the center was decided to encourage the pedestrian to enter the site and to generate a more walkable space for its residents.

Figure 27: Proposal "Center of walkability" (Grahl et al., 2021)

Based on the selected case studies, an infrastructure adequate for pedestrians which considers walking amenities was also proposed (Figure 28).

Furthermore, proposals were presented to each one of the routes analyzed based on the results of each parameter and therefore bollards, street lighting, appropriate street crossing, preservation of the already existing vegetation were implemented.

Even though the exact percentage of residents with disabilities could not be found, integrating infrastructure for them to maintain the core concept of walkability for everybody within the neighborhood is still considered.

EVALUATION AND MONITORING

The broad impact planned in this project is the paradigm shift from car-oriented to pedestrian-oriented. The success can be measured after the implementation of the project by the decrease of 5% of cars using the street in the neighborhood annually. Therefore, the first assumption to evaluate the positive results of this project is that the residents will be encouraged to walk and reduce the use of cars, after the project is done, .

The tangible result of this project is the existence of a continuous pedestrian lane with the necessary amenities and clear separation from cars, which can be monitored by the 200 meters on sidewalk installation every month. Coordination with local authorities and Niš Ekspres as the public transport provider in Somborska Boulevard is necessary as the project progresses. Finally, the promotion of public activities to encourage residents to utilize the lane should also be considered.

CONCLUSION

Streets and sidewalks are important elements of a city (Jacobs, 1961), therefore they should function well, regardless of the street hierarchy, either main street, neighborhood street, or local street. In the existing condition in Somborska Boulevard, the streets which were located further from the main one had fewer amenities for pedestrians. Nevertheless, a connection of the neighborhood through sidewalks is still possible. Due to these reasons, the group proposed a project to facilitate the residents to be more comfortable and secure while walking on a short trip in the neighborhood. Within the analysis, visualization of the neighborhood and a multi-criteria decision analysis were conducted in order to find and prioritize where the interventions would take place. Within the project and for future recommendations, clear communication with the community is necessary to achieve the expected sustainable development of the neighborhood.

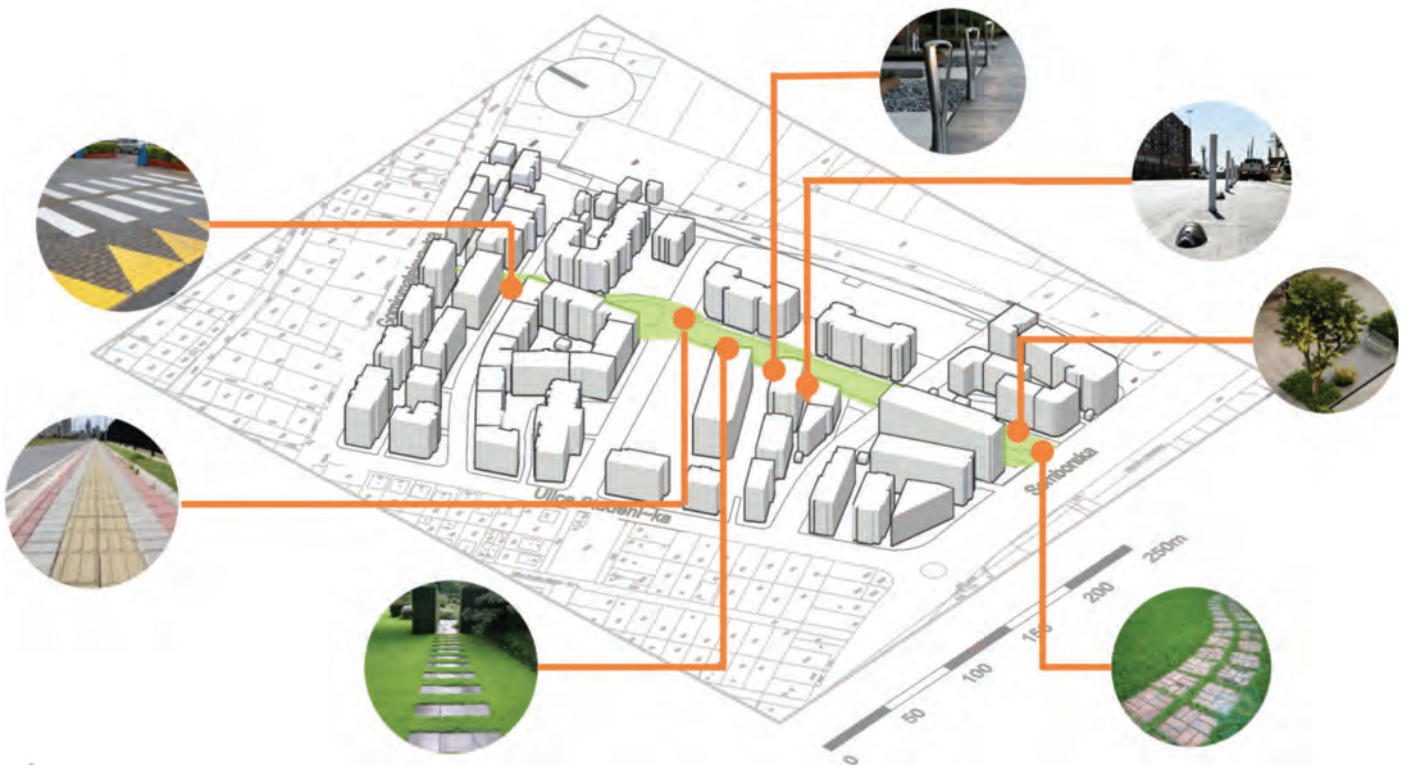

Figure 28: Proposal "Green Axis" (Grahl et al., 2021)

Figure 29: Intervention top view playground & outdoor gym (Bauer et al., 2021)

GROUP 3
A GREEN VISION FOR SOMBORSKA

INTRODUCTION

Niš is the third largest city in Serbia and an important regional center. Somborska Boulevard is situated in the outskirts of the city. The construction of the residential complex started in 2005 within the Somborska housing area. In recent decades, the post socialist changes have affected the trends in urban planning and policies which are majorly influenced by real estate market and property ownership. In Somborska Boulevard investor urbanization has led to privately owned plots and multi-storey buildings which are made for the sole purpose of selling in market instead of any consideration of the wider context. This is the reason that the neighbourhood has been facing serious physical, social, environmental, and economic deterioration that include degraded urban areas, neglected and underutilized public open spaces, which are unattractive for human living (Protić, Mitković, & Vasilevska, 2020).

After thoroughly reviewing the site photos, interviews with the residents, provided by the students of the University of Niš, and literature research, Somborska Boulevard proves to

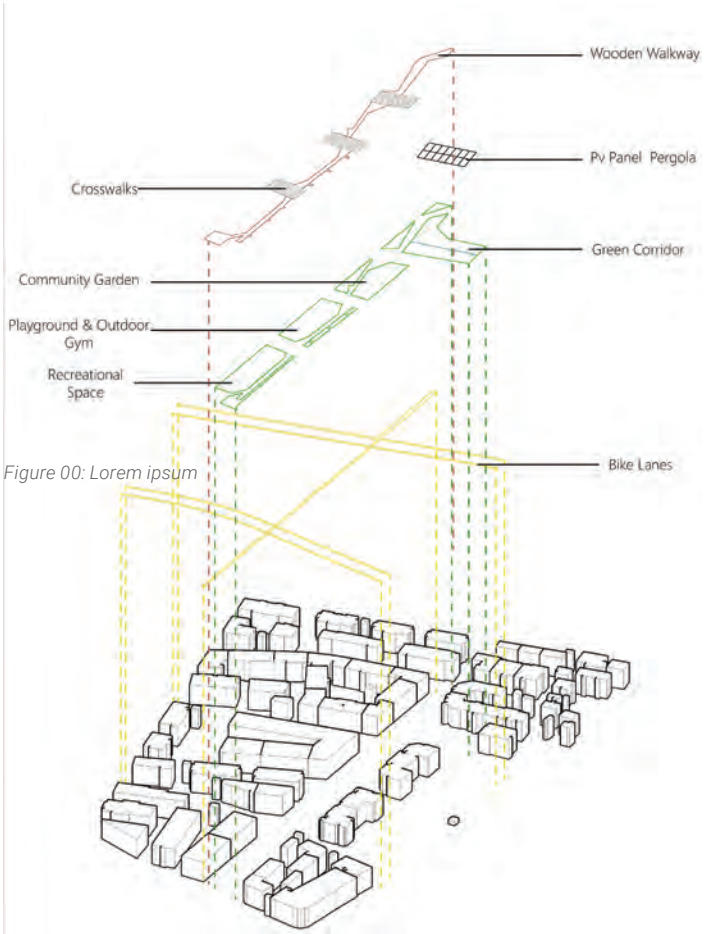

Figure 00: Lorem ipsum

Figure 30: Concept diagram (Bauer et al., 2021)

be facing some critical problems that are affecting the livability in the area. The main reason behind this is that the development of the area started before planning (Vasilevska, Vranic, & Marinkovic, 2013). There are many unfinished constructions that have ben in the same condition for many years. The roads are in poor condition and thus increase the risk of accidents in the area. There is no specified parking area in the neighborhood and therefore cars can be seen randomly parked everywhere, mostly in public open spaces. The area has no green spaces and thus the environmental comfort in the neighborhood is very low particularly due to the high occupancy level (Vasilevska, Vranic, & Marinkovic, 2013). The absence of communal spaces in the neighborhood has led to low levels of interaction between the residents. The pedestrian and bicycle lanes in the neighborhood are missing, also the street lights are either absent or not maintained which decreases the safety of pedestrians. Residents have complained about the poor quality of materials used for the construction of buildings as they have found some gaps between the wooden logs on the floors making it a hazard for children.

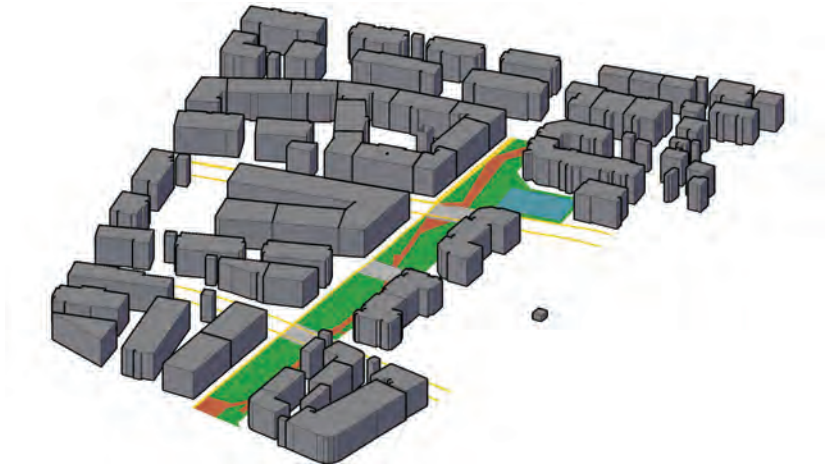

Figure 31: Concept diagram (Bauer et al., 2021)

Figure 32: Intervention top view community garden (Bauer et al., 2021)

Figure 33: Entire intervention top view (Bauer et al., 2021)

RESEARCH QUESTIONS

"What are suitable interventions that improve the underutilized open spaces in the neighborhood of Somborska Boulevard?"

Sub question 1: *How do these interventions affect the livability and resource efficiency in Somborska Boulevard?*

INTERVENTION

The analysis and workshop showed that the main problem for the Neighborhood in Somborska is not only the lack of open public spaces, but mostly the way these public spaces were being treated. For this reason, the focus of the intervention revolves mainly around finding suitable open spaces for different interventions and identifying areas available for improvement.

The intervention is composed of a set of improvements that generate positive changes in the area, and altogether will help to achieve a meaningful transition in the livability and resource efficiency in the neighborhood.

The elements that constitute the intervention are:

- A green corridor with a series of functional elements such as: community garden, playground for children, outdoor gym, and different recreational spaces.
- High quality bike lanes that offer connectivity throughout the entire neighborhood
- PV panel pergola
- Travertine walkway with cross-walks
- Sidewalks for safer connectivity and accessibility

One of the vital parts of the intervention was giving more importance to elements such as the green corridor, the travertine walkway and bike lanes over the vehicle roads. This will be achieved mostly through crosswalks which are meticulously designed to give a significant priority to the aforementioned elements. In this way the green corridor and its constituent elements will be granted a continuity throughout the neighborhood, becoming an organizing and iconic element for the entire area.

Regarding the tree species used for the multiple green areas, big trees such as beech and black locust will be planted. Both of these are endemic to the area and offer shading. In addition, the black locust counts with a particularly high resistance to pollution, which can also play a big role due to the urban conditions of the neighborhood (Republic of Serbia, 2015).

MATERIALS

Materials play an important role to reduce the heat stress in large open spaces. The selection of them has been investigated carefully based on the assessment with the Universal Thermal Comfort Index (UTCI) for a moderate / Mediterrean climate (Dietrich 2018), which corresponds to the Southern Serbian climate where Niš is located. Materials have a dynamic interaction with the outdoor temperatures and solar radiation in a 24 hour period. Only the first 10 to 20 cm of a material have an active contact with the surroundings; therefore, the temperature of the material surfaces is important to define the thermal comfort on the street.

The surface temperature of the ground is set on by the outdoor air temperature, infrared radiation exchange with cold and clear sky and absorbed direct or diffuse solar radiation (Dietrich, 2018). For a lower heat stress during the day, ground material should have a good compromise between reflection and absorption. Although the materials with a higher reflectivity lead to low temperatures during the day, it increases the discomfort in the street due to the high reflection of solar radiation to the person (Dietrich, 2018).

The surface temperatures that show comfortable thermal perception with no psychological stress are 18.1°C - 23.0°C (Irmak, A. et.al. 2016); thereupon, for moderate / Mediterranean climate, natural stone

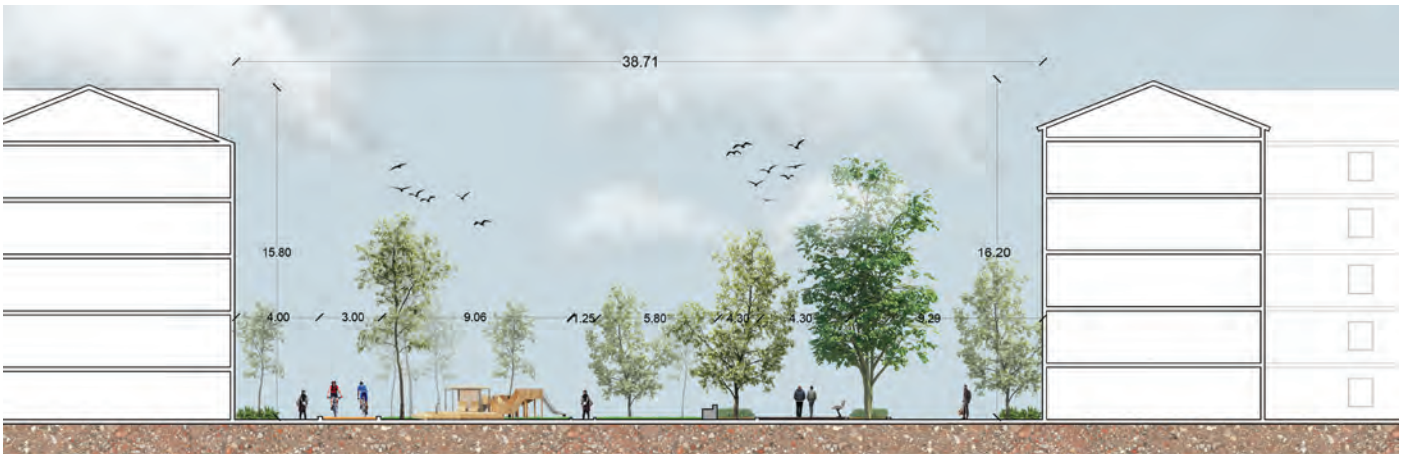

Figure 34: Intervention section playground & outdoor gym (Bauer et al., 2021)

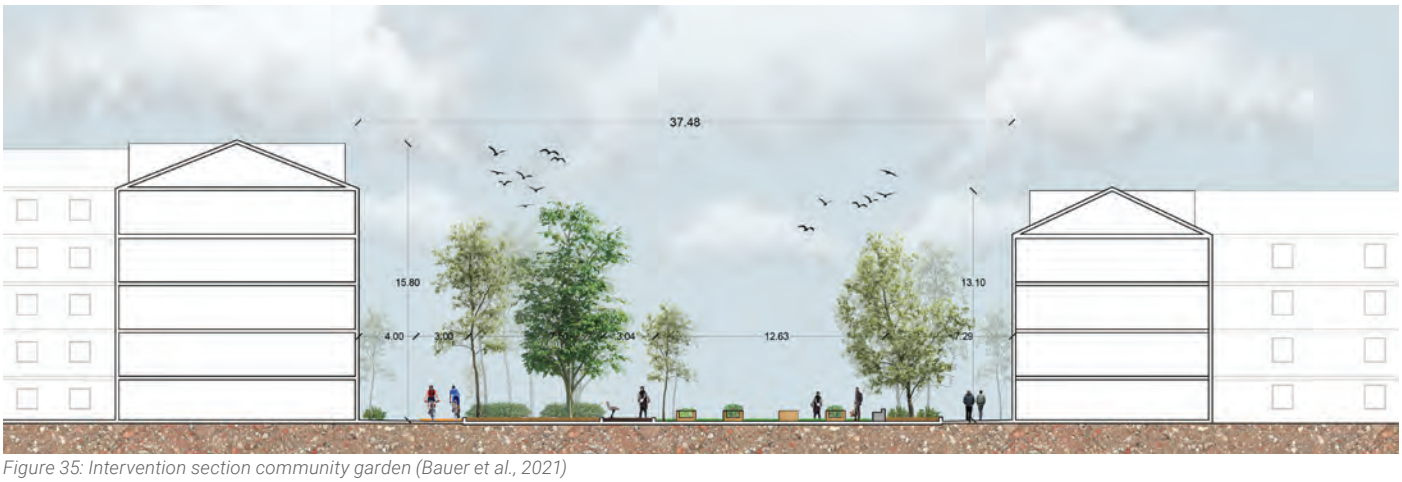

Figure 35: Intervention section community garden (Bauer et al., 2021)

(pavement) (24.5°C surface temp.), grey concrete (24.3 °C surface temp.), grass (25.9 °C surface temp.), travertine (26.1°C surface temp.), and granite (26.7 °C surface temp.) show the best results since they exhibit a level of heat stress that is close to the comfort range (Dietrich, 2018; Irmak, A. et.al. 2016).

In this type of climate, with hot summer days and high solar radiation, apart from the materials, shading has the highest impact on UTCI to reduce the heat stress. Bringing persons into shadow (with the use of vegetation, sun umbrellas, awnings etc.) reduces UTCI by about 6°C (Dietrich, 2018).

Figure 36: Livability (Bauer et al., 2021)

INTERDEPENDENCIES

A single intervention does not have a single effect; it rather has many effects on the neighborhood in terms of livability as well as on other REAP scopes (material, energy, water, and mobility). The above proposed interventions are interconnected and interdependent as following:

- The intervention of a green corridor affects material and water in a positive manner; the greenery increases permeability thus improves conditions of material and mitigates flood risks which means an increased resiliency of the neighborhood. The green corridor also improves the microclimate which has the potential of improving the conditions for biodiversity. Finally, more greenery means better air quality, decreased heat island effect in the neighbourhood and is generally more aesthetically pleasing (Protić, Mitković, & Vasilevska, 2020).
- Creating bike and pedestrian lanes improves mobility and livability. This creates organized traffic and increases safety. Those laterals create the opportunity of a disabled-friendly mobility.
- Adding PV panels contributes to the energy scope by generating clean renewable energy for the neighbourhood.
- The intervention of a community garden affects livability as it creates a sense of belonging to the neighbourhood thus increases the responsibility towards it. It has also the potential of generating income if this garden flourishes and its products can be sold on the local market.
- The interventions of open-air gym as well as playgrounds improve livability. They offer the opportunity to increase physical activity for the residents as well as create more opportunities for socializing and engagement.

RESOURCE EFFICIENCY & LIVABILITY

The proposed interventions have several positive effects on resource efficiency and livability in the neighborhood which were identified in the research, especially in the SWOT analysis of the interventions. In regard to resource efficiency, the implementation of green infrastructure improves the microclimate, decreases the heat island effect, and supports local biodiversity (Center for Clean Air Policy, 2011). Furthermore, the amount of permeable surfaces is increased which also has the potential to mitigate the flood risk in the area. The chosen materials for the proposed measures also contribute to a reduction of temperature compared to the use of standard materials and increase the thermal comfort (Dietrich, 2018).

There are potential positive effects regarding livability. The integration of the community into the planning process is a key element. The creation of communal spaces supports neighbors to come together. The air quality is improved and people have the opportunity to increase their physical activity by using the outdoor gym. Furthermore, there are different options for leisure activities where people can come together and enjoy some free time. Overall, there is an increase of safety by the integration of street lights along the intervened areas. Additionally, all these areas are accessible for disabled people.
To summarize, the positive effects of the interventions contribute to an increased resilience of the neighborhood (Center for Clean Air Policy, 2011), strengthen the community, and potentially increase the satisfaction of residents in regard to their neighborhood (Gough, 2015). The project can be considered as a role model for an upgrading of areas with underutilized public open spaces. Many comparable situations exist in Niš, Serbia due to the effects of changes in urban planning frameworks in the post-socialist era (Vasilevska, Vranic & Marinkovic, 2014).

Figure 37: Municipal waste in open spaces in Somborska Boulevard (Đorđević, Niš student, 2020)

GROUP 4
WASTEWISE

INTRODUCTION

Somborska Boulevard is one of newly developing residential sites located in the northeastern region of Niš. Rapid investment in the project area has resulted in vastly constructed multi storey buildings and overall densely occupied residential zones. In addition, based on observation made from photographs, municipal waste is poorly managed and needs attention.

Interviews conducted by students from the University of Niš in November 2020 showed that the majority of residents are unsatisfied due to few qualitative open spaces, lack of greenery and light as well as the spatial, visual and environmental pollution on site. In order to address the mentioned issues, the following research question and sub-question were formed:

"How can a properly implemented waste management strategy contribute to an enhanced quality of public open spaces?"

Sub-question: *Can the community engagement play a role in this process?*

Hence, the goal is to improve the condition of public spaces in neighborhood by implementing a robust solid waste management system with community and stakeholder engagement as key instruments.

BACKGROUND ANALYSIS

Initial study was undertaken with a literature review about waste generation, material streams and existing frameworks.

One of the remarkable findings was that waste generation per capita in Serbia is 338 kg/year, which is lower than that of EU countries with an average of 502 kg/year (Eurostat, 2020). Nevertheless, ecological issues arise due to improper handling of waste. The municipal waste separation system is still in its beginning. As a consequence, on an average 97% of the generated municipal waste eventually ends up in landfills (Jovanović, 2019). Looking at the shares or sources in the municipal waste, a high number of organic waste was identified (39%), followed by plastics (21%) and textiles (15%). Other potentially profitable sources are paper (7%), glass (6%) and metal (2%), as shown in figure 38 (City of Niš, 2010).

In the next step, already existing frameworks were reviewed, starting with UN-Habitat guidelines, followed by EU principles and finally by the Waste Management Strategy of the city of Niš.

UN-Habitat developed an analytical framework for solid waste management known as "two triangles".

Figure 38: Waste categories (City of Niš, 2010; redrawn by Hiller 2021 with NounProject, n.d.)

This framework distinguishes three physical components of solid waste management systems: waste collection services - driven by public health concerns, environmentally sound disposal - followed by environmental concerns and the 3Rs - steered by economic value of resources. In addition, the framework also focuses on three governance aspects, namely: inclusivity of users and providers, financial sustainability and sound institutions as well as proactive policies (UNEP, 2013).

The waste management hierarchy indicates an order of preference for action to reduce and manage waste, and is usually presented diagrammatically as in figure 39. Different versions of the hierarchy have been adopted by different countries, although they are all broadly similar to that outlined above. The EU, for example, has adopted a hierarchy comprising, in descending order, prevention, preparing for reuse, recycling, other recovery (e.g. energy recovery) and disposal (Directive (EU) 2018/851 on Waste).

The 2011-2021 Waste Management Strategy of the city of Niš also covers most of the aspects discussed at UN and EU level. It has outlined priorities, profitable recycling goods such as paper, plastic, metal and glass along with planned separation and collection projects. It has also highlighted inclusion of Roma community within the waste management framework and supporting local industries with employment opportunities (City of Niš, 2010).

Analysis of the theoretical framework led to clarification of the major stakeholders who would play a vital role in the success of each step, e.g. cooperation of residents and community make a significant contribution towards working of bottom-up waste management system (Muller et al., 2002). This information acted beneficial in further development of the stakeholder involvement in the project .

STRATEGY and INTERVENTION

Oriented on reviewed frameworks and case studies, the proposed waste management strategy revolves around convincing and incentivization of stakeholders, separation, collection and dealing the waste, as well as information about responsibilities, engagement, and motivation. These concepts will be achieved through implementation of the four components demonstrated in figure 40. For each component, an executive body is introduced.

Figure 39: Waste hierarchy (Directive (EU) 2018/851 on waste, redrawn by Bahari, 2021)

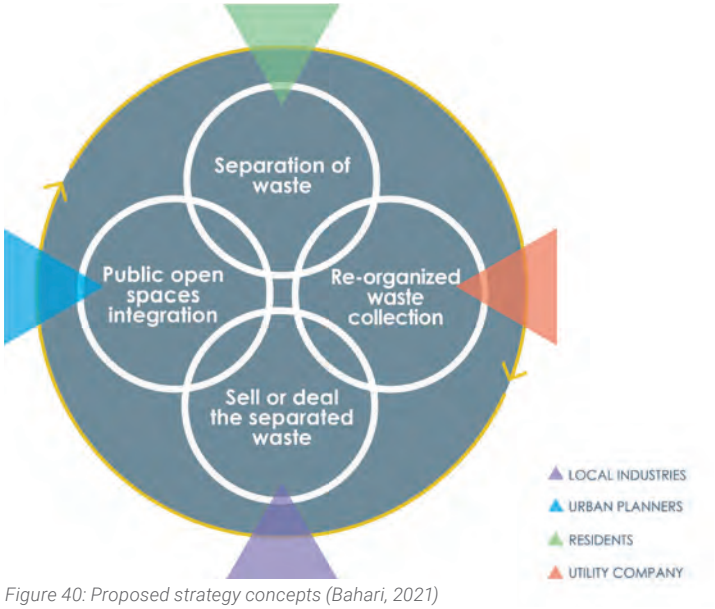

Figure 40: Proposed strategy concepts (Bahari, 2021)

Starting with the separation of waste as a partially missing behavior in the city of Niš today, a set of actions is required to be taken.

The principle of separation at source will be implemented by introducing a decentralized organic and household waste collection on one hand and a centralized collection for recyclable products on the other. For the decentralized collection by utility company's garbage trucks, hygienic, proper spaces will be set up next to each building block or row in the accessible streets. For the separation of dry, recyclable waste such as plastic, paper, metal, and glass, residents shall take action to bring them to one of three "recycling islands", which are a suggestion taken from the reviewed frameworks.

These spots are designed as flexible, multifunctional areas within the neighborhood where residents can put their dry and recyclable waste. In addition, waste bins will be a part of the urban furniture as the islands consist of the five different modules named as Waste, Greenery, Meeting, Play and Education. With these elements, waste management, community building, as well as integration in public spaces and awareness raising can be introduced. The mentioned modules can be combined with each other in various ways as all of them have the same length and width. However, to prevent foul odor, waste should not be put directly next to meeting modules. In addition to that, waste modules should be taller than other modules. Their slot should be sealable and placed away from the sitting area. To raise awareness, electronic displays showing the amount of waste collected and information about the potential or future materials will be placed next to the modules. The "recycling islands" can be implemented fast and easy without the need for building permits, tortuous approvals processes or heavy construction works. Moreover, they are multifunctional and if changes or removal is necessary, structures can be dismounted without problems and are reusable in other locations. This is an advantage in comparison with heavier alternatives as acceptance of investors might not be reached and approval from municipality might take longer time. Therefore, recycling islands are an ideal intervention to meet the objectives of a proper separation and disposal of waste while spatially integrating the facilities in the neighborhood to make the public spaces more attractive. Furthermore, by adding gathering and playing possibilities as well as education, information sharing and awareness creation tools, residents can be engaged and motivated.

Following separation, collection will be done by different stakeholders. Recyclable waste from the islands will be picked up by existing private industries and pickers. They will integrate the raw material directly in their processes or sell them profitably.

Production and recycling companies for the sources paper, plastics, metals, and glass were identified in Niš. Additionally, the existing municipal utility company would reorganize their schedule and limit

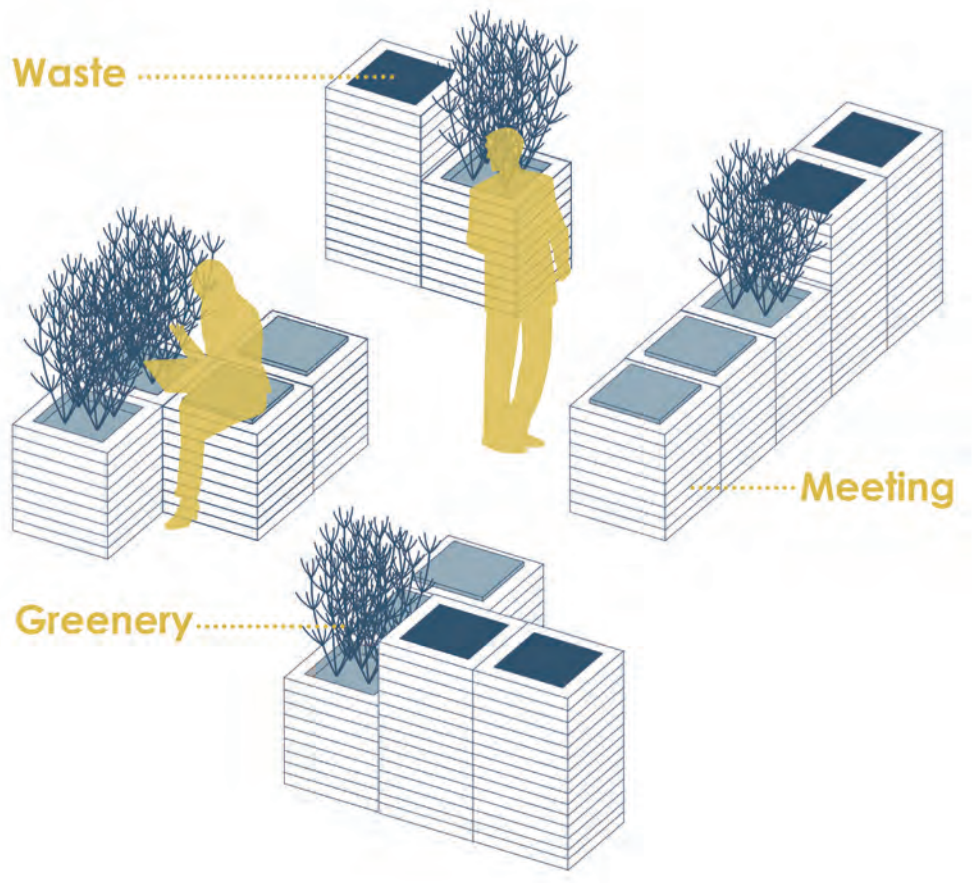

Figure 41: Proposed modular recycling islands (Hiller, 2021)

their actions to decentralized door-to-door or curbside pickup of organics and household waste. Both would be brought to the landfills where compost can be produced from organic waste. Regional farmers can pick up the final compost directly at the landfill for an incentivized price and use it to fertilize their fields. Apart from the advantage for the utility company to have less total residual waste and get stable income from buyers in the region, the concept would also benefit farmers. It would save them money from buying synthetic fertilizers and they can advertise their products as local and healthy by using regional compost. In addition, purchasers would be offered to sell their products on the weekly farmers' market in the Somborska neighborhood without paying any fees. With this, a circularity can be introduced from product to consumer, to compost and finally back to the cycle. Once a week, the market would benefit the neighborhood by transforming public spaces into community gathering points where shopping, communication and information can be combined.

By inviting farmers, who use residents' compost, awareness about potentials in waste as a resource and the necessity of separation can be raised while establishing a regular collective event for the whole Somborska neighborhood.

CONCLUSION

The absence of qualitative open spaces and the spatial, visual, and environmental pollution by household waste within the neighborhood were observed as two of the main challenges. In order to tackle these issues, a waste management strategy was developed which addresses the waste issue on one hand and integrates the open spaces and the unsatisfied residents on the other hand. The principles of separation at source and recycling of valuable materials were implemented and waste pickers, residents as well as public and private companies were included in the separation and collection activities. Recycling islands and farmers' markets, integrated in the underdeveloped open spaces, provide additional gathering possibilities and awareness-rising elements.

The combination of all mentioned measures form a powerful waste management strategy that can lead to a decrease in spatial, visual and environmental pollution, enhanced public spaces and an improved satisfaction of the residents in the neighborhood.

Figure 42: Integration of modules in the enhanced open spaces (Bahari, 2021)

Figure 43: Integration of local farmers in the social activities taking place in the open spaces (Bahari, 2021)

Figure 44: Intervention lookout (Tesfamichael, 2020)

GROUP 5
NO FLOODING IN SOMBORSKA

INTRODUCTION

No doubt cities across the world are facing different environmental challenges as a result of urbanization, among which urban water challenges take a share. This is uniquely evident when assessing the impact of urbanization on urban stormwater.

From the authors point of view, the need for proper planning and management of stormwater arises when a particular portion of land ceases from being in its original state as a result of development. As vegetation is removed and replaced with impermeable surfaces such as buildings and paved roads, the natural infiltration capacity of the site is reduced. For this reason, sustainable solutions and responses have been developed to meet the stormwater challenges that come with urbanization.

One of the environmental threats to the city of Niš and Serbia as a whole is urban flooding. The constructed flood defense structures and other measures taken so far to address the situation do not meet protective requirements (UNDRR, 2019). In 2014, Serbia experienced a heavy flood event that displaced over 1.6 million people, and resulted in at least 53 recorded deaths (Belgrade, 2014). On May 15, of the same year, the city of Niš alone experienced a 68 mm rainfall (Reliefweb News, 2014).

In the attempt to find sustainable solutions to the stormwater problems, resulting from heavy rainfall events and swift gravitation of runoff in the city of Niš, this research proposes different sustainable stormwater management technologies for the Somborska Boulevard neighborhood based on the feasibility evaluations for implementation of each technology.

KEY FINDINGS

Weak regulation and application of policies

The rules and regulations of the land use and planning of the city are influenced by the politicians and investors. This has limited the participation of the society in the planning process.

Insufficient livability amenities

The impact of the weak regulation and land use planning can be observed in the neighborhood of Somborska Boulevard. There is little space between apartment blocks, lack of playgrounds and other community activities, poor solid waste management, interrupted pedestrian walkways, unregulated parking spaces, and unsustainable stormwater management (Miljkovic, et al., 2014).

Irrational freshwater use, wastewater discharge and poor stormwater management

The extraction, treatment and delivery of freshwater depletes energy and natural resources. However, due to the low water tariff, sufficient financing for maintaining the water infrastructure could not take place (Brussels regional public service, 2017). Since there is no wastewater treatment plant in Niš, untreated wastewater is discharged to water bodies (Balkan Green Energy News, 2017). During the high precipitation months of May and June, the streets are flooded because of overstressing in the stormwater drains (N1 Belgrade, 2020).

ANALYSIS

Concerning stormwater issues

The post-socialist transition brought a lot of changes and challenges to the city of Niš. It was observed during our analysis that the development of Somborska Boulevard lacks several livability amenities which include a lack of green open spaces and poor stormwater management. Poor policy regulation, disobedience to land use policy, and lack of compliance from the investors were some of the causes of the uncoordinated development. Investors, whose interest is only in making a profit, used up every space for erecting buildings. As a result, the buildings are convergent and open spaces are lacking (Vasilevska et al., 2014).

In the initial analysis phase of the project, maps showed the built and sealed areas that cover more than 70% of the total area of the neighborhood. On the contrary, the potential green open spaces make up only 14% of the total area. Also, the site pictures show the lack of rainfall drainage maintenance.

RESEARCH QUESTION

"What sustainable stormwater technologies can be applied to address flooding with integrated open spaces in the Somborska Boulevard neighborhood?"

In the in-depth analysis phase, more qualitative and quantitative analysis tools were engaged, including maps, slope analysis, SWOT, Stakeholder analysis, interviews, a problem tree, and an objective tree. These analyses provided more clarity regarding the challenges and risks that may be encountered in the neighborhood, as well as how the project will benefit from the available strengths and opportunities.

The key findings from the analysis provided support to gain insight on ways to advance stormwater management projects and address intense rainfall through the integration of blue-green strategies.

CONCEPT DEVELOPMENT

The concept approach was based on current opportunities in the neighborhood. The district was developed in a way that presents several limitations which hinder the integration of some new infrastructures due to a lack of space. The project has taken into consideration the lack of greenery and open spaces in the district, an issue that has caused several protests by the residents demanding the creation of some.

However, the focus is to address flood-related issues in the neighborhood, which is the result of intense precipitation and a lack of sufficient stormwater management technologies. The project analyzes the best available data with similarities to the Niš climate. The concept finds the best stormwater management practices that provide the neighborhood with some greenery while still solving stormwater problems, and in regards to the climate change mitigation and other health benefits.

PROPOSED TECHNOLOGIES

In determining the stormwater management technologies that are viable for Somborska Boulevard, a series of them were analyzed, out of which some proved not feasible due to site limitations. However, a few sustainable stormwater management technologies were found to be feasible in the neighborhood, such as tree pit, bioswale, and permeable surface technologies. These three technologies portray similar techniques at managing stormwater, either by infiltration, evapotranspiration, runoff detention/retention, or reuse of stormwater.

Tree Pit Technology

The advantages of tree pits as a stormwater management technology cannot be overstressed. Urban trees direct precipitation into the ground through trunk flow and absorb rainfall through their roots (GreenBlue Urban, 2015), while the runoff filters through the tree roots and to the surrounding soil mix. Regarding sustainability aspects, urban trees contribute to climate change mitigation by reducing the overall concentrations of greenhouse gases in the atmosphere (NASA Global Climate Change, 2019).

The implementation of the tree pit system was found feasible for the neighborhood, in consideration of the availability of some key principle requirements of the technology within the site. For example, the soil type in this neighborhood corresponds with the type of soil suitable for tree pit technology. This soil allows easy infiltration of stormwater, and is suitable for tree root growth (USEPA, 2016).

Bioswale Technology

Swale is one of the essential stormwater management infrastructures used in urban areas. This technology shares similar principles to the tree pit system. It is designed to capture, detain, and treat stormwater. The swale takes surface flows from adjacent paved surfaces and allows water to infiltrate through the soil bed into the underlying soil, providing underground storage in a drain rock reservoir (New Westminster, n.d).

This technology was considered feasible to be implemented in Somborska Boulevard due to its low construction cost as well as the possibility to integrate its maintenance into landscape management. In terms of sustainability aspects, bioswale portrays several environmental benefits. It strengthens the presence of plants and contributes to a healthier ecosystem.

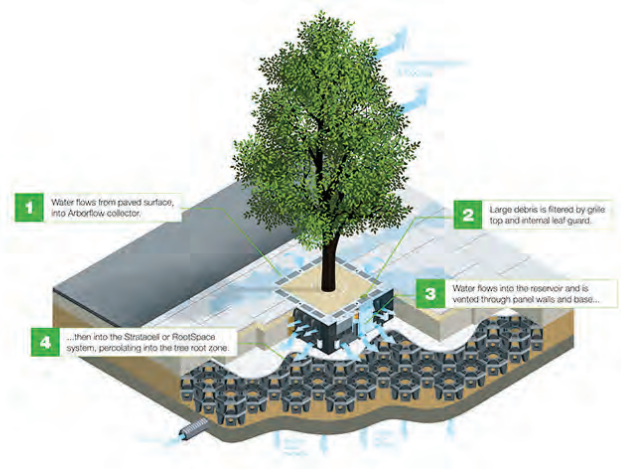

Figure 45: Tree pit system (GreenBlue Urban, 2015)

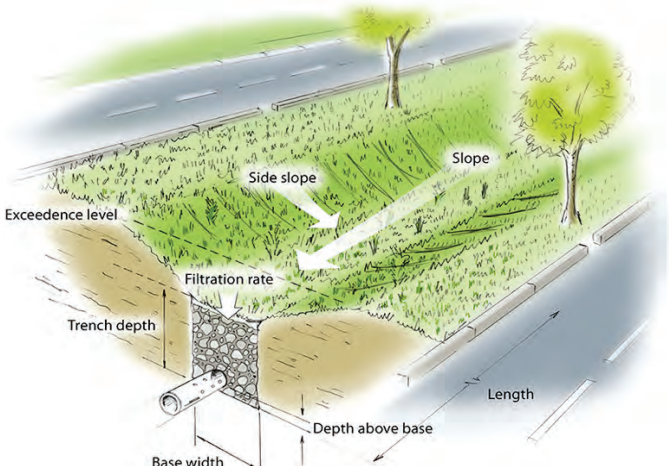

Figure 46: Bioswale (Innovyze, 2021)

IMPLEMENTATION STRATEGIES

The stakeholders in this project can be classified into two main categories; stakeholders who will render services or engage in the project until the completion and the others, who will be permanently engaged in the process. Stakeholders who will engage in the project temporarily will be the project team, contractor, funders, and other supervising bodies. The residents and authorities administrating the area will be permanent stakeholders of the project.

Integrating the society, economy, and environment will help to achieve the expected result on the proposed technologies. The residents, research institutes and the governing body should participate in the processes of delivering the project and to create responsibility as well as awareness on what the proposed technologies can contribute to the neighborhood and the environment.

Engagement of different stakeholders on funding and financing will allow the project to be completed on the expected schedule and to generate income for maintenance and service afterward. An extended monthly fee of the tenants will enable proper functioning of the technologies until the estimated service year. The fund for the implementation of the project will only be a one-time payment until the completion of the project.

CONCLUSION

As the current planning of Niš is a market-oriented planning system, it influences the sustainable planning of the city. One problem the city faces is not having a sustainable urban water cycle. Since the water tariff is low, potable water is used irrationally, and it cannot secure finance for maintenance of the existing infrastructure. Wastewater and stormwater are discharged to the Nišava river without any treatment and the stress on the drain lines creates flooding in the city. Considering stormwater management solutions at the source will ease the stress on the sewer lines and contribute to reducing urban flooding.

After analyzing the site conditions and potential technologies, tree pits, swales, and permeable pavers on unpaved areas were proposed. Further study and research on the expansion areas of the neighborhood are recommended to incorporate green roofs and retention basins. Furthermore, revisions of water policies on the legislation level are suggested to create a sustainable water cycle in the city of Niš.

Figure 47: Site location for implementation of the technologies (Alyousef, 2021)

CONCLUSION

by Cicilia Steffi Lukman & Daniel Tesfamichael

This research aims to enhance the resource efficiency in new housing post-socialism planning in Niš, Serbia. As the basis of preliminary knowledge of site condition, a virtual visit was conducted and insights about the planning and legislative framework in Niš were gained. Various topics such as energy, water, material, waste, land use and housing development, and mobility in Niš were also discussed. Afterwards, different analysis tools were executed to address the challenges on site and possible intervention approaches were created.

The main purpose of this research is to improve the housing condition of Somborska Boulevard, either from social aspects that can be seen from the interaction and social engagement between residents, or environmental aspects in the neighborhood

Figure 48: View of Niš (Young, 2019)

planning. The proposals presented in this research arose from different perspectives, such as behavioral change in creating a less car-dominant neighborhood, the improvement of pedestrian lanes, optimization of public open spaces, waste management strategy and its integration in the urban planning, and potential stormwater harvesting in the neighborhood. The challenges that would be faced during the implementation of the projects include acceptance from the residents, different approaches in engaging the stakeholders, adaptation and adjustment to the current local context, and financial support.

Due to the top-down approach and market-led policy, the power and influence of the authorities and investors have dominated the participation of other stakeholders.

Any sustainable project would be beneficial to the environment and the society. The engagement of non-profit organizations and institutes create a chance to control the misuse of the fund and reach the expected end results.

The proposed projects conduct an opportunity to create awareness on sustainable development planning of the neighborhood, efficient use of resources, and utilization of open spaces. The same approach can also be implemented in other neighborhoods of Niš in order to make the whole city more liveable. In order to achieve that, cooperation and effort from the stakeholders involved is required to tackle the obstacles and cultivate the potentials of the neighborhood and the city of Niš.

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LIST OF FIGURES

LIST OF ABBREVIATIONS

DAAD	German Academic Exchange Service
EEA	European Environmental Agency
EU	European Union
HCU	HafenCity Universität Hamburg
IEA	International Energy Agency
MCDA	Mulit-Criteria Decision Analysis
MSW	Municipal Solid Waste
NGO	Non-Governmental Organization
P4P	Places 4 People
PV	Photovoltaic
REAP	Resource Efficiency in Architecture and Planning
SWOT	Strengths Weaknesses Opportunities Threats
UN	United Nations
UTCI	Universal Thermal Comfort Index

ISBN: 978-3-947972-27-2