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Making Healthy Cities for People HURBE2021

Education, research, practice in planning, architecture and engineering

4-5 October 2021

Faculty of Architecture, University of Sarajevo

Sarajevo, Bosnia and Herzegovina

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Healthy Urban Environment

2021

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Introduction

Making Healthy Cities for People

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Head of Conference

The International Conference HURBE2021 “Making healthy cities for people. Education, research and practice in planning, architecture, and engineering" is the final and at the same time the first step of the project Capacity Building in the Field of Higher Education (CBHE- KA2) “Healthy URBan Environment Developing Higher Education in Architecture and Construction in Bosnia and Herzegovina - HURBE” co-financed by European Commission (2018-2021).

The Conference was launched by the HURBE consortium that consists of three Higher Education Institutions (HEIs) from programme countries - Sapienza University of Rome, Italy (coordinator); the University of Zagreb, Faculty of Architecture, Croatia; University of Architecture, Civil Engineering and Geodesy, Bulgaria - and three partner country HEIs in Bosnia and Herzegovina (BiH) - Džemal Bijedić University of Mostar; the University of Sarajevo, Faculty of Architecture, and University of Zenica - plus six associated partners from different parts of Europe - the Center for Information and Recognition, BiH; European Association for Architectural Education; Federal Ministry of Education and Science, BiH; Federal Ministry of Health, BiH; Mediterranean Universities Union and the Italian Ministry for Universities and Research of Italy, Office for Internationalization of Higher Education.

HURBE consortium worked for three years on the modernisation of curriculum in the partner country universities through the development of new and innovative courses and installing specialized laboratories dedicated to operating in the field of the Healthy Urban Environment. Despite the COVID-19 pandemic, the project was able to reach its objectives and achieve the following results in the Bosnian HEIs:

- Six new courses on ‘Healthy Urban Environment’ were designed, approved, and delivered.
- Three laboratories equipped with specific instruments, were installed, and used by students and researchers.
- Two Massive Open Online Courses (MOOCs) “Healthy urban environment. Spatial Planning and Architecture” and “Healthy urban environment. Engineering” were designed, recorded, and submitted. These courses are currently available online for all types of participants.

Although, this text is not the 'place' to describe in detail the HURBE project, and also because it is difficult to summarize all the efforts that the consortium members exerted to study, discuss and share their experiences, the brief description written above, allows the readers to have an idea of the context in which the consortium operated for the organisation of the conference HURBE2021

The HURBE2021 conference aimed to share interdisciplinary visions, studies, plans, projects, and experiences for making a 'Healthy City'. It connected scholars and practitioners in the HURBE project countries and the surrounding region, as follows: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Italy, Kosovo, Montenegro, North Macedonia, Romania, Serbia, and Slovenia. The project consortium decided to open the conference call on 30.11.2020. The call focused on these countries to initiate a dialogue and enhance collaborations on a regional scale. This represents a step towards a long-term vision for the establishment of a regional association and/or network that addresses on the themes of healthy urban environment.

The design of a healthy city requires a holistic approach that overcomes sectorial visions and effectively enhances people's health. After the Covid-19 pandemic, the topic has become even more actual and urgent. It is a challenge for all disciplines in the architecture and engineering fields, moving through a process of interdisciplinary or transdisciplinary collaborations with other disciplines (such as sociology, anthropology, economics, environmental health, medicine and others).

In the last twenty years, the rise of inhabitants in urban areas is a growing trend: in 2018 55% of the world population live in urban areas, and according to the last projection is expected to reach 68% by 2050 (UN 2018; Ritchie and Roser 2018). The world's cities occupy just 3 % of the earth's land, but the most significant consumption processes take place in them. The cities consume between 60 and 80 percent of energy, they generate 70 percent of human-induced greenhouse gas emissions, they produce 70 percent of global waste and, indeed, they are the hubs of the world economy for 70 percent (UN). In this framework, Europe is a region with a high density of urban population, where more than 74% of the population live in urban area, and the density is 34 people per square kilometre on the total land area of 22,134,900 square kilometre (Eurostat 2016; Worldmeter 2021). Although it is characterized by low fertility rates, population decrease, and significant diversity in urbanization levels of each country, Europe is the third continent in the world, after Asia and Africa, in terms of population number.

The 2030 Agenda for Sustainable Development, which includes the Sustainable Development Goals, highlights the global importance to build "A world with equitable and universal access to quality education at all levels, to health care and social protection, where physical, mental and social well-being are assured" shortly a world where the people's 'health' is at the core.

In fact, "Health is a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity (WHO 1948)" and it is "A resource for everyday life, not the objective of living. Health is a positive concept emphasizing social and personal resources, as well as physical capacities"…. "Health is created and lived by people within the settings of their everyday life; where they learn, work, play, and love" (WHO, The Ottawa Charter, 1986). The definition of health is constantly evolving because health is a dynamic state of well-being depending on the interaction among different kinds of determinants like the individual, social, and environmental ones. The health is strictly interconnected to the environment where we get born, live, grow, love, work,

and age. The environment is made by natural resources like water, air, soil, forest, etc. and 'places' as housing, buildings, streets, routes, green area, and so on. For these reasons, building a healthy city is as a long-term process, not an outcome. A healthy city is a city "that is continually creates and improves its physical and social environments and expands the community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential" (Health Promotion Glossary, WHO 1998).

According to international official documents, the topic of the healthy city is a vast one and it ranges from the promotion of 'caring and supportive environments' to 'healthy living' and 'healthy urban environment design'. The actions for developing the 'Healthy urban environment and design' interest a wide range of aspects as urban planning, urban design, creativity and liveability, climate change and public emergencies, safety and security, transport, exposure to noise and pollution, and housing and regeneration (WHO-EHCN 2009).

These brief considerations clearly show the role of the architecture and engineering disciplines in the processes of planning, building, maintenance, and regeneration of the urban environment, while promoting and enhancing people's health. Making a healthy city involves different scales of intervention: the level of the city, neighbourhood, local environment, and building. Whatever the scale of intervention of this process is, it must be developed in a constant dialogue with the cities' users, and through an exchange with other disciplines.

The political strategies and decisions play a crucial role in the activation of those processes. Health is a human right and so it is the right to the city, for that reason with a syllogism, it is possible to argue that the city is a driving force for the right to health.

In this framework, the steering, scientific, and organizing committee of the HURBE consortium identified three thematic areas for the international conference. These areas cover various strategies, projects, and actions that directly influence the health of citizens. They are identified as described below.

- Healthy spatial planning: integrating health considerations into urban planning processes, programmes, and projects, especially emphasizing master planning, transport accessibility, and neighbourhood planning.
- Healthy urban and architectural design: integrating health considerations in creating socially supportive environments, enhancing cities' distinctive and multifaceted cultural assets in urban design, and promoting designs that meet all citizens' expectations for safety, accessibility, comfort, and active living. This thematic area also includes the topics of housing, creativity, and all relevant subtopics related to healthy urban and architectural design.
- Healthy engineering: integrating health considerations into technical design, construction, operation, and processes, with specific attention to the building and mechanical engineering-related branches such as the noise reduction in all its forms, air pollution, toxic and health-damaging substances, and the potentialities of modern technologies like the Internet of Things (IoT).

The conference organizers invited researchers, professionals, and experts to exchange and share their experiences, in relevance to the thematic areas, in the fields of teaching, research and practice, concentrating on the region of the interest of the consortium.

The members of the steering, scientific and organizing committee of the HURBE consortium, with the members of the international scientific committee, represent the full scientific board that guarantees the quality of the blind peer-reviewing of all contributions. The scientific board members accepted 36 papers, that were presented by professors, researchers, PhD students, and practitioners from Albania (2), Bosnia and Herzegovina (7), Bulgaria (6), Croatia (4), Italy (9), Kosovo (2), North Macedonia (2), Romania (1), Serbia (2) and Slovenia (1). Most of the authors positioned their papers in the thematic area "Healthy urban and architectural design", and in the field of 'Science/Research' (23), the remaining papers addressed experiences in 'Teaching' and in the 'Field of practice'. In the feedbacks of the first reviewing process, the scientific board members invited most authors to highlight the direct links between their work and the topic of health, which in some cases were not clear, taking into consideration, that every anthropic planning and transformation process within the city generates an impact, directly or indirectly, on the human health. After the second reviewing process, 31 papers were presented in their final version.

The HURBE proceedings book is divided into three sections, according to the thematic areas identified by the steering, scientific, and organizing committee, respecting the choice made by each author, or group of authors, to allocate in one of the areas the paper: healthy spatial planning, healthy urban and architectural design, and healthy engineering. For each section, an overview written by HURBE consortium members highlights the most important aspects that emerged from the papers.

Matching and elaborating the keywords indicated by the authors to identify the arguments of their papers, it is interesting to focalize the attention on two specific words: health, and its adjective healthy, and urban, to understand the link with the other 'keywords' or 'key adjectives', written by the authors, to limit and describe their papers. The result of this 'matching' is represented in the figure below. It shows the main fields of interest of the selected papers and the connections between 'health' and 'urban', and the words or adjectives associated with each of them.

Figure 1: 'Health' (or Healthy) and 'Urban': keywords elaborated from papers and their connections (by Author).

At the beginning of this introduction, I wrote that HURBE 2021 is the last step of the HURBE project, but at the same time, it is only the first step for achieving other results. In fact, this first edition of the conference will be followed by future biennial appointments to share experiences and expand the vision of designing healthy cities. The second edition of HURBE international conference is planned in 2023 in Croatia.

The steering, scientific, and organizing committee of the HURBE consortium is currently working on the creation of a network between universities and institutions from the conference countries. This network is dedicated to the topic of 'healthy urban environment'. It will provide a space for exchanging and discussing experiences in the fields of research, teaching, and practice. It will boost cooperation between academics and external stakeholders. It will provide various benefits through the activities promoted within it (exchange of researchers, application for European funds, project design support, conference organization, etc.).

Before concluding, a sincere thank you is due to our dear colleague and project member, Dženana Bijedić, who passed away on 16.06.2021. Professor Bijedić's holistic approach to architecture, urbanism and environmental protection was an inspiration through the whole project. On the behalf of the local coordinators - Professors Senaida Halilović-Terzić, Samir Lemeš, Vesna Mikić, Maja Roso Popovac, and Milena Tasheva-Petrova - and on behalf of all the academic team, I thank her for all her valuable contributions. Her memory and ideas will continue to live and inspire through every project member.

Finally, I express my gratitude to all the members of the international scientific committee. Their contribution was the key to enhancing the scientific quality, internationalisation level, and promotion of the first edition of HURBE 2021 conference. I, also, thank all the esteemed authors for their contributions and trust.

"Making a healthy city is a long process of co-creating and co-dreaming the future of the city in which we live. Let's starts to dream!" (Author).

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Healthy Spatial Planning

Overview

Healthy Spatial Planning

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The Healthy Spatial Planning session outlines the growing importance of health considerations in planning in contemporary societies. The papers discuss topics, scales, aspects, and intersections across various geographical locations. The presented papers from Bulgaria, Bosnia and Herzegovina, Italy, Kosovo, Slovenia, and Serbia position health in the light of various perspectives, related to culture, planning ethics, changing theoretical and applied research on planning approaches, methods, and tools.

The papers regard the city as an arena of health-related activities. They present different interpretations of the links of health with urban morphology - densities, streets, intermediary space between buildings, and metropolitan development. The regional scale of planning and development is also discussed in different contexts and perspectives: the shrinking cities and the potential of building networks of peripheral and border cities of the Danube region through valorization of the natural and cultural heritage and promoting projects for sustainable tourism; the co-planning of urban healthy corridors in the border urban area of Nova Gorica (Slovenia) and Gorizia (Italy); and the potential to build regional and local sustainability based on the spatial framework for tourist development of the Herzegovina-Neretva county.

Public open space, urban green infrastructure, urban public space, mobility with a focus on walking and cycling, and tourism are among the key topics discussed. The healthy city characteristics are related to the importance of re-integrating nature in the city). The authors demonstrate a growing sensitivity to the urgency of reacting to climate change and covid-19 pandemics and to the importance of re-balancing the co-existence between human beings and nature. They pay special attention to the role of the urban public and private open space system as capable of facing the current health and climatic emergencies. Some papers re-consider the connection between health, people and buildings under the pandemic; others open a discussion on the changing needs, perceptions, and use of urban space during the Covid-19 situation, e.g., the increased pedestrian and bicycle mobility, and the importance of access to green open space. The issue of environmental injustice in times of pandemic is also addressed by re-evaluating territorial imbalances, social inequalities, anti-urban behavior. Suggestions are

made for the revitalization of villages and small municipalities located in the inland areas.

Experimentation and technical but also social innovation are claimed important. The changes in planning approaches identified as necessary are interdisciplinarity, cross-sectoral cooperation, integrated and participatory approaches, inclusive planning; urban acupuncture; landscape urbanism, and building adaptive, resilient, and eco-oriented scenarios.

The raised key issues of planning ethics comprise the 'right to the city' concept as mentioned in several papers and social inequalities alongside requested better knowledge about the specific needs of vulnerable or disadvantaged groups and teenagers.

Several papers present theoretical and applied research results of international, regional, and local projects. The EU-funded research projects presented, as the Horizon 2020 projects CLIC, URBiNAT, and REBUS reveal the efforts to conceptualize but also to quantify and operationalize needed changes on the path to a healthy urban environment. The papers reflect on implementing a variety of research methods – theoretical analysis, comparative analysis of the urban morphology and the local microclimate, NBS-based planning and inclusive design, and estimation of environmental impacts. Some papers suggest practical tools for the local level of governance, as the preventive and reactive platform for cities resilient to pandemic and epidemic situations. Tourism is seen as one of the economic sectors with a potential to bring positive changes to society. Landscaping through spatial plans is regarded as an effective tool in support of the public interest.

Healthy urban environment is embedded in the broader frame of culture – users' changing lifestyles, the role of heritage, and the need for a new planning culture. A growing sensitivity to culture and its regional peculiarities could be traced in most of the papers. Re-thinking recent regional legacies is discussed, including that of socialist Yugoslavia, e.g., the culture-specific trends of post-Dayton Sarajevo's informal settlements and their impact on the environment. The comparative analysis of the high-density fabrics of private buildings and the public residential buildings of the 1950s along the Tuscolana road axis in Rome add value to the discussion on legacy, urban form, and healthy environment from a different cultural perspective. The changing culture of urban space users is reflected in the attempts for helping citizens, and especially teenagers to develop responsibility for their own health by involving them in the process of urban co-creation in Sofia, in the increasing NBS popularity, and in raising awareness on intercultural and cross-border values. The importance of educating new planning culture is stressed upon by acknowledging the need for planners' 'adaptability' and attaining new skills to evaluate, analyse, rank, and prioritize. Student urban research is estimated to contribute to realistic proposals for a healthier city and a constant interplay between learning spaces and healthy places in the dynamically evolving urban environments is outlined.

Rethinking the Urban and Territorial Space

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ABSTRACT

With the Covid19-pandemic, ancient problems of territorial imbalance have arisen, not only between north and south but between metropolitan cities and medium-sized cities, between the same urban neighborhoods. Urban concentration has manifested all its contradictions and dangers.

Debate opens on prospects for changing contemporary city model and, one may hope, like Lefebvre in 1968, a new "Right to the city".

A city that has changed culturally and economically compared to the past where contradictions persist: in social inequalities and in the fracture between the center and the suburbs.

Debate over prospects for change in contemporary city's centralised model that, as a magnet, attracts innovation, economy and ideas, desertifying the rest of the territory.

Today, forced distancing lockdown for the pandemic situation leads to anti-urban behaviour and makes it difficult to understand what the outcome will be in terms of living and working.

It is propose a return to the villages, to the small municipalities located in the inland areas: proposals that result from the search for greater livability than metropolitan areas, but that would also represent an opportunity for territorial rebalancing.

Italy of the "hundred bell towers" has produced cities and villages of exceptional beauty that today are at risk of extinction. It takes a great national project to redesign cities, places and landscapes of the "Bel Paese" and heal existing imbalances in fragile internal areas.

Will predictions of possible increasingly damaging pandemics be enough to reverse course?'

It's a gamble with uncertain outcomes, given the development model of today's cities.

Salvatore Settis recently spoke of a "prison city" and called for a return to the countryside "as a place to stay alive".

Rem Koohlaas in "Delirius New York" identifies urban gigantism and "Manhattan-ism" as a "culture of congestion" that forces residents to live in a completely artificial, unimaginative landscape.

Keywords: *Anti-urban behaviour, Lockdown, Urban gigantism, Internal area.*

INTRODUCTION

Covid-19 has jeopardized certainties already acquired on the development model of the contemporary city and its territory, fuelling a debate that implies a change. We wonder about the future of historic centres, about a new city-countryside relationship, about new ways of producing and working. After years of analysis, conferences and writings on urban dynamics, it was necessary to ascertain that the model of development consolidated after World War II contains dangers that had not been carefully evaluated. Covid-19 raised questions about urban concentration, about the nature of the attractive power of cities which, as a magnet, attract innovation, economies, dynamism and ideas, impoverishing the surrounding territory.

Today, special distancing induces anti-urban behaviours that make it difficult to understand what results it will bring, in terms of regulations and new forms of living and working. The city as we know it will most likely have to be transformed.

There is, however, an underlying inertia; in reality, an immediate return to the past is hoped for, without excessive changes.

In theory, everyone agrees that the metropolisation of the territory is the major cause of the pandemic: a place of soil, air and water pollution, propagation and outbreak of contagion. The concentration of the population of the large metropolitan cities, overflowing into the territory through an urbanized continuum, devours the territory. A model defined by Bernardo Secchi as "porous", as it expands through urban elements not directly connected to each other. Urban hierarchies, networks of cities, the settlement structure of Christaller's memory are broken, in favour of ensembles, settlements that follow one another obeying exclusively the laws of the market and real estate values (Secchi, 2015).

CITY AND COUNTRYSIDE

In reality we have seen how the utopias of the modern city made up of grands ensembles, of habitation units surrounded by greenery, have been transformed into the nightmares of superblocks and of the nothingness of the out of town. In contrast to these urban structures, in the sixties the historic centres were re-evaluated and became the object of restoration; in them a real city "effect" was recognized as well as an inestimable monumental heritage.

The clean slate advocated by the modern movement in architecture for historic cities, expressed in the effective image of le Corbusier's Plan Voisin (1925), was created in a different and distorted way in the suburbs, which in some cases have become desolate, threatening places and areas of conflict. However, in the courses and recurrences of history, today the suburbs constitute, with the presence of a still easily alterable fabric, the propitious place for new architectural scenarios, where it is still possible to operate and experiment with new urban arrangements.

Today, the suburbs threaten the historic city, with shopping centres, multiplex cinemas, subway stations and airports. In Turin, "a skyscraper made to measure for the historic city" is being built and in Milan the projects for new skyscrapers, even if covered with greenery, are profoundly altering the city's skyline.

Is architecture still beneficial for the cities? Josef Rykwert, identifies the loss of the role of architecture in the inability to produce shared symbols and in having reduced the symbolic system of the built world to an elementary degree that often is reduced in the construction of a skyscraper. Architecture as a profession of thinking of the city that is in intimate contact with its history, could still have

an extraordinary democratic function, it could be the meeting place for those who try to build the most just city for all.

Humanity - Rykwert maintains - “has been able to create cities for a few centuries knowing what to do, by simply assembling elements”. Perhaps these are very appropriate questions, which nevertheless give the measure of how architecture, while multiplying the symbols of a new formal language, which is expressed through unique elements, often detached from urban contexts, has lost “the art of making the city” which is fragmented, as a result of single elements that do not converse or interact with one another (Rikwert, 1996).

The slow death of the urban middle class, the rise of architecture as an instrument of pure urban marketing, has contributed to the narrowing of architectural social objectives, at a time when it was beginning to penetrate the imagination of a wider public. This has greatly influenced the material way of making architecture: it is no coincidence that we have always been bombarded with new interventions and projects: from Renzo Piano’s skyscraper in New York, to the nuvola di Fuksas, to the bridges of Calatrava, Jan Nouvel, Koolhaas, etc., in a kaleidoscope that changes quickly.

In this multifaceted framework where everything moves and is replaceable, it is reassuring to think that - as claimed by Marco Romano - “the mature cities of Europe in the last thousand years can legitimately be considered as works of art, since their artefacts have been imagined in themselves as such and that their mutual disposition was in turn created with that intention ”(Romano, 2004).

We work more and more in the awareness that it is necessary to clarify the role of planning the different parts of the city and their proposal for the overall structure, in the “composition” of urban projects and in the diffusion of the environmental sustainability of the territory.

IS THE CENTRE THE OUTSKIRTS?

The part of the city that we traditionally recognize as “historical” is the product of an evolution that from time to time has been updated and contemporised by its inhabitants. This particular transformability of the structures requires continuous updating on the meaning attributed to its historical forms and the inclusion of new values.

The structure of the contemporary historical city is therefore configured as the result of multiple models of city growth, from a demographic, architectural and urbanistic point of view; when viewed through the classical conceptual apparatus such as population, city / countryside and centre / periphery, it escapes understanding, despite maintaining some recognizable characteristics. On the other hand, if the industrial development of the eighteenth century redefined the spaces of the city into separate functional units (zoning), the knowledge economy transformed the city into a magnet that attracts resources from the surrounding areas, desertifying them with services and structures.

The historical city, under the pressure of new functional and dimensional mutations, expands, while traditional politics, based on the identification of the historical perimeter, proves to be increasingly insufficient to address the more general problems of sustainability, from new economies and those posed by the “new architecture”.

Looking at the international panorama we can say that only in a few cases the local administrations have been able to maintain a balance between development

and preservation of historical-cultural values and the landscape. However, there is no shortage, even in Italy, of innovative examples and attempts to interpret the urban structure as the premise of a new “sustainable” vision of the territory.

The most advanced urban policies, as in many Italian and European cities, today tend to reverse the trend of considering the historic centre as the only significant part of the urban context and, in many cities, the focus has shifted to widespread environmental values and peripheral areas. The interventions related to polycentricity in fact push towards the decentralization of functions, the regeneration of peripheral areas and the construction of service, university, cultural, hospitality, commercial and residential structures: structures that are located within the new centralities. The city thus extends towards the countryside, which is perceived not only as an agricultural reserve, but as an integral part of the city itself.

Figure 1: Hamburg Hafencity, an urban regeneration project in an abandoned port area, a city of neighborhoods.

The pervasiveness of modern architecture, which is expressed in increasingly unexpected and surprising forms, nevertheless awakens fears about the real possibilities of protecting the urban landscape and his historical memory. Today the new urban centres compete with the historical centres for some traditional functions: free time, leisure and commerce, thus inducing new problems of survival of the original nuclei.

The recovery process of the historic centres starting from the 70s of the twentieth century has been slow and uncertain in general outcomes. In many historic cities, in fact, the tourist component has led to the formation of a stereotyped image of history, through the trivialization of the image, the nostalgic reconstruction of memory, and the Disneyfication of urban furnishings.

After the pandemic, a new concept of city and territory is proposed through urban regeneration, the formation of eco-sustainable neighbourhoods, infrastructures capable of reconnecting minor centres now in the process of depopulation: urban planning procedures that go beyond traditional planning, towards a more

inclusive notion of the territory. Solutions being proposed must compete with the pressing settlement processes, intent on prefiguring a new territorial balance between the areas, limiting land consumption, redeveloping the existing building stock and, ultimately, containing the fragmentation of the territory.

THE OUTSKIRTS

The processes of diffusion, polycentrism, fragmentation and exclusion that have occurred in most urban areas are, in fact, to be considered the results of economic and social transformations that require new methods of analysis, planning and management. It occurs that, while the historic city is legible through the morphology and hierarchy of places, based on largely recognizable economic and social phenomena, the fall of the hierarchies within the urban space and the loss of continuity of the contemporary city, makes it essential to have continuous and updated archiving of heterogeneous data capable of describing the "complexity" of the structure through integrated reading.

The different geographical and geopolitical connotations of the cities lead to the identification of two prevailing morphological structures that are being consolidated on a planetary level: the "spontaneous" city, born without an overall project, which develops through a chaotic model, present above all in Asia, south Africa, Latin America etc, and the layered city. European cities fall into the second category; however, here too there are phenomena that lead us to question their future. Giving shape to the stratified city as it is taking shape implies the need to identify policies aimed at linking urban and architectural quality to social quality, made up of transport, services and sustainability. "Happy are those cities - Calvino argued - which, through the years and changes, continue to shape the desires of men." (Calvino, 1972).

Urban sprawl, without borders and identity characterized by an accumulation of elements and, in some cases, of iconic and mediumistic architectures, however, fails to trigger a new overall urban quality.

Urban redevelopment policies deal with central problems: that is, with a wide range of themes and problems inherent to urban reorganization.

It is a purely modern problem to restore identity to parts of the city that, for various historical reasons, have lost it or that have changed function because they are located in marginal areas. These interventions move at the same time as the urban marketing strategies that find in the city the culmination of location and investment choices, through public-private partnerships that have had, also in Italy, wide application with territorial pacts, district contracts, etc.. The "suburbs project" did not have the desired outcome because the assumption of responsibility at the various institutional levels was lacking; but also implies that the development of the local economy, the ability to attract new actors and investments, the growth of skills and of the knowledge of individuals, was lacking.

Many experiences of degraded neighbourhoods on the outskirts of large cities have shown the importance of the "participation" of the inhabitants, in the definition of projects and in the control and management of the works. These are experiments born as a response to social conflicts, triggered by processes of degradation or social restructuring, of parts of the city.

In Italy, these projects, launched in the last decade, have partly unfolded their potential through new relationships between urban communities and institutions, in order to involve citizens, raise the capacity to accept and participate in urban transformation processes. Meanwhile in France, experiences of population

relocation and urban regeneration, considered largely positive, have shown their partiality, following the phenomena of violence that have affected the Parisian banlieues. The French case, different in many ways from the Italian one, has shown that good urban planning and the decentralization of activities and services are not enough to guarantee a good social stability. The expansion projects of the cities and the projects of the ville nouvelle were born, in France, under the best auspices, through the decentralization of commercial, productive and tertiary activities to consolidate the "city effect", supported by an efficient transport network on iron able to connect the new settlements to the main cities. However, this did not save the French from the traumatic experiences of the uprisings in the peripheral areas. Despite the diversity of the different local situations, this experience made us rethink the fact that, even in Italy, the most heinous crimes committed recently did not have skyscrapers or subways and city parks as their theatre, as much as the areas of former rural Italy, of sprawl, made up of houses in the fields, far from urban crossroads. One wonders if the theorists of the scattered city - for example Bruegemann who describes the sprawl formed by the neat London suburbs - have analysed the social implications of settlement dispersion as it has consolidated in Italy or in Europe (Bruegmann).

It is therefore evident that the so-called suburbs project must be a development proposal aimed at the city as a whole. In the Italian reality, the city is made up of neighbourhoods that maintain, in most cases, their own identity and culture; they contain human, economic and cultural resources which, while changing, have been partly safeguarded. It is therefore a strategic project in which urban planning plays a significant role especially in identifying strengths and weaknesses and in the more rational allocation of resources. To improve the quality of life, it is also necessary to create opportunities for economic and social development starting from the enhancement of local resources: to encourage economic and commercial activities, create job opportunities, encourage the development of local intellectual, artisanal and productive energies; favour the reconstruction of the sense of belonging to the territory in which one lives or works by stimulating discussion, comparison, and the reconstruction of communication between social groups and the mediation of existing conflicts in order to arrive at the definition of a common project.

It is also interesting to look at what is happening, on the management and legislative front in Europe, with regard to the theme of the recovery of neighbourhoods and housing as a right. Oriol Nello, secretary of territorial planning in Catalonia, illustrated in 2005 the scenario opened by the new urban planning law (law 1/2005) which allocates at least 25% of new residential building to low and moderate rent accessibility.

Going back to talking about suburbs therefore means consolidating the right to the city as a whole, theorized as early as 1974, by Henry Lefebvre. Many countries in Europe and around the world are engaged on this front; it is to be hoped that also in Italy the problem of cities, of peripheral areas, will become a point of priority in the political program and that we will return to legislate on the theme of the city as a right, of housing and, more generally, of territorial government through an adequate law, announced and awaited for too long now (Lefebvre, 2018).

TERRITORIAL IMBALANCES

One gets the impression that the degradation of medium-small cities, especially if located in the Southern Italy, follows a reverse path to that of large cities, where the concentration of productive, tertiary and quaternary functions, pose problems of urban gigantism, pollution and unfit for habitation. In reality, even large cities are losing population but not in absolute terms since the urban area expands well beyond the municipal limits and engulfs smaller settlements. The sprawl develops without any urban planning rules through the sum of isolated and circumscribed interventions. The widespread city slowly transforms into a chaotic city, following the development model of the major world cities such as Los Angeles where the urban area, which extends along an arc of 200 km along the coast, includes several cities, industrial, agricultural and areas in enclosed built-up areas.

Figure 2: Los Angeles: a city of cities, characterized by a chaotic urbanization that develops around the various downtowns scattered within the urban perimeter that extends for over 200 km along the coast.

Martinotti reads the phenomenon as a natural evolution of the contemporary city: "cities around the world are affected by three macro processes that are changing the urban phenomenon: the abolition of borders that transforms clearly defined entities into" boundless lands "of difficult delimitation ; the birth of "non-resident population" (NRP) starting from commuters who distribute activities over large areas of low density; the spread of media and mass culture that contribute to profound mutations in the forms of government and the shared representation of social reality "(Martinotti, 2008) The old and the new coexist in the presence of high levels of traffic, projects for cabled cities and forms of pre-industrial exploitation such as those of workers in the food delivery sector, of the new poor and migrants. Can we therefore speak of a different "city effect" and of a particular form of deurbanizations?

Themes emerging in this debate include historical-urban planning, sociological and health-care, but that never are dealt with in terms of planning. The historical imbalances between the north and south of the Italy, between the Tyrrhenian and Adriatic coasts, between strong areas and inland areas located mainly along the Apennines and the foothills are accentuated, including areas that are fragile from a hydrogeological and seismic point of view.

Figure 3: Santo Stefano di Sessanio, a medieval village at over 1250 meters above sea level within the Gran Sasso National Park.

Many centres are now ghost towns; under the threshold of 2000 inhabitants some essential services are lacking such as post office, the banks, and the secondary schools. The poor accessibility and competitiveness of the mountain and high hill economies make it difficult to reverse this negative trend. Some smaller towns, of high historical and cultural value, have managed to break the isolation to which they were condemned, through sustainable third generation tourism, but the majority of the centres risk abandonment. A major national project is needed to reverse the depopulation of entire territories located throughout the peninsula, which must rely upon some development drivers such as rurality, rural and cultural tourism, alternative housing, development of real estate and forest assets, technological innovation, and education.

Many sociologists argue that 80% of the world's population in 2050 will be concentrated in cities, underlining the dangers inherent in this development model. Salvatore Settis recently spoke of a city-prison and hoped for a return to the countryside "as a place to stay alive" (Settis, 2020). Rem Koolhaas in Delirious New York identifies in Manhattinism a "culture of congestion" that forces the inhabitants to live in a completely artificial landscape, without imagination. A model that has been confirmed in the urban language of the contemporary city (Koolhaas, 1997).

Will the warning, advanced by many scientists, according to which, in the future, increasingly deleterious pandemics develop, be enough to reverse this course? It

is a bet with uncertain outcomes, given that the development of current cities, based on the consumption of fossil energy, the primary cause of CO2 production, is projected towards an ever greater concentration of functions: a factor that exponentially increases the attractive power, despite the artificiality of the landscape and the lack of healthiness of the air and soil.

A reversal of the trend is then advanced by well-known urban planners, architects, such as Boeri and Fuksas, who wish a return to the villages, seen as "appendages" of the metropolitan areas: areas where you can regenerate, produce genuine food, at the service of the city and also to recover human settlements on a human scale and landscapes of exceptional beauty. A desirable project, but certainly not resolving the existing imbalances in internal areas, which are fragile from a hydrogeological, seismic, mobility and service point of view. The Italy of the "hundred bell towers" has produced cities and villages of exceptional beauty, which today are in danger of extinction. It will take a great national project to redesign the cities, places and landscapes of the "Bel Paese".

CONCLUSIONS

The reorganization of urban and metropolitan systems represents an emergency that can no longer be postponed: a fact that is confirmed in the increasingly critical conditions of the overall structure of the territory.

Figure 4: Project of a polycentric and resilient city formed by adequate circular metabolisms of functions (Journal of architecture).

It was argued, also at European level, that it is necessary to support the different development paths of the more peripheral parts, redistributing the opportunities for centrality and promoting and strengthening functional relationships with the general objective of reducing dependence on central areas.

The construction of networks of medium and small cities and their connection with the more consolidated urban systems is therefore to be considered an emergency that characterizes the settlement systems most penalized from a locational point of view. Actions aimed at improving the quality of services to citizens, related to intangible actions in the social and health fields, could be considered a first

action tool for urban redevelopment, aimed at achieving a minimum standard of services in disadvantaged areas in the process of depopulation.

Interventions in terms of infrastructures, both on a local scale (energy, water and sewerage networks, mobility and technology) and on a territorial scale (large mobility, environmental infrastructure, works for soil defence and seismic safety) represent pressing needs. It is a question of improving the quality of intervention projects through integrated and participatory planning, using the multiple forms of communication with the citizen to implement knowledge of the territory through technologically advanced tools, with particular regard to the natural and anthropogenic risks to which the urban settlements are most vulnerable.

Figure 5: Parma, the historic city and the peripheral districts in the information system, an aid tool for decisions and management of urban transformations.

In particular, it is necessary to make greater use of information technologies to support decisions, the creation of georeferenced databases that allow an integrated management of territorial reference data in order to identify risk situations and prepare preventive initiatives through, for example, a telematic system for the mapping, control and management of the existing environmental and building heritage, even in small towns.

The protection and restoration of the physical and cultural integrity of the territory require the prioritising of actions aimed at knowledge as a basis for the integrated recovery plans for historic building structures and minor historic centres and more generally the recovery of the natural and residential heritage.

The set of historical-archaeological, environmental and landscape resources are essential factors on which to activate integrated plans for the conservation

and revitalization of degraded urban centres that have historical-environmental characteristics and qualities capable of guaranteeing returns on investment.

A large-scale project that must be tackled with the resources of the Recovery Plan on which, however, there are already concerns. It is feared that the simplified procedures of urban regeneration could open a new demolition season in historic centres. Also, the landscape may be disfigured by wind turbines and that the Mezzogiorno, despite the huge resources allocated, may not emerge from underdevelopment. There are too many expectations and therefore there will be many reasons for possible disappointments. It is complex game, full of risks in the face of the many problems and inefficiency that exist within the management of the territory: the time is, however, ripe for a change of course.

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Spatial Planning of the Green Infrastructure of the City of Sarajevo

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ABSTRACT

The research subject is the planning of green infrastructure in the area of the City of Sarajevo. Green infrastructure is crucial for the preservation of geodiversity and biodiversity and the general benefit of the population of Sarajevo. This is reflected in a wide range of geosystem services, through mitigation of climate change and other geoecological imbalances and their consequences, providing key habitats for flora and fauna, provision of clean air and drinking water, tourism, and more. As part of the research, an analysis of the surface coverage of green infrastructure in the analyzed area was performed. This analysis involved comparing changes in green infrastructure over the last 20 years based on existing remote area detection. Vectorization of landscaped green areas on recent satellite images and their correlation with the norms and standards of Bosnia and Herzegovina in this area was also performed. The analysis of the current situation and the transformation of green infrastructure during the mentioned period was performed by categories of regulated park areas, unarranged green areas, and protected areas. A quantitative analysis of specific indicators in the area for municipalities and settlements in the City of Sarajevo is planned. The results of the conducted research were compared with the valid spatial planning documentation, based on which assumptions for the future period were given. The statistical method, GIS method, cartographic method, method of analysis, synthesis, and comparison were applied during the research.

Keywords: *Green infrastructure, Remote sensing, Spatial planning, City of Sarajevo.*

INTRODUCTION

The topic of "Green Infrastructure" is relatively new and complex and there is no widely accepted definition for it. The term green infrastructure was originally more related to researchers in the United States, but on the European continent it is increasingly used with the adoption of the Green Infrastructure Strategy in order to promote green infrastructure in urban and rural areas by the European Commission in 2013 (European Commission, 2013). This strategic document seeks to integrate green infrastructure into spatial planning. Integrating green infrastructure into spatial planning has multiple benefits – from reduction of climate change consequences through encouraging economic, territorial and social cohesion, to better ecosystem connectivity inside and outside the Natura 2000 ecological network.

The European Commission defines green infrastructure as a tool for providing environmental, economic and social benefits through solutions based on understanding the benefits that nature provides to human society and initiating investments that maintain and improve those benefits. In other words, it is a network of natural, semi-natural areas and green spaces that provides ecosystem services, while promoting human well-being and quality of life.

Green infrastructure can provide multiple functions and benefits in the same spatial area. These functions can be environmental (e.g., conserving biodiversity or adapting to climate change), social (e.g., ensuring quality drainage or green spaces), and economic (e.g., job creation and rising real estate prices) (Rouse, 2013). Additionally, there is wide-ranging international evidence that spending time in green spaces is good for a range of mental health conditions. It has been shown than people living in greener urban areas tend to be happier than people in areas with less urban greenery. General health questionnaire scores have shown that people living in greener areas experience significantly lower levels of mental distress, while life satisfaction scores have indicated significantly higher levels of wellbeing among people living in greener areas. (White et al., 2013) The mental health and wellbeing benefits of green space can also result from participation in activities occurring in such spaces, such as social interaction or physical exercise. (Van der Berg et al., 2010) Benefits include alleviation of stress and anxiety, and improved mood and attention span. (Nutsford et al., 2013) A green urban environment that supports health in general may also produce healthier workforces, enhancing people's productivity and earning potential as well as their quality of life. Engaging with nature benefits those living with conditions such as attention deficit hyperactivity disorder, depression and dementia, by improving cognitive functioning and reducing anxiety. (Cianga, Popescu, 2013) Evidence indicates that participation in physical activity in a natural setting is associated with more improved mental health outcomes than is the case for participation in physical activity in an indoor setting. (Davidson, Lawson, 2006)

The EU Green Infrastructure Strategy advocates the full integration of green infrastructure into EU regulations so that it becomes a standard element of territorial development across the EU. The Strategy also recognizes that green infrastructure can contribute to a range of EU regulations whose objectives can be achieved through solutions based on natural principles, placing the use of green infrastructure in the context of the Europe 2020 Growth Strategy (EEA European Environment Agency).

When it comes to territorial elements of green infrastructure, they refer to large areas of specific purpose such as: ecological central areas used within agricultural areas, multifunctional zones that create a balance between zones of

different purposes in the immediate vicinity of existing and planned settlements, protected natural areas, areas designed for the movement of animals, restored areas, those that are re-forested ecosystems for improvement, green urban areas include parks, vertical gardens, urban gardens and others. (Naumann, S. et al. 2011; IUCN. (2011) Lucius, I., Dan, R., Caratas, D. (2011), European Commission (2010))

According to the previously defined territorial elements, changes in green infrastructure, its protection and planning can best be monitored by land cover analysis. Land cover denotes the natural characteristics of the Earth's surface and the part immediately below the surface (forest areas, grasslands, water, soil, buildings, etc.). (Cvitanović, M., 2014) The study of land cover has come to the fore with the development of remote sensing and GIS. Analysis of changes in land use is a very important segment in the field of spatial planning.

Mapping of land cover changes aims to show the spatial structure of land, or to separate zones of agricultural land, forest and unproductive land, in order to allow a proper planning of settlements expansion and other human activities. (Kicošev, W., Dinčić, D., 1998) In the immediate vicinity of cities, conflicts of interest between the maintenance of green infrastructure, agriculture and urbanization often arise. Recently, we have witnessed changes in land cover in Bosnia and Herzegovina, which are often not in line with legislation and spatial planning documentation. Today's urban area in Sarajevo is significantly denser compared to the previous few decades. An example is shown in figure 1. The need for urban infrastructure construction has increased due to the functional diversification of space as well as the migration of the population on the rural-urban route, which significantly changed the land cover. Undeveloped land is the only remaining alternative location for new construction (Đorđević, J., 2004). Modern processes of development of human society, especially the processes of industrialization and urbanization, have led to a huge devastation and degradation of the territorial elements of the green infrastructure of Sarajevo.

The technological revolution has brought a number of changes to the mankind. Nature has ceased to exist exclusively as the natural environment of a human, in which he has existed for thousands of years mainly as a passive factor. In the new changed conditions, it has become a medium of exploitation with diverse, inexhaustible, but also uncontrolled possibilities of use. In the past, while striving for survival, and today for a better and more comfortable life, man has seriously polluted the natural environment and thus disturbed the natural balance. Urban green infrastructure provides countless environmental, social and economic benefits to cities and their populations. Such spaces make the living and working environment more pleasant to live in, improve environmental performance and strengthen resilience to climate change. However, natural and semi-natural green areas of all species are increasingly endangered due to constant urbanization and suburbanization, resulting in fragmented ecosystems and loss of biodiversity.

Green areas in the urban environment are of great importance in the immediate fight against pollution, provided that they are built on the principles of modern horticulture. Plant material, properly selected and properly placed in the space, can serve as a protective belt for the city and its inhabitants. Many urban green areas of the City of Sarajevo have lost their functional, sociological, biological, ecological and economic value, and the devastation of a large number of urban green areas during the 1992-1995 war has contributed to this.ace coverage of settlement Otoka in Sarajevo, comparation 2002:2021 Source: Google Earth Pro (adapted and edited by the authors).

Figure 1: Surface coverage of settlement Otoka in Sarajevo, comparation 2002:2021 Source: Google Earth Pro (adapted and edited by the authors).

RESEARCH METHODOLOGY

The methodological concept of the research realization is defined according to the goals and set tasks of the work, which refer to the analysis of the change of land cover in the area of the City of Sarajevo. Following scientific methods were applied in the realization of the research: spatial analysis method, geostatistical method, quantitative method, comparative analysis method (comparative method), GIS method, field observation method, comparison method and synthesis of all collected and analyzed data. The research of land use change included a detailed analysis of:

- The change in land cover visible from a topographic map at a scale of 1:25000 and a Google Earth images from 2002 and 2020,
- Analysis of Corina Land Cover images for 2000, 2006, 2012 and 2018 and
- Analysis of the area and manner of using the soil capability of the land.

The CLC database contains data on the land cover for the reference years as well as data on the change in land cover between the stated reference years. The standard approach of CLC database development is based on visual interpretation of satellite images according to the accepted standard CLC methodology, giving vector data on the land cover at a scale of 1: 100,000, minimum polygon width 100m and minimum mapping area 25 ha, or 5 ha for land cover change base. Corine Land Cover (CLC) is one of the most used products from the Copernicus Land Monitoring Service. It has been produced in 1990, 2000, 2006 and 2012 and the last edition dates to the 2018. It consists of an inventory of land cover in 44 classes. CLC uses a Minimum Mapping Unit (MMU) of 25 hectares (ha) for areal phenomena and a minimum width of 100 m for linear phenomena. The time series are complemented by change layers, which highlight changes in land cover with an MMU of 5 ha. It is produced with assistance from the European Environment Agency's Eionet network who contribute their own data produced mainly by visual interpretation of high resolution satellite imagery. In a few countries semi-automatic solutions are applied, using national in-situ data, satellite image processing, GIS integration and generalisation. CLC has a wide variety of applications, underpinning various Community policies in the domains

of environment, including agriculture, transport, spatial planning etc.[1] Available CLC images were collected, imported into GIS, and then allocated to the Sarajevo area. After that, a comparative analysis of land cover data and a synthesis of the analyzed data were performed.

The level of compliance with norms and standards for Urban Green Areas in Sarajevo

The city is an artificial creation and its development can be achieved only if all urban processes are comprehensively planned and harmonized with the laws provided by the natural environment. The rapid expansion of city cores conditions the growing need for the construction of infrastructure and other facilities, while areas intended for parks and other categories of green areas remain in the background. In that sense, one of the important factors is the planning and raising of green areas according to the adopted norms and standards for urban green infrastructure. The main condition for the realization of the network of green areas in the city is their sufficient amount, which is expressed in terms of population. The importance of green areas in populated areas and their use has been constantly changing with the development of civilization itself. The importance of green spaces depended on the needs of the population and the social rules of a certain area at a certain time.

From a global perspective, although there are great differences experts of the twentieth century. In some countries like Germany and Japan, a standard of 40 m^2 of high quality urban green areas or 140 m^2 of suburban forest areas per capita is proposed. The international minimum standard proposed by the World Health Organization (WHO) and adopted by the Food and Agriculture Organization of the United Nations (FAO) is the minimum availability of 9 m^2 of green space per capita.

The basic norm is based on the fact that one hectare of forest consumes the amount of CO^2 during the day, which is expelled by breathing by about 200 people, from which it is derived that 50 m^2 of greenery is needed for one person. In urban conditions, this norm is much smaller, changeable, and depends on the size and structure of the city, natural conditions and the like. The planned norm for green areas in European cities is $15m^2$ to $25m^2$. Everywhere in the world, efforts are being made to provide enough green space to achieve tolerable living conditions for residents. In major cities around the world, spatial planners are increasingly recognizing the importance and diversity of green infrastructure functions in urban areas. Several European countries, such as the United Kingdom, France, the Netherlands, and Switzerland, have set standards that determine the needs of green spaces in new housing planning projects.

Norms and Standards for Urban Green Areas in Sarajevo

Unlike the most European countries, little attention has been paid to green infrastructure planning and protection in Bosnia and Herzegovina. The greatest attention is focused on the isolation of protected natural areas, but it is also at a very low level. By analyzing the spatial plans of both entities of Bosnia and Herzegovina, it was found that the total percentage of protected nature is 2.49% (Drešković, N., 2018). In accordance with the European Directive for the Establishment of the European Ecological Network, the process of establishing NATURA 2000 has begun in Bosnia and Herzegovina, identifying, listing and mapping all the most important natural habitats and plant and animal species that need to be protected in order to preserve rich biodiversity and geodiversity.

1 https://land.copernicus.eu/news/corine-land-cover-now-updated-for-the-2018-reference-year

However, to date no such area has been singled out. When it comes to spatial planning concepts for the establishment and preservation of green infrastructure in the City of Sarajevo, it is completely dependent on the spatial planning concepts of the Canton and the municipalities that are part of it. In the Sarajevo Canton, several protected natural areas have been identified, the categorization of which is defined in accordance with the IUCN and makes up about 2% of the total area of the Canton (Drešković, N. et al., 2015).

At the level of Sarajevo Canton, there is no comprehensive study on green infrastructure. In the strategic and spatial planning documents of the Sarajevo Canton, it is treated sporadically within the chapter on environmental protection and preservation as its integral element. Within the Green Action Plan of Sarajevo Canton, it was pointed out that the Urban Area of Sarajevo Canton has very limited green areas that are not easily accessible to all citizens and which are highly urbanized. Also, one of the problems highlighted is the lack of information and the lack of monitoring the growth of built-up areas and illegal construction. Through research conducted in the work and their supplementation through future research, key information is provided that would support the process of more adequate management and preservation of green infrastructure. The urban area of the City of Sarajevo has very limited green areas which are not easily accessible to all citizens and which are highly urbanized. Some of the problems that Sarajevo still faces are the lack of information and the lack of monitoring the growth of built-up areas and illegal constructions. According to European norms, it is considered that in settlements per capita there should be a minimum of 15 m^2 of intra-urban green areas. (Milinović, 2002) According to the local and cantonal environmental plans and development strategies of municipalities, the representation of green areas of public use per capita is different by city municipalities (tab. 1).

Table 1: Area of public urban greenery in the area of municipalities in the City of Sarajevo (2016).

Municipality	Urban greenery area (m^2)	Population	m^2/capita
Stari Grad	28 150	36 090	0.78
Centar	551.958	55 191	10.00
Novo Sarajevo	484 236	75 662	6.40
Novi Grad	1 111 957	120 314	9.24
City of Sarajevo	2 176 301	287 257	7.58

Source: Local and cantonal environmental plans and development strategies (adapted and edited by the authors).

Table 1 indicates that the total representation of urban greenery areas per capita is 7.58 m^2 in the area of the City of Sarajevo. The most unfavorable ratio of green areas is in the municipality of Stari Grad (0.78 m^2 per capita), which can be justified by the old densely built-up parts of the city and the lack of larger available areas for planting greenery and building parks. The best ratio of green areas in urban municipalities is in the municipality of Novi Grad and amounts to 9.24 m^2 per capita. Based on the given data, it is noticeable that the municipality of Centar has 10 m^2 of public greenery per capita, which is slightly higher than the average for the area of Sarajevo Canton. The recommendation of the World Health Organization is to provide a minimum of 9m^2 of green space per capita,

while the ideal area according to the same organization would be 50m^2. In this regard, it can be concluded that the municipality of Centar meets the minimum criteria of the necessary area of public greenery per capita. In order to achieve an acceptable norm of the minimum area of green infrastructure per capita for the City of Sarajevo, it is necessary, from the current 7.58 m^2 per capita, to increase by almost 20% (18.74%), while in order to achieve the ideal norm of 50m^2 of green space per capita, the current area needs to be increased by 6.6 times.

An amount of 7.58 m^2 of green space per capita was achieved primarily due to the geographical specifics of an analysed area. Namely, the city of Sarajevo is positioned in the valley, and is surrounded by hilly and mountainous morphostructures. If those surrounding areas under vegetation are taken into account, which are characterized by low population density, the total green area per capita would be significantly smaller.

As previously mentioned, the total representation of urban green areas in the municipality of Novi Grad Sarajevo is 9.24 m^2 per capita, This ratio of total green areas and total population is achieved by a total of 1,111,957 m^2 of public green areas that are regularly maintained by the utility company. On the territory of the municipality there are 45 green areas around the memorial and 55 children's and sports playgrounds that are regularly maintained. Also, all 14 primary schools in the municipality have a school yard, as well as most kindergartens. Green areas in the sloping part of the municipality are mostly privately owned and maintained as needed.

ANALYSIS OF CHANGE IN LAND COVER

The analysis of land cover change in the researched area was performed for the period from 2000 to 2020. In order to obtain land cover change data, Corina Land Cover images were analyzed. The analysis involves a detailed study of the change in land cover visible from a topographic map at a scale of 1:25 000 and a Google Earth image. Special attention is paid to the analysis of soil capability, their distribution, area and method of use.

In order to obtain precise data on changes in land cover, a database was formed in order to quantify the indicators. The aim of the analysis of Corina Land Cover images is to determine the change in the purpose of land cover in the last twenty years. CLC recordings for four years were analyzed: 2000, 2006, 2012 and 2018. In the area of the City of Sarajevo, according to the CLC, the following first level classes are represented: (1) artificial surfaces, (2) agricultural areas and (3) forests and semi-natural areas (fig. 2). According to the 2nd level, the following are represented: (1.1.) urban fabric, (1.2.) industrial, commercial and transport units, (1.3.) mine, dump and construction sites, (1.4.) artificial, non-agricultural vegetated areas, (2.1.) arable land, (2.3.) pastures, (2.4.) heterogeneous agricultural areas, (3.1.) forests and (3.2.) scrub and/or herbaceous vegetation associations (tab. 1).

The analysis of land cover data in the area of the City of Sarajevo established *discontinuous urban fabric* has the highest surface coverage at the end of an analysed period (22.54 % of total). This category is also characterised by the largest increase in surface coverage of 5.51 km^2 in the last 20 years. This increase is caused by the physical-geographical limitation of settlements, infrastructure and human activities on a very small area - valley extensions along Water courses. Considering the mentioned factors, significant areas belong to the category of *land principally occupied by agriculture, with significant areas of natural vegetation,* which reaches a value of 24.10 km^2 or 17.41 % in the total area of the City of

Sarajevo. However, this category also records one of the largest reductions in total surface coverage, as its area was almost 3 km² larger in the year of 2000. Nevertheless, the largest decrease in surface coverage (-3.43 km²) was in the category of *Complex cultivation patterns*. In the analyzed period, other significant changes have also occurred in the land cover. The primary indication factor of the change in surface cover in the City of Sarajevo is the reduction of agricultural area in all categories, as Corine Land Cover data indicate that these areas have decreased by about 8 km² in the last two decades. For the most part, agricultural areas decreased in favor of artificial surfaces, which recorded an increase of 5.6 km² or 4.4% in total area over a twenty-year period.

Figure 2: Corine Land Cover of the City of Sarajevo 2000:2018.
Source: www.copernicus.eu (adapted and edited by the authors).

It is important to emphasize the fact that Corine Land Cover recognizes a code 1.4.1 which relating to the *Green urban areas*, which unfortunately have not been recognized at all in the analyzed area, as its surface is smaller than 25 ha, which was a special curiosity in this study. Of particular concern is the fact that there are plans to further influence the most valuable green urban areas by building settlements and other urban infrastructure. Therefore, spatial planning is necessary to do everything to preserve, protect and rationalize the use of higher quality urban infrastructure.

Table 2: Corine Land Cover in the area of the City of Sarajevo for the period 2000 - 2018.

Level 1	Level 2	Level 3	Area (km²) in 2000	Area (km²) in 2018	Absolute change (km²)	Relative change (% of total area)
1. ARTIFICIAL SURFACES	1.1Urban fabric	1.1.1 Continuous urban fabric	0.99	0.99	0.00	0.00%
		1.1.2 Discontinuous urban fabric	25.68	31.19	5.51	3.98%
	1.2 Industrial, commercial and transport units	1.2.1 Industrial or commercial units	4.19	4.75	0.56	0.40%
		1.2.2 Road and rail networks and associated land	0.58	0.58	0.00	0.00%
	1.3 Mine, dump and construction sites	1.3.1 Mineral extraction sites	-	0.25	Not applicable	Not applicable
		1.3.2 Dump sites	0.25	0.32	0.07	0.05%
	1.4 Artificial, non-agricultural vegetated areas	1.4.2 Sport and leisure facilities	0.84	1.07	0.23	0.17%
2. AGRICULTURAL AREAS	2.1 Arable land	2.1.1 Non-irrigated arable land	0.75	0.74	-0.01	-0.01%
	2.3 Pastures	2.3.1 Pastures	4.81	3.05	-1.76	-1.27%
	2.4 Heterogeneous agricultural areas	2.4.2 Complex cultivation patterns	17.67	14.24	-3.43	-2.48%
		2.4.3 Land principally occupied by agriculture, with significant areas of natural vegetation	26.84	24.10	-2.74	-1.98%
3. FOREST AND SEMI NATURAL AREAS	3.1Forests	3.1.1 Broad-leaved forest	20.06	20.40	0.34	0.25%
		3.1.2 Coniferous forest	18.76	18.28	-0.48	-0.35%
		3.1.3 Mixed forest	5.18	6.87	1.69	1.22%
	3.2 Scrub and/or herbaceous vegetation associations	3.2.1 Natural grasslands	3.36	4.46	1.10	0.79%
		3.2.2 Moors and heathland	0.62	-	Not applicable	Not applicable
		3.2.4 Transitional woodland-shrub	7.81	7.10	-0.71	-0.51%
		TOTAL AREA (1+2+3)	138,39	138,39	-	-

DISCUSSION AND CONCLUSION

Based on the conducted research, it can be concluded that concrete measures must be taken for better management of an existing green infrastructure in Sarajevo and its increase in general. Some of these measures include the following steps: (1) Ensure the legal basis for green infrastructure is incorporated

into the Constitution of the Sarajevo Canton; in connection with the spatial planning, protection, preservation and arrangement of the green infrastructure, amendments to reference laws and bylaws should be made; (2). Establish long-term frameworks for green infrastructure management in Sarajevo Canton through the development of strategies, plans and programs, and systematically monitor the situation, (3) Establish a unique methodology for identification, inventory (database), valorization (value verification), classification and protection of green infrastructure at all levels (national, regional, local) and ensure its implementation; (4) Ensure the obligation to prepare green infrastructure bases for the needs of preparation of spatial planning documentation. Accelerate the application of GIS, and for the needs of spatial planning documentation, define standards in cartographic processing of landscape data with an appropriate ordinance; (5) Harmonize reference laws, especially the Law on Protection of Cultural Heritage of Sarajevo Canton, the Law on Nature Protection of Federation of Bosnia and Herzegovina, Law on Spatial Planning and Land Use at the level of the Federation of Bosnia and Herzegovina, etc. (d) Determine a geo-database with the integration of existing ones, and preparation of methods and standards for documenting green infrastructure areas in the City of Sarajevo by providing a detailed analysis of the state of the existing areas and development of methodology for typology, valorization and its classification. The importance of the study is reflected, above all, in the efforts to emphasize the importance of green infrastructure for improving the quality of life in urban areas in general, as it increases exposure to natural environment while reducing exposure to air pollution and other harmful substances. In addition, these areas provide opportunities for physical activity and recreation whose significance for human health is known to directly or indirectly benefit public health. At the end, it is important to emphasize a significance of preparation of standards for studies of green infrastructure areas protection at all levels of spatial planning and other documentation related to this topic in Sarajevo, as the degree to which the environmental, social, economic, and public health benefits of green infrastructure are realized is dependent on a number of factors, including the design, installation, and maintenance of the green infrastructure features.

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Facing Dystopia. Teaching Landscape Urbanism in an Ever-changing Society

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ABSTRACT

Since the middle of the 20th century, the research society has developed a sense of need for openness and communication between disciplines, in an everlasting search not only for a wider knowledge but for better communicating it as well. This paper focuses on landscape urbanism as part of the field of landscape planning in this long chain of disciplines, analysed both as influenced and influencer. The term interdisciplinarity was first used in social sciences at the middle of the 1920s and became commonly used by the end of the Second World War [1]. Ever since that, the term was subject to many debates. Similar to the concept we just mentioned, landscape urbanism arose as an interstitial design discipline, its main purpose being to operate in the intermediary space between buildings, infrastructural systems and natural ecologies. Its purpose is to link and it should be studied and treated as such.

The reality we live in is getting more complicated by the day, changing its parameters worldwide. In such a context, the academic society should wonder, firstly, what it should teach its students. Our present is certainly different from a few years ago, it comes with other needs and concerns, and most certainly, other expectations. The field of planning is certainly finding itself in the mist somehow. Thus, in times of change, we advance the need to teach adaptability. The professionals of tomorrow are to be working in a different present than the one they learn in. They have to imagine spaces flexible enough to answer to the requirements of an ever-changing society. We live in a world guided by technology, which has become more than an instrument. Technology is nowadays a part of our lives, it is a social component, causing different behaviours and attitudes.

Keywords: *Landscape urbanism, Dystopia, Technology, Society, Adaptability.*

INTRODUCTION

The present article focuses on interdisciplinarity in a time when the boundaries between theory and practice are extremely diffuse, when theoreticians and practitioners unite forces to face a time of change unlike any other in our lifetime. JT Klein traced the rapid evolution of interdisciplinarity to the beginning of the twentieth century, stating that "it was no accident that the most visible momentum of interdisciplinarity in the first part of the twentieth century was in general education and social sciences'' (Klein, 1990). Klein describes this tendency as normal in the fields of education and social sciences, given the fact that natural sciences were dominated, at least until the middle of the twentieth century, by disciplinarity and an increased specialization. "In response many proponents of "liberal" and "general" culture promoted "general" education as an antidote to specialization" (Klein, 1990).

The contemporary interpretations of the terms disciplinarity and interdisciplinarity are linked to social evolution during the nineteenth, twentieth and twenty-first centuries. Thus, as society evolved from mainly agricultural to industrialization and technologization, the idea of specialization and the division of labour in society (Durkheim, 1960 (1933)) became more and more present, because of the need for mass production. "The modern connotation of disciplinarity is a product of the nineteenth century and is linked to several forces: the evolution of the modern natural sciences, the general "scientification" of knowledge, the industrial revolution, technological advancements, and agrarian agitation" (Klein, 1990). The sacrifice, however, was directed to the education of the whole human being. People were specialized in one specific area, as part of a system, but could not easily intervene in another part of the same system. As a result, some specific areas of the scientific world remained unexplored. Interdisciplinarity evolved as a way of "bridging gaps between disciplines" (Klein, 1990), working towards the unity of knowledge.

In the twenty-first century, the unity of knowledge is a must, especially in social sciences. The complexity and fast-evolution of societies today cannot accept the existence of just disciplinarity. The term interdisciplinarity, as previously stated, became first used in social sciences in the middle of the 1920s (Frank et al., 1988), evolving immediately after the Second World War (Moran, 2002). Both during its emerging period and today, this concept has had two different facets. On one hand, it seeks to unify knowledge into this unity we previously mentioned, providing a holistic image, and on the other hand, it brings an inquiry into the nature of knowledge itself, as well as the way in which we choose to "organize and communicate it" (Moran, 2002). The present article draws attention to specifically this second aspect of interdisciplinarity, as it represents an inquiry into the education of the twentieth century itself, based on the pandemic crisis the world is facing today. The results of this research were drawn from two experiments, led on both theoretical (lecture) and practical (workshop) levels, based on the teacher-student experience during the period March-June 2020.

The specific relevance of the subject is directed towards the knowledge of teaching and using the urban space in the context of social distancing. Thus, teachers not only seek to decipher the urban space from a distance but seek to understand and teach, at the same time, a new social order which, even if it is only temporary (probably), might lead to new forms of use and design of the built environment. Teachers are, in this case, simultaneously learning and teaching, forced to re-organize and structure projects, course materials, student teaching and evaluation methods or principles of the perception of the urban space (both natural and anthropic).

RESEARCH QUESTIONS AND OBJECTIVES

This paper is an inquiry into the field of urban landscape academic discipline, in the context of a fast and ever-changing society on technological, social, economic and ecologic levels.

Objectives:

- Development of three key concepts that define the idea of teaching today's students that become tomorrow's professionals.
- Establishment of three key directions for the urban landscape teaching and practice fields, in order to best respond to the contemporary and future societies.
- Description of the urban landscape as an interdisciplinary academic field, a result of the unity between different sciences which define and influence the development of the built environment.

Research questions:

- Which are the main concepts that insure a coherent urban landscape teaching method in today's society?
- Which are the disciplines whose activities define and influence the contemporary urban landscape academic field?
- Which are the three most important professional qualities that the young urban landscape students should acquire in order to become good professionals?
- Which are the options to adapt the methods of teaching in a crisis situation, such as pandemic?
- How to learn and teach about adaptability, in order to be prepared to face a dystopian scenario?

RELEVANCE OF THE RESEARCH

This research approaches the subject of the creation of contemporary urban space on two levels. On one level, we address the issue of teaching urban space, with the purpose of forming new professionals that help mitigate future aspects of the urban societies, ones that are yet unknown to us. On the second level, this research approaches the issue of the design of urban space. In our double role, as teachers and researchers, we are constantly in quest of new methods, key-concepts and objectives that can best help develop professionals and teachers of today, form professionals and teachers of the urban space of tomorrow.

This issue is even more important, as we are presently facing a transitional moment, on levels that dramatically impact the design of the urban space - ecology, economy, health, technology, mobility are just a few examples.

METHODOLOGY

The research method used in the process of obtaining the data presented in this study is the content analysis, focusing on the teaching experience on both theoretical and practical levels. Thus, during the period of March to June 2020, students from three master's specialisations ([1] Territorial Planning and Regional Development; [2] Urban Mobility and [3] Landscape and Territory), as well as

students from one bachelor specialisations (Landscape Design and Planning) were encouraged to rethink the urban landscape in order to best respond to the needs of the society. Given the emerging crisis of COVID-19 pandemic, which caused the lockdown of all Romanian activities in march 2020, students and teachers alike were confronted with a new urban reality. As a result, courses and workshops had to be reorganized, evaluation methods had to be changed and means of communication had to be rethought in order to correspond to the new requieries of the society.

In terms of education, the projects conducted during the period earlier mentioned consisted in the creation and imagination of new forms of use of the given urban landscape in order to respond to four main needs: [1]social distancing; [2] protection of the elders; [3]fast supply; [4]recreation. These were aspects of the society that none of us thought about as essential in the urban landscape projects, but whose absence immediately became inconceivable during this exercise.

The results were drawn from 41 projects which resulted from the three masters earlier mentioned and 12 projects which resulted from the bachelors specialisation. The main aspects that were taken into account were:

- the capacity of the students to rethink social interaction;
- the capacity of the students to rethink functional distances for basic human supplies (groceries, pharmacies, food-markets, green and public areas);
- the capacity to rethink mobility;
- the capacity to adapt existing spaces to new usage requirements.

INTERDISCIPLINARITY IN THE URBAN LANDSCAPE TEACHING FIELD

The urban landscape finds itself at the complex confluence between science and art, bringing together multiple disciplines, among which we can name urban design, landscape design, architecture, sociology, psychology, semiotics, history, art, geography, technology. The multi-level approach in the field of teaching and design requires analysis on all its levels as well as the specific connections between all disciplines that influence the development of the urban landscape.

Understanding the urban landscape requires understanding the specific connections between disciplines that compose it. The multilevel approach is a mandatory process that leads to the identification of the uniqueness of each situation (Okamura, 2019). Particularity is one of the main characteristics of the urban landscape, which cannot be discovered unless that particular space is decomposed into all its structuring levels and carefully analyzed the subtle interaction between them.

“The urban landscape is a territory of integrative synthesis” (Brandão, Remesar, 2010), requiering an overall view which comes “through the collaboration of various sources of knowledge, some through professional and others through non-professional knowledge of users” (Brandão, Remesar, 2010). Thus, teachers and students of urban landscape are expected to have at least a basis of all these disciplines put together.

Understanding the Urban Landscape field lead to the professional profile of the urban landscape student, following the main requests of the domain, of its challenges and complexity. The most important qualities should refer to their ability to communicate, to work in teams, to understand different aspects of

a particular context – like social structure, climate issues or characteristics, technological needs, ecological aspects, etc.

THE PANDEMIC CONTEXT. SPECIFIC ISSUES ON SOCIAL, URBAN AND TECHNOLOGICAL LEVELS

The Covid-19 Pandemic has brought unexpected transformations in all the aspects of everyday life. The paradigm changes have challenged society's ability to adapt. The loss, even temporary, of a normality defined as the sum of daily habits anchored in the social practices, has led to the imagining of dystopian scenarios, along with increasing cases of anxiety and depression.

Interestingly, we would never have thought that a virus could completely change our routine. In a debate between Alain de Botton, Malcolm Gladwell, Steven Pinker and Matt Ridley in 2015 - "Do Humankind's best days lie ahead?", this subject was approached, and Steven Pinker said: "Now, if you're bringing up infectious disease, there's just no comparison between the vulnerability of the human population in the past compared to the present. (...) The rate of death from infectious diseases has absolutely plunged, and there are dozens of new antibiotics in the pipeline. Of course, there are science fiction scenarios in which the proverbial Bulgarian teenager invents a superbug in his garage. But a massive and increasingly sophisticated network of expertise in molecular biology is mastering the machinery of life in a way that mitigates risks and makes them a tiny fraction of what humanity has lived with throughout its existence." (Griffits, R., 2016)

The consequences were felt on each level, generated on the one hand by the need to adapt, on the other hand by the need to reduce stress and anxiety.

The technology, which is the heart of the 21 st century society's concerns, became essential in education, economics, tele-working, communication. Reducing the need to travel between home and work has determined at urban level a release of road traffic, public transport, a lack of use of public spaces, determined by the rule of social distancing. The roads become unused, while the pedestrian areas do not offer enough space or suitable arrangement for the mental comfort of the user.

The public spaces temporarily lose their utility, the fear of infection exceeds the need of social interaction. We are faced with the need for spatial rethinking determined by different ways of use required by the new rules of pandemic conduct.

As Enache & Floroiu said, "the way that people assimilate the changes is often unexpected and unpredictable. Domains like education, philosophy, culture become slowly inappropriate to a world in a continuous mutation. This is the general context in which we have to find ourselves beyond the traditional way to communicate, to educate, to promote." (Enache, Floroiu, 2018)

A Gehl survey of public space usage during Covid-19 pandemic lockdown shows its importance on maintaining the mental health of people in urban areas. (Gehl, 2021).

Analyzing the answers, it is clear about the essential role of the public space in crisis situations, versatility being a key quality. Public space was, since the second half of the twentieth century, a central element of the design process all over the world. The pandemic period has only managed to increase its significance in everyday life, while at the same time pointing out how much is still to be done.

Figure 1: Use of the public space during the COVID-19 pandemic, Source: Gehl, 2021.

Technology was at its best, as in a matter of days, took the first place in the management of all aspects of the society, including education or even public administration. For instance, a survey conducted in 2019 and whose results were published in 2020 has shown the fact that citizens feel the need of digitization of the public administration in order to facilitate their involvement in the decisional process in Bucharest (Acasandre, 2020 [2]). As the pandemic and lockdown came unexpectedly, rapid digitalization measures had to be taken in these aspects, generating important steps towards the modernisation of the public administration. Similar to this example, in education, teachers and students taught themselves to use technology in ways they never even thought of before, from live online meetings, to online drawings and cloud archiving. Education had to continue in the best possible ways, given the circumstances, and for this to happen, imagining new forms of teaching had to be found, some of which will probably continue after the pandemic, as well.

COVID URBAN LANDSCAPE - STUDYING, TEACHING, DESIGNING. RESULTS AND INTERPRETATION.

Studying the urban landscape during the pandemic context

Along with the lockdown, which occurred suddenly all over the world, the entire educational process (as almost all other activities) moved from the physical space into the virtual space. The society quickly complied to the new restrictions, being the only possible option, the teaching methods have adapted to the new context.

The on-line studios lack the physical activity of drawing on paper, the face-to-face interaction, the drawn illustration which accompanied the explanations.

It is important in this new context to find a method which will ensure the continuity of teaching the most important features of a coherent urban space, without living and experience it, and using only the imagination. 3D visualizations, VR applications or devices, street view experience, are tools that can be used to achieve the quality of design and to answer to the main requests of the society.

The main concepts are the spatial continuity, the accessibility for all the people, the human scale, the versatility, and adaptability.

The advantages of on-line teaching benefit by the elimination of physical problems of distances - like the possibility to invite professors from abroad or professionals in the field of study. They can simply connect, without having time and spatial issues. In fact, the accessibility of the internet through the computer allows the illustration of discussion with some internet examples, matching with the particularities of the project's proposals.

The disadvantages come, on the one hand, from the impossibility or from the difficulty of directly visualising the sites, the visits being replaced, during this period of time, with rapid and easily accessible virtual visits by using applications such as street view. On the other hand, the online workshops cut off the direct social interaction, visibly affecting activities such as teamwork, widely specific to the urban landscape field of work.

It is obviously that adaptability is one of the most important features in this particularly, but also in general crisis situations. How to learn and teach about it was one of the main challenges. Teaching methods had to adapt to the new context, considering:

- choosing the online platform that suits the specific requirements of the teaching domain
- reviewing the way of communicate, address and behave
- new opportunities given by the online accessibility
- the ability to take unexpected decision, to ensure the continuity of teaching activity

Learning about adaptability it is not necessarily linked to the pandemic context, considering the increasing rate of changes, with which the society faces since the industrial revolution. We already know that the urban space must be flexible enough to be able to respond to different needs and requirements. A dystopian scenario will be easily to approach in a flexible space, that can be easily adapt. It is although important to establish the adaptability as the main feature of the public space.

Teaching (about) and designing the urban landscape in the Covid-19 context

The teaching methods were forced to adapt to the particular context which rapidly became a normality - online teaching through the use of specific platforms. Because of the specifics of the field, new issues emerged which were very necessary to be solved and inserted in the design and teaching process, especially in the urban landscape and urban design areas of activity. With a strong applicability in everyday life, the new reality quickly became a theme for the urban landscape domain. Thus, within the lectures and workshops, students had to confront these new restrictive conditions which seem to limit our actions and the structure of the urban space, for an important and yet unknown timeline.

In this research article, we based our results on the data that students, from both bachelor and master levels, presented as a response to a given exercise. Thus, the respondents were asked to imagine a new urban landscape configuration, starting from the pandemics period, taking into account the changing world we are facing because of COVID-19. The exercises specified that, among the issues that society was confronting with, were the need for social distancing, *the protection of the vulnerable categories, fast supply, and the need for recreational spaces*.

Table 1: Operationalization of the projects according to the 4 main criterias.

PROGRAM	*Social distancing*	*Protection of the elders*	*Fast supply*	*Recre-ation*	*TOTAL RESPONSES*
Bachelor program (*Landscape Design and Planning*)	10/12	0/12	4/12	10/12	**12**
Master program (*Territorial Planning and Regional Development*)	15/18	2/18	8/18	12/18	**18**
Master program (*Urban Mobility*)	9/9	0/9	1/9	5/9	**9**
Master program (*Landscape and Territory*)	11/14	0/14	8/14	10/14	**14**
Total bachelor responses	**10/12**	**0/12**	**4/12**	**10/12**	**12**
Total master responses	**35/41**	**2/41**	**17/41**	**27/41**	**41**
TOTAL	**45/53**	**2/53**	**21/53**	**37/53**	**53**

We divided the data into four categories, taking into account the way in which students addressed the given issues. As a result, we could observe that the main preoccupation of the students of the masters' levels was to respond to the pressing matter of *social distancing*. We divided the data into four categories, taking into account the way in which students addressed the given issues. As a result, we could observe that the main preoccupation of the students of the masters' levels was to respond to the pressing matter of social distancing.

Most of the analyzed projects addressed the need for social distancing through the reorganisation of the urban public space, streets and pedestrian areas. Secondly, the students addressed the issue of reorganization of the public recreational areas (recreation), mentioning the fact that people need to "create alveolar spaces, separated by different materials and vegetation, in order to allow only a restricted number of people to enter the space" (Landscape and Territory student). Remarkably, the protection of the vulnerable social categories was only addressed by two students (out of a total of 41), an aspect that raises awareness on the social matters of the situation. Even though urban planning is a discipline that incorporates a multitude of disciplines, many times it is difficult to take into account all the aspects of everyday urban life. "The proportion in which the different age groups are being presented in the public urban spaces represents an index of the way in which society thinks about the public spaces and activities that happen there" (Acasandre, 2020 [1]).

A study conducted in 2020 has shown that when it comes to designing the urban space, usually we think of the middle-aged person (without discrimination of gender). Most of the time we associate the public urban space to the adult individuals, not groups, while the other age categories are present in lesser percentages. Children are the age-group that is the least present in general urban space planning (Acasandre, 2020 [1]), while the seniors come up second to last.

As previously stated, receiving information and values is not enough for the students of today. They must learn to evaluate, analyse, rank, and prioritize according to the situation, considering risks and threats, to design for a future society, in which technology is an essential element of everyday life. Thus, designing modular spaces provide the adaptability we vouch for in this article and in real life.

Figure 2: The matrix of the urban public space, as imagined by a student
Source: Student from the Territorial Planning and Regional Development master, first year of study.

Figure 3: Public space project in a collective housing area, in COVID-19 conditions context. Alveolar spaces

Source: Student from the Landscape Design and Planning bachelor program, third year of study.

Figure 4: Public space project in a collective housing area, in COVID-19 conditions context. Modular design

Source: Student from the Landscape Design and Planning bachelor program, third year of study.

CONCLUSIONS

One of the most important qualities of a contemporary urban space is modularity. The capacity of the designer to create such a space lies in his or her capacity to imagine different scenarios for its use, some of which are yet unknown. The future's uncertain and so, students of today are preparing, in the field of urban planning, for a society which will most likely be different in terms of technology, ecology, demographic structure, health and other specific elements that influence the use of space in everyday life.

We already know that modern Europe is going through an acute demographic ageing, which means that the cities of tomorrow will have to think of ways to adapt to these tendencies. We already see the effects on rural areas and small towns, which are fastly depopulating because of, on one hand, the migration of young people towards the large economic centers (such as Bucharest, in Romania's case) and, on the other hand, because of small birth rates (Griffiths, 2016). At the opposite limit, large cities are slowly becoming overcrowded. Concepts such as shrinking cities or urban sprawl were barely known one generation ago, while today, they are at the very center of urban planning.

All these and more cause landscape urbanism teachers to think about reinventing themselves and their teaching methods in order to respond to contemporary tendencies. Is not enough to teach concepts. Students need to learn logic and adaptability. They need to learn how to change their views of the world, not only of the future society they will live in but also for the future societies they will work with, for the new generations of professionals and their own views of the world.

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Estimating Environmental Impact of Informal Settlements in Sarajevo, after 1996

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ABSTRACT

Spatial development of Sarajevo during the period of socialist Yugoslavia was marked by two opposing tendencies: persistent efforts to regulate the growth of the city through development and implementation of long-term plans; and the phenomenon of self-organized, informal settlements which have been occurring simultaneously in all parts of its territory. Although the data on 15,000 informal facilities created in the period 1970-1990 may sound like a worrying figure, from the perspective of post-Dayton Sarajevo, a city where approximately 30,000 new, illegal buildings were built between 1996 and 2016, it is hard to deny that the data from the past appears to sounds much less harmful. Apart from many differences that one might draw between these two separate epochs, the period after 1996 distincts itself significantly by the lack of the official data regarding informal settlements and their impact on the environment. This paper aims to discuss the topic and to offer a rough assessment of the damage done, by comparing the statistics from the previous period with the impecunious data available today. Final conclusions aim to offer partial contribution to the wider polemic related to the environment and the future of Sarajevo.

Keywords: *Informal settlements, Slums, Environmental impact, City environment.*

INTRODUCTION

Observed from the point of view of contemporary inhabitants of Sarajevo, it is clearly visible that urban reproduction of the city is predominantly managed by informal processes. Although their influence can be read within various domains of the spatial structure of the city, from the level of individual buildings, to the level of procedurally dubious changes of the General Urban Plan, informal, residential settlements remain the most visible and spatially dominant indicator of its uncontrolled development.

If we connect the informal settlements in Sarajevo with the radical social changes that befell the city at the end of the 20th century, it is interesting that they, unlike the planning and regulation mechanisms characteristic of the welfare state, transcend the boundaries of one political and economic system, while successfully moving to another , radically different. In addition to the fact that they transcend between two ideologically opposed environments, the capitalist present and the socialist past, the patterns of their origin and behaviour in space seem to remain unchanged, despite the devastating historical discontinuity of the 1990s.

However, the consequences of their existence continue to be devastating for the health of the city, especially in the environmental and infrastructural sense. Large areas of vacant land within and around the city, traditionally agricultural, or planned for other urban purposes have been irretrievably wasted; amount of car traffic has tremendously increased due to the fact that public transportation cannot function properly inside informal settlements; landslides have started to emerge around the city due to improper and informal sewer and water supply solutions and air pollution has increased significantly due to solid fuel heating systems which are being used in settlements as such. It is hard to argue that environmental problems like these do not have a significant impact on the urban health and the quality of life in Sarajevo. Estimating their scale is a crucial first step before any environmental plans or proposals concerning healthy and sustainable living are to be undertaken.

Despite the fact that not enough serious, scientific studies have been done in the last thirty years, especially those which would be a useful tool for any attempt to understand the current spatial development of the city, this article will try to offer a rough assessment of the environmental and infrastructural damage experienced by the city of Sarajevo so far. First paragraphs will discuss a brief history of informal settlements, together with the social origins and reasons related to the phenomena in order to provide a general overview. Last paragraph will be focused on the provisional environmental damage evaluation, based on deficient literature and limited research available on this topic.

Although many urban health issues can be associated with informal settlements, the aspects addressed by the rough evaluation in this article are chosen for discussion because they represent the most obvious repercussions of the phenomena and have been the main topics of public debate for decades. This article attempts to summarize the scale of their impact by putting together fragmented information obtained from different sources.

BRIEF HISTORY OF INFORMAL SETTLEMENTS IN SARAJEVO

Informal settlements in Sarajevo have been a permanent problem within the city probably since first urban plans were introduced to it. As visible from available archives they certainly have been a topic of discussion in Sarajevo even in early

1930s, in the period of the Kingdom of Yugoslavia, when local newspaper were reporting an emergence of 350 illegal houses on the periphery of the city, which were inhabited by the poor people and have been erected almost overnight (Aganović, 2014). Compared to the articles published in the later decades until now, it is interesting to notice that the same issues and the same public concerns tend to repeat themselves year after year throughout the history of the city.

However, the period after 1945 until the 1990s, was marked more than any other period with serious and persistent efforts to regulate the growth of the city through development and implementation of long-term plans (Donia, 2006). The 1970s were the time of the intense infrastructural development of the city, where major public, industrial, health-care, sport and education buildings were being erected, together with utility and transportation infrastructure. Large housing projects were being built at the same time in order to absorb the quantities of new population migrating from all around Bosnia and Herzegovina to Sarajevo (Donia, 2006). In regard to the fact that Sarajevo, compared to the majority of other capital cities in Europe, was never largely populated, the intensity of its urbanization during the SFRY period, expressed as a percentage of increase, was relatively high even when compared to other major world cities . For instance, in the early 1930s the city had a population of 78,173 citizens, while just before the outbreak of the war in the 1990s, the city had a population of 454,319 (Zavod za planiranje razvoja Kantona Sarajevo, 2020). These figures show that Sarajevo had an almost six-fold increase in terms of population growth over a period of fifty years.

Figure 1: Freshly built collective housing Otoka in 1970. In the background are the settlements of Annex and Švrakino selo (Spomenikdatabase, 2020)

From the available data, it is clearly visible that the number of urban population in Sarajevo, on a five-year average, from 1945 to 1985, grew by 9.1%, occasionally reaching a figure of 18.4% (Islambegović, 2016). Especially strong increase in immigration occurred in the period 1953-1961, when 36,692 inhabitants immigrated to the city, but numbers continued to remain high in the following periods until the war, at a slightly reduced rate (Aganović, 1980). The largest

number of inhabitants emigrated from the area of eastern Bosnia, eastern Herzegovina and north-western Montenegro, inhabiting the peripheral and hilly areas of the city where they were trying to provide themselves a permanent accommodation in Sarajevo through individual, mostly informal construction (Stambeno preduzeće Sarajevo, 1971).Despite enormous efforts to regulate and improve the development of the city made on behalf of the city authorities, only five years after the adoption of the General Urban Plan, at a time when social construction was celebrating the creation of 9,773 housing units and the implementation of capital projects of urban infrastructure, for a total of 5,556 built buildings, only 2,588 regular urban permits have been issued (Aganović, 1980). Official data estimates that around 30,000 informal buildings were erected during the 47 year long period of SFRY, while the real numbers might go even 30% higher than it was officially stated (Aganović, 1980).

Figure 2: Alipasino polje settlement and informal settlement Vojničko polje. Picture taken after 1996. (Bublin, 2015)

On one hand, the city was spreading towards the west with large housing developments which were supposed to provide thousands of new apartments, while on the other hand large areas covered with informal settlements were emerging in parallel on northern and southern hill sides of the Sarajevo valley, literally right next to the areas of planned development. For the purpose of illustration, figure 1 shows large collective housing settlement Otoka from the 1970s, with informal settlement Švrakino Selo in the background (Spomenikdatabase, 2020).

While public opinion was expressing concern and appealing for something to be done, contradictory and unclear measures were being launched by city authorities in different scales, depending on different municipalities of the city. Although, small number of houses were demolished and a bit more significant areas covered with informal settlements were repaired and rehabilitated, mostly in terms of infrastructural quality, the majority of these areas were just left as they were (Aganović, 2006). The main reason for authorities to behave in this manner

was related to political reasons, particularly to fear from the social revolt which would appear as a consequence of any radical measure (Aganović, 2006).When it comes to informal settlements, the situation in Sarajevo after 1992 became rather chaotic. Hundreds of thousands of people from Eastern Bosnia and other parts of the country were forced to leave the place of their permanent residences while fleeing the horrors of war. Almost 300,000 people found a refuge in Sarajevo in a matter of a few months, while leaving all their property in the places of origin (Bublin, 1999). While some of those people moved further from Sarajevo, or went back to their homes after the war, the vast majority of refugees decided to stay permanently in Sarajevo.

Even a few years after the war these people were housed in temporary accommodation, most often in collective accommodation facilities or in apartments and houses that had been abandoned during the conflict. Most of them were waiting for refugee return programs to be implemented for as much as ten years, but after realizing that their return is hardly going to happen they decided to start solving their existential problems individually (Islambegović, 2016). For this reason a new, massive wave of informal construction has hit the city. Again, city authorities were indecisive and paradoxical in their behaviours, while publicly stating concern and opposition, in practice they were doing nothing to prevent further devastation. One can argue that authorities were tolerating informal behaviour in space more than they did before 1992, by tacitly giving consent or even encouraging it in certain cases (Aganović, 1980).

While before 1992 some areas were being strictly protected from illegal development, after the war nothing was spared. Water protection zones, forest greens, protected nature areas, agricultural lands, industrial zones and areas intended for the development of collective housing were being devastated or seriously damaged under the pressure of new, wild development. Situation as such turned the city into a certain form of 'no-man's land', where beside the houses which were being built by unfortunate people who were solving their existential problems, many major investments, worth one million euros or more, started to emerge by following the same logic of informality (Aganović, 2006).

For decades after the war, no records were kept in regard to the number of illegally constructed buildings, few to none projects were developed that would deal with the rehabilitation of what had been done (Islambegović, 2016), nor support programs were being made in order to help the city to combat such phenomena. According to insufficient estimates that were made, in the period from 1995 until 2013 almost 30,000 informal buildings were erected within the territory of the city and an additional 21,000 in the rest of the Canton of Sarajevo (Aganović 2006.). These figures suggest that more than 200,000 of people within the Canton of Sarajevo, live in informal settlements while 120,000 of them live inside the area of the City. When turned into percentages, these figures mean that almost 50% of people living inside the Canton of Sarajevo are accommodated in informal settlements, as well as 43% within the territory of the city. (Islambegović, 2016)

Vast number of these buildings got their legal documents through the process of "legalization", which interestingly kept emerging shortly before local elections in many years after the war until now. First 'legalizations' in the newer history of the city emerged shortly after 1995 and were mostly including buildings which were built before the war, as being justified as an 'act of reward' for the soldiers which survived the conflict (Aganović, 2006). Shortly after that they became a kind of traditional behaviour happening in regular cycles, where it was even possible to predict when the next one is going to happen.

THE REASONS BEHIND INFORMAL DEVELOPMENT IN SARAJEVO

Sarajevo is a city which is located in a valley, where traditionally people used to live on the slope and work in the fields. In the modern decades which followed, this logical relationship became the first significant determinant of a city's urban development. With the Ottoman colonial conquests, the city expanded to a fertile plain along the Miljacka River and the process of urbanization in the east-west axis began, continuing the existing logic of fields and slopes. With the Austro-Hungarian occupation, the city expanded further to the west and classic European blocks were built, leaving the slope equally unregulated and left to fragmented individual construction, where mostly poor people were struggling to put the roof above their heads. The period between the two World Wars was of a similar nature. With the arrival of the new economically potent state of the SFRY, this process of parallel urbanization of the Sarajevo valley started to experience a certain kind of culmination, when the city started to expand much more intensively along the east-west axis (Bublin, 1999).

The roots and causes of both parallel processes, of formal and informal development of Sarajevo after the Second World War, can certainly be found in the ideological framework of the socialist political system (Lowinger, 2009). Essentially, the whole of society was subordinated to collective matrices, while neglecting the natural individual needs in regard to collective interest. Urban planning with a modern orthogonal network of streets has completely neglected the planning of settlements on slopes, with single-family buildings and at full capacity oriented itself towards the planning of collective housing settlements. In parallel with this process, following the south-north orientation, at almost identical dynamics, a quiet, crucially unplanned process of informal housing development was taking place on the slopes around the city (Stambeno preduzeće Sarajevo, 1971).

Above mentioned spatial distribution of the planned and the unplanned parts of the city directly relates to social distribution where low-income and less privileged citizens were left to occupy the slopes, while more privileged were being given apartments in the flat, planned and regulated parts of the city (Islambegović, 2016). Research conducted before the 1990s clearly shows the data on social distribution according to which ordinary low-positioned workers were being represented in informal settlements by the figure of 65% in comparison to high-positioned management personnel which were represented by the figure of 35% (Aganović, 1980, p. 239). The data presented in terms of planned, flat parts of the city show quite similar results, whereby 70% of state provided apartments were given to officials and only 30% of apartments were provided to ordinary workers (Aganović, 1980, p. 239).

The roots for distribution as such lay in a simple reason that the Law on Allocation and Direction of Funds for Housing Construction, which came into force in 1954, was promoting social inequality in a specific manner. According to this Law, 4% of each salary of all employed persons and pensioners had to be allocated to the Housing Construction Fund (Stambeno preduzeće Sarajevo, 1971). In the specific case of Sarajevo the 'Fund and the Directorate for Housing Construction of the City of Sarajevo' was the institution in charge, being the one which took care of the planning and construction of new housing estates predominantly concerning collective housing. Through this Fund apartments were being given to the employees of the city companies and the institutions, according to the established regulations which at the time were favouring references in regard to position within the workplace and the level of education. Although all funds were allocated to the Housing Fund, the apartments were predominantly given to administrative and managerial, high-income staff, leaving left the ordinary, poor

workers who were not quite able to make ends meet (Aganović, 1980). There was no place for them on the housing allocation lists, although they all were allocating funds to the sluggish and partly corrupt Housing Fund (Aganović, 2013).

Figure 3: Simplified zones of dominant construction development in Sarajevo valley trough the time of main political systems © Ibrica Jasarević

Further on, high incomes and the need to retain labour, has brought companies which existed before 1992 to provide incentive loans to address the housing issue to their workers. These loans were not big enough for the low-income workers to buy themselves an apartment, but they were enough for them to start building their own houses on the slope, as they had learned in their places of origin (Aganović, 2006). This process was partly taking place with the consent of the city institutions, which were legitimizing it by partly investing in infrastructure and other minimum utility conditions within the building sites.

After 1996, in the period after the war, reasons for informal development predominately changed in terms of causes of migration. In other words, the war acted as a certain kind of accelerator in regard to migration, although direction of the movement remained almost the same. Even in these new circumstances people who were coming to Sarajevo were mostly fleeing from Eastern Bosnia and other peripheral areas towards the capital city (Zavod za planiranje razvoja Kantona Sarajevo, 2020).

Major difference concerning this period compared to the previous one is represented by the magnitude and speed by which informal development was happening. Planning institutions were almost numb when faced with such a challenge, especially in the context of the city that has just emerged from war (Islambegović, 2016). Clearly, there was no strong political will to deal with this issue, especially for the reason that this phenomena was directly related to the failure of the refugee return programs (Islambegović, 2016).

In the years which followed, informal approach became a predominant way of development within the city, whereby, besides ordinary people, large investments were using the chaos to push their interest through (Aganović, 2006). This situation created a fertile ground for corruption and made way for different kinds of opportunistic behaviours which were feeding up informality even more. In other words, the system of informal development became a self-reproducing system of general social behaviour.

ENVIRONMENTAL DAMAGE MADE BY INFORMAL DEVELOPMENT OF THE CITY

In regard to the abovementioned, it is undoubtable that informal development has left a significant amount of serious environmental and urban health damage within the territory of Sarajevo. This paragraph will try to summarize fragmented and lacking data available from different sources while trying to present a rough assessment in regard to this topic. Generally, three main groups of problems can be singled out: the problem the problem of usurpation of available urban land; the problem of land-slides which are related to the informal infrastructural development on slopes and the problem of air pollution due to the use of solid fuel stoves for heating purposes inside the informal housing.

As it is visible from the available urban planning documentation (Aganović, Krzik, 2006), by 2006, illegal construction has covered almost 4,000 ha of city land. Almost 90 ha of these surface areas were planned to be used for the city's major public facilities such as schools and hospitals, as well as sport and recreation facilities (Aganović, Krzik, 2006). Besides this fact, almost 420 ha of land intended for collective housing was irretrievably lost as well as 1300 ha of agricultural land, 415 ha of forest land, and 200 ha of urban green space (Aganović, Krzik, 2006.). When compared to the existing city structure, the area of the city which is covered by informal settlements, is large enough to fit 152 settlements of the size of the existing collective housing neighbourhood Grbavica 2 which consumes 25ha of land, with over 90,000 inhabitants (Stambeno preduzeće Sarajevo, 1971). Although some of the above mentioned areas could be recovered with great cost and effort, such as areas which were planned for collective housing, other areas such as areas for agricultural use, forest lands and green spaces of the city are irretrievably lost (Zavod za izgradnju Kantona Sarajevo, 2017). Some areas, such as areas which represent major protected zones of water supply for the city, have to be recovered as soon as possible, at any cost implied. Fortunately, informal development still has not devastated a bigger part of water supply areas.

Another issue which is directly related to the topic of informal settlements is the problem of landslides which tend to grow in numbers all across the city. Over 1,000 landslides have been registered in Canton of Sarajevo, out of which 205 are very dangerous (Aganović, 2013). Dominantly, these landslides can be found in the sloping parts with illegal settlements and majority of them were registered in the period after 1996. In the great number of cases, reasons for their occurrence are connected to the poor quality and unmaintained infrastructure within illegal settlements, such as leaking water supply networks, and individual sewage systems known as septic tanks (Zavod za izgradnju Kantona Sarajevo, 2017). Although the city government has already invested significant resources in the rehabilitation of areas covered by landslides, some of which were cataclysmic, many of them still remain untreated while requiring a great amount of resources to be fixed. On the other hand, many landslide issues could be solved by rehabilitation of the illegally constructed water supply systems.

Further on, the impact on the environment and air pollution has been recorded through the use of solid fuels as energy sources for heating the buildings in illegal settlements. According to the study (UNDP, 2019), most suburban settlements in nine municipalities of Canton Sarajevo, with a population of 162,230, do not meet the criteria which are necessary for them to be supplied with the central district heating system. Only 5 settlements meet the selection criteria in regard to the Guidelines of the Energy Efficiency Directive 2012/27 / EU (UNDP, 2019).

As it is already well known, gasification of Sarajevo which had happened in the 1980s has largely reduced the use of solid fuels, but the use of energy sources such as firewood, brown coal, lignite coal, heating oil and pellets / briquettes is still present. These primitive heating systems are large air pollutants in the Sarajevo valley, and in the winter period are able to create high air pollution in the amount which is potentially dangerous for the inhabitants on certain days, with the pollution index over 300 units (Zavod za izgradnju Kantona Sarajevo, 2017). In lack of other options, this issue can be solved by introducing electrical heating systems such as heat pumps or similar systems, to the settlements which cannot be treated in any other affordable manner. Electrical heating together with subsidies related to it, although expensive, represents the most likely solutions of the problem.

CONCLUSION

As incredible as it may sound, a pressure of informal development, at least in terms of individual, informal housing, seems to experience a decline when observed within the period of last ten years. This is happening mostly due to population decline and the fact that many young people are leaving the country, as well as Sarajevo (SECONS, 2019). In conditions as such, where the pressure of migration is becoming less forceful, available situation might be used by city authorities to reinforce the regulations, create new plans and deal with the rehabilitation of devastated city areas.

However, before any measures are undertaken it is highly important to conduct great number of research related to this topic in order to produce sufficient amount of guidelines necessary for creation of the plans as well as their implementation. As noted before, lack of the precise and reliable data regarding the problem is one of the major obstacles in the process of creating the vision in regard to the city's future. As have been seen before, any attempt to solve any problem related to informal development before these necessary preconditions are met is almost certainly doomed to end up in temporary, ad-hock result. For instance, risk of floods, the risk of landslides, the risk of drinking water and air pollution, as well as the risk of inability to dispose of waste, are just some of the risks that can be associated with the emergence of illegal settlements, while almost certainly many other issues would be noticed after proper research is conducted.

Hopefully, the time when the city will engage in rehabilitation of the areas devastated by this phenomena, will come in the foreseeable future before the next wave of informality arrives. Maybe in the future, citizens of Sarajevo will be allocating 4% of their salaries as they did in the past, only this time in order to save the city from the devastation that has already been done. Certainly, many of us would be gladly joining this initiative.

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Shrinking Cities - Building Regional and Local Sustainability Through Valorization of Danube Cultural Heritage

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ABSTRACT

The main object of the present study are the shrinking cities along the Danube, considered in the context of the achievements of Danurb+ Project. The nature and importance of shrinking cities in spatial and socio-economic development were highlighted. The whole palette for achieving the set goals covers peripheral areas, shrinking cities and the corresponding shrinking of the functionality of the riparian spaces. The main goal is to improve the framework, capacity and solutions for sustainable development of tourism in the Danube region, based on the protection and sustainable use of natural and cultural heritage and resources, reducing the consumption of resources and energy and sustainable mobility management in order to extract many benefits in terms of economic development, environmental protection and improving the quality of life of the local population. This goal requires the development of better strategies and tools for the sustainable use of cultural and natural heritage and resources for regional development, and the avoidance or reduction of conflicts in their use (eg for tourism, consumption of natural resources, etc.). The specific objectives of the study are valorization of the cultural heritage, development of sustainable tourism, creation of a network of active stakeholders and branding for the Danube culture. The final product of the research is the creation of an Atlas of Shrinking Cities, the cultural and natural heritage along the Danube, as well as the inclusion of the adopted strategy, planning tools, local plans, interregional networks of interaction.

Keywords: *Shrinking cities, Sustainable development of tourism, Protection of natural and cultural heritage, Branding of Danube culture.*

INTRODUCTION

The study presents shrinking cities along the Danube. It analyzes and determines their nature and importance in their spatial and socio-economic development to create a more efficient, healthy urban environment. The whole palette for achieving the set goals covers peripheral areas, shrinking cities and the corresponding shrinking of the functionality of the riparian spaces. Improving the framework, capacity and solutions for sustainable tourism development in Danube region requires the protection and sustainable use of natural and cultural heritage and resources, the reduction of resource and energy consumption and the sustainable management of mobility. In order to achieve results and many benefits in terms of economic development, environmental protection and improving the quality of life of the local population, it is necessary to follow the identified priorities for the period 2020 - 2027. This requires the development of better strategies and tools. for the sustainable use of cultural and natural heritage and resources for regional development, and avoiding or limiting conflicts in their use (e.g. for tourism, consumption of natural resources, etc.). The specific objectives of the study are valorization of the cultural heritage, development of sustainable tourism, creation of a network of active stakeholders and branding for the Danube culture. The final product of the study is the creation of an Atlas of Shrinking Cities, the cultural and natural heritage of the Danube, as well as the inclusion of the adopted strategy, planning tools, local plans, interregional networks of interaction and other natural heritage.

1. THE ESSENCE OF SHRINKING CITIES

1.1 Forms and causes

Shrinking cities are those in which the economic base has eroded and whose population is constantly declining. Processes of this kind have been observed in the industrialized cities in Bulgaria for several decades. The contraction processes were caused by an economic structural change that took place in all Western industrialized countries in the early 1970s, and which led to huge job losses in the manufacturing industry. In Bulgaria, this process occurred after 1989 as a result of job cuts, which cannot be offset by new employment opportunities. The population of these cities has also decreased. The losers of the economic structural change are the cities in the Danube region, as well as the peripheral industrial locations, which are also facing constant shrinking processes. In these disadvantaged regions, the natural population decline is also becoming increasingly important. With the introduction of the market economy and the privatization of state-owned companies, the industrial base has been collapsing for several years.

Job cuts in the manufacturing industry were increased by parallel job cuts in agriculture and forestry, administration and the military. Accordingly, cities lost a large population, especially in the early 1990s, due to labor market emigration. Long-distance migration weakened significantly in the mid-1990s, instead suburbanization became more important. In addition, the dramatic decline in birth rates has caused a significant decline in urban and especially rural populations.

The timing, extent and causes of the shrinkage vary from region to region, but the cases are long-term structural defects that cities will have to deal with and that will deepen in the future. Forecasts do not show that the population in large cities will increase again. Due to the declining birth rate, cities in particular

will continue to lose population. Immigration will not compensate for population losses.

1.2 Social consequences

Cities in East and West are already facing the drastic social consequences of the shrinking process. In addition to persistently high levels of unemployment, especially socially and age-structurally selective emigration, it causes problems for cities. On the one hand, there are well-educated, qualified and younger staff who leave the cities in search of new employment opportunities, on the other hand, the processes of housing suburbanization are carried out mainly by higher-income families with children who can afford small house. Both processes lead to a change in the social composition of the population in the declining cities. Those who are poor, unskilled or old enough to emigrate remain. Shrinking processes, which are left only to the market process, run the risk of a spiral of decline [8]

1.3 Overcoming shrinkage

Dealing with shrinkage poses new and unknown challenges for affected cities. Until now, the task of urban development policy has been to make growth processes functional, socially acceptable and environmentally healthy. There are hardly any tried and tested policy strategies or tried and tested policy instruments for future-oriented control of contraction processes. It can be assumed that it will take a long time before a period of growth begins, as we still have a continuing contraction in urban development.

Shrinking cities face dramatic problems of urban development that they are not sufficiently prepared to deal with. However, it would be too short-sighted to view cities simply as victims of adverse circumstances. In these cities, too, room for maneuver can be explored and, at least in part, answers should be found to the pressing problems and their solutions.

2. LINK BETWEEN SHRINKING AND HEALTHY CITIES

2.1 Healthy city essence and meaning

An evolution of the concept of health and its connection with the urban environment and design has been made, starting from the first phase (1997) of the initiative of the Regional Office of the European Health Organization "Healthy Urban Planning". The Zagreb Declaration (2009) defines that "a healthy city offers a physically developed environment that maintains health, leisure and well-being, safety, social interaction, easy mobility, a sense of pride and cultural identity and is accessible to the needs of all its citizens."[10] [5]

"A healthy city is a city that is constantly creating and improving its physical and social environment and expanding those community resources that enable people to support each other in fulfilling all the functions of life and to develop to their full potential." City is a term used in public health and urban design to emphasize the impact of policy on human health. "Health is created and lived by people in their daily lives where they learn, work, play and love." - Ottawa Charter, 1986 [7]

The key principles of health conditions include community participation, partnership, empowerment and equity.

2.2 Healthy Cities Program

The Healthy Cities program is the best-known example of a successful Health Settings approach.

Initiated by the WHO in 1986, the idea of healthy cities spread rapidly in Europe and other parts of the world.

The healthy city aims to:

- to create a healthy environment to achieve a good quality of life,
- to provide basic sanitary and hygienic needs,
- provide access to health care.

To be a healthy city depends not on the current health infrastructure, but rather on the commitment to permanently improve the city‘s environment and the desire to create the necessary links in the political, economic and social environment . [6]

Under the 2030 Agenda for Sustainable Development, in 2015 the UN reiterated the importance of the interconnectedness of global development efforts by setting 17 Sustainable Development Goals (SDGs). Efforts to promote health based on an approach to healthy cities can contribute to these goals, including the SDGs 11: “make cities and towns inclusive, safe and sustainable”. [1]

2.3 Healthy Spatial Planning

Healthy spatial planning is the integration of health requirements in urban processes, programs and projects, especially with an emphasis on spatial planning, transport accessibility and urban planning. A healthy city is defined as a process, not one that has achieved a certain health status. It creates conditions for a healthy environment and strives to improve it. In this way, any city can be a healthy city, regardless of its current state of health. The requirements are: commitment to health and the process and structure for achieving it.

A healthy city is a city that is constantly creating and improving its physical and social environment and expanding community resources that allow people to support each other in fulfilling all the functions of life and to develop to their full potential.

2.4 Healthy Cities Approach

WHO / Europe recommends a basic model - a healthy city approach. The approach seeks to place health high in the political and social agenda of cities and to build a strong public health movement at the local level. This model strongly emphasizes the fairness, governance and solidarity of participation, cross-sectoral cooperation and action to address the determinants of health.

Successfully implementing this approach requires innovative action addressing all aspects of health and living conditions, as well as a wide network between cities across Europe and beyond. This includes:

- clear political commitment;
- leadership;
- institutional change;
- cross-sectoral partnerships.

The concept of healthy cities is inspired and supported by WHO European Health for all Health21 strategies and goals. It is fully in line with the European Health 2020 policy framework and the 2030 Agenda for Sustainable Development.

Comparing and breaking down the problems of shrinking cities with the essence of healthy cities, it can be said that for shrinking cities there must also be governance policies towards a sustainable, economic, social and healthy environment. When developing the strategy for exposing the cultural heritage and the development of tourism in the shrinking cities, the principles of a healthy city must be advocated in order to achieve a good healthy environment for the restoration of the city.

3. DANURB+ PROJECT

3.1 Nature of the DANUrB + Project

The DANUrB + project was launched in July 2020 to activate the underused cultural heritage and resources in the peripheral and border regions along the middle and lower sections of Danube. It is co-financed by the Interreg Transnational Danube Program 2014-2020. The expected result is to increase local development and international tourist attractiveness. [9] DANUrB + aims to activate the underutilized cultural heritage and resources in the shrinking settlements in the peripheral and border regions of the Danube to create new opportunities to make its cities and regions attractive again.

3.2 Main goal, specific goal and priorities of DANUrB +

The main goal of the program is to build capacity for local stakeholders to enable them to cooperate at local and interregional level to valorise their Danube-related natural and cultural heritage with local actions under a single brand, strong enough to increase local prosperity and international tourist attraction.

Specific goal – to promote the sustainable use of natural and cultural heritage and resources.

Main priority - the Danube region, responsible for the environment and culture.

Figure 1: DANUrB+ horizontal principles. Source: Internal project documentation.

DANUrB + is an upgrade of the work of DTP1-249-2.2 DANUrB, where the foundations of the cultural corridors were laid with a coherent strategy, a functional platform based on a wide cultural network supported by thematic

routes. It has been found that such DANUrB + instruments are most useful in the peripheral and border regions, where the declining socio-economic status can rely for now only on the development of the special resources of the Danube.

DANUrB + is creating a dense network of stakeholders and projects along the Danube, implementing EUSDR actions in the peripheral and border regions of the river, which can only rely on the potential of the Danube to halt the socio-economic contraction.

DANUrB + contributes to and promotes the sustainable use of cultural heritage and resources in the shrinking communities along the Danube.

3.3 Thematic directions of DANUrB +

The project consists of 4 horizontal thematic areas in 4 vertical working groups: research, planning tools, education and actions.

The thematic areas are:

- Interregional network as an opportunity;
- Shrinking cities as a challenge;
- Local residents and their cooperation as an asset for development;
- Heritage as a tool.

In this work matrix, the goals of DANUrB + become clear and easy to follow. The novelty of DANUrB + is connection of the strategic objectives to the real stakeholders with action plans applicable in peripheral situations in all sections of the Danube, and marking these initiatives in inclusive and effective ways. [3]

Figure 2: DANUrB+ partners map distribution and area of the project. Source: www.danurb.eu.

4. VALORISATION OF THE CULTURAL HERITAGE, DEVELOPMENT OF SUSTAINABLE TOURISM, CREATION OF A NETWORK OF ACTIVE STAKEHOLDERS AND BRANDING FOR THE DANUBE CULTURE

The main goal of the project is to create a comprehensive spatial and cultural network, „Danube Cultural Alley - Promenade“, connecting all communities along the river, uniting them and branding of Danube culture, ie creating a brand tourist destination on the Danube, offering thematic routes and development opportunities that can increase the number of visitors by extending their stay in the region.

One of the specific objectives of the research is valorization of the cultural heritage, development of sustainable tourism, creation of a network of active stakeholders and branding for the Danube culture.

The project partners are universities, research and development centers, municipalities, NGOs in the cultural sector, tourism councils and professional agencies based on the market, which will create a network and a common platform for work, ie creating a sustainable cultural and tourism strategy by proving that the creation of a common Danube urban brand can bring socio - economic benefits. It is very important in this process that the generalized knowledge from all countries and practices will be applied in local conditions. The closest cooperation with the communities and regional stakeholders of the 7 Danube countries leads to the creation of a common strategy based on an individual approach and specific to the site. All this ensures the sustainability of the project‘s results, reflected in the sustainable maintenance of the ‚Danube Cultural Promenade‘ by local communities with economic independence based on stimulating the development of tourism and the cultural industry. [4]

The project framework is based on the existing authentic quality brand, which supports smaller tourism service providers to develop better tourism products and attract high-value, vulnerable customers. The key issues are related to strengthening the competitiveness of micro, small and medium-sized tourism service providers by improving their access to global markets through a certification scheme.

4.1 Pilot project

The pilot project will focus on the development and testing of a certification scheme for industry representatives for small hotels and for wineries with sufficient capacity to receive visitors. The project will undertake research and use customer feedback to train members (on new trends in tourism development). In addition, it will help to create a network of certified partners to raise awareness of the authentic quality label of the Danube throughout the region and among selected international markets.

Expected results from the project activities:

On the one hand, the project is expected to lead to induced cooperation between stakeholders, which in turn is bound to improve the professionalism to constantly provide the best to visitors. Improved service quality will lead to an improved experience and greater satisfaction.

In the meantime, this pilot phase will strengthen cooperation between partners from the Middle and Lower Danube and the upper reaches of the river, which will inevitably play a crucial role in balancing the overall development of tourism at regional level. [2]

Figure 3: DANUrB+ focus of activities. Source: Internal project documentation.

4.2 Actions

The actions that will be implemented regarding the exposure and socialization of the cultural and natural heritage of the Danube will consist in the preparation of local, regional and international projects. This will be done by preparing:

- development of documentation for the local cultural heritage;
- elaboration of local plans for exposure of the tangible immovable and movable and development of the intangible cultural heritage, ie cultural values;
- promoting the local population and socializing the cultural heritage in international tourism;
- creation of projects for valorization of heritage in order to develop sustainable tourism;
- creation of projects for cooperatives, including cultural values.

Research will focus on specific points of intervention for the sustainable use of cultural heritage. It will consist of:

- development of documentation for local cultural heritage;
- processing the heritage data and when this activity is completed, connecting them to a network in the platform;
- Heritage sites will be measured and technically documented.

The development of local plans for effective cooperative valorisation of cultural heritage will achieve greater efficiency and effect of actions. The creation of new local cooperatives of stakeholders will help to valorize the local cultural heritage. Local plans for the development of cultural heritage will include the participation of a wide range of the population as education. Education will raise awareness

of the sustainable use of cultural heritage at local, regional and international levels. It will also cover information on intercultural and cross-border values. School curricula will be designed to raise awareness of intercultural and local heritage values in order to enable future generations to prosper. Training in school curricula will cover information on intercultural and cross-border values, as well as policies for the disclosure, preservation, exposure, socialization and management of heritage. In addition, the capacity of local networks for SMEs will be built with a training program to enable local entrepreneurship to operate within the cultural industries and heritage. A brand for local stakeholders will also be developed based on their local values and products, so that a healthy environmental, social and economic environment is not disturbed and built with the development of activities. Thus DANUrB + will become a regional system for quality assurance of local values and products.

Excursions and films about DANUrB + valuable for tourists and locals will be organized. The films will be about the values of the Danube cultural life and good initiatives and practices. PocketGuide tours will be organized, interconnected and developed in 4 more regions. The Danube Day celebrations will be to promote the values of life in the periphery, placed at the center of the intercultural flow of the Danube. This will result in an intensive knowledge transfer during the Danube Days. In parallel with the celebrations of the Danube Day, interconnected festivals will be organized and held. Other actions will be the implementation of the cultural values of the Danube in action, ie. their inclusion in other local, regional and international projects. The network of peripheral and border cities on the Danube will be prepared for the formation of competitive regions. Building a common brand for local cooperatives valuing cultural heritage is one of the main tasks of the project. Heritage valorisation projects will be developed in order to develop sustainable tourism that does not violate and protect the environment and social environment, as well as restore the economy by raising it to a healthy level.

DANUrB + plans are developed for action, to use the Danube heritage for the prosperity of local communities. The regional action plans are for wider regions.

4.3 Valorization

The adopted guidelines for an action plan for heritage valorisation for future projects cover:

- DANUrB + quality assurance label to ensure the visibility and quality of heritage valorisation projects;
- Building a regional brand based on DANUrB Brandbook;
- Defining quality criteria - for the quality of the DANUrB brand;
- DANUrB brand for brand quality, operational and local initiatives and values qualified throughout the river.

The cooperation between all regional and interregional projects for valorization of the heritage of the Danube River for a single brand will be implemented. The networks of the peripheral and border towns of the Danube will work for joint action. The Danube Cultural Alley Promenade Action Plan, signed by the network of all existing regional and interregional brands and projects, will promote the valorisation of cultural heritage, the development of sustainable tourism, the creation of a network of active stakeholders and branding for Danube culture.

4.4 Platform

Training and seminars are being conducted on online skills and tools enabling SMEs and cultural economy initiatives to join all DANUrB +-related conferences, meetings and workflows during the Covid-19 pandemic. A mechanism is also being set up to support stakeholders in using the DANUrB + platform. The network function is activated in the DANUrB + platform, managing and documenting new regional and transnational networks and good practices. The operation of the DANUrB + project platform is with online support for stakeholders who help to create cooperatives, including heritage valorization.

4.5 Atlas

Maps of the peripheral and shrinking areas along the Danube are being compiled for the atlas, which will be integrated into the DANUrB atlas. The proof of printing of the DANUrB atlas is also the ready for the network in digital version of Atlas, ready for integration in the DANUrB platform. Mapping of the resources that are revealed will be developed and exposed in DANUrB +. A "Resource Guide" has also been prepared to identify common development potentials in the peripheral and border regions along the Danube. A report is being prepared on current strategies, frameworks, programs, policies and provisions for linking the DANUrB + action plans with EU, national and local policies and programs. On-site research is carried out for study trips to cities with good practices to study the potential for development in declining cities. Research reports are being prepared on the potential of the intangible heritage associated with the Danube to create joint development actions in peripheral and shrinking regions.

Local stakeholder seminars are held to find local and common values on the periphery and the opportunities associated with them and the Danube. Regional conferences (in all sections and countries) on the (local) values of the peripheral situations on the Danube are also organized.

The DANUrB + action plans will use the cultural and natural heritage of the Danube for the prosperity of local communities, to build regional and local sustainability through the valorisation of the Danube cultural heritage.

4.6 Action plans

Planning reports are prepared to integrate good practices into action plans valorising heritage in shrinking situations. With the developed guidelines for an action plan for inheritance, they enable the networks of stakeholders to successfully create projects. The DANUrB + action plans will use the Danube heritage for the prosperity of local communities. Seminars are being held with local stakeholders on how to implement the DANUrB + action plans. Heritage valorisation action plans are managed jointly with local stakeholder cooperatives.

The development of regional reports on the possible impact of DANUrB branding activities on the sustainability of the peripheral regions along the Danube will lead DANUrB + to bring together all projects valuing the Danube heritage. The cooperation of all regional and interregional projects for valorization of the heritage of the Danube River as a result should lead to branding for the Danube culture.

The creation and signing of an Action Plan on the Danube Cultural Promenade of all existing and newly formed regional and interregional initiatives and projects working to valorize the Danube heritage will be a good result for branding the Danube culture.

4.7 Inter-project cooperation for the „Danube Cultural Alley - Promenade“

Online and real stakeholder meetings with participants in international network projects aimed at expanding transnational initiatives for the valorisation of the Danube heritage are taking place. An international conference on local values and initiatives along the Danube is organized, with all good practices and the formation of networks of stakeholders in order to build a common brand - branding for the Danube culture. Stakeholders will meet with participants in international network projects aimed at expanding transnational initiatives for the valorisation of the Danube heritage.

A database of projects, initiatives related to heritage valorization and local territorial development of the Danube will also be created. Any possible contact working in this field will be invited to start for future cooperation.

CONCLUSION

For the shrinking cities, the construction of regional and local sustainability through valorization of the Danube cultural heritage is a starting point for all planned areas and actions of the project. For the project, capacity building by local stakeholders to enable them to cooperate at local and interregional level on the basis of valorisation of their Danube-related natural and cultural heritage with local actions under a single brand is a strong enough reason to increase local prosperity and international tourist attraction.

Promoting the sustainable use of the natural and cultural heritage and resources in the areas envisaged in DANUrB + are a prerequisite for building a healthy environment, social and economic environment.

The Danube region responsible for the environment and culture at this stage of the project builds on the work of DTP1-249-2.2 DANUrB, where the foundations of the cultural corridor were laid with a coherent strategy, a functional platform based on a wide cultural network supported by thematic routes. DANUrB + introduces such tools that are most useful in peripheral and border regions, where the declining socio-economic status can rely for now only on the development of special resources of the Danube without compromising the health potential of this territory.

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Zagreb Declaration for Healthy Cities, 1997 https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2009/zagreb-declaration-for-healthy-cities [10]

Space as a Basic Framework for the Tourist Development of the Herzegovina-Neretva County

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ABSTRACT

Landscaping through spatial plans is an important element that determines the course and dynamics of tourist development of a place. Its importance is unquestionable and many countries recognize it as part of their development policy. Each tourist area assumes a combination of different attractions, goods and services, and availability. Modifying the old and creating new requirements for tourists, to a different type of travel, is a clear indicator of tourisam globalization path. Tourists choose to visit a certain destination based on their wishes, interests and tastes. Many features of the tourist offer will be influenced by the attractiveness of the space and tourist attractions. Herzegovina-Neretva County is located in the southern part of Bosnia and Herzegovina at the intersection of two axial communication routes – with regional, state, interstate (BiH – Republic of Croatia) and European features – which determines the current but also the future position of Herzegovina in this part of Europe. The beauty of the capital of Herzegovina, Mostar, the nature parks: Hutovo blato and the Nature Park Blidinje and growing religious tourism in Međugorje are tourist potentials that can be used for tourist purposes. In order for the entire tourism sector to adapt to the new tourism reality and circumstances, a common approach of all levels of government is required. Therefore, the task of this paper is to seek answer to following question: Will the attractiveness of the space affect the tourist demand? Will the tourism sector adapt to the new tourism reality and circumstances? Internet research, the questionnaire method, the use of secondary data sources and the method of theoretical analysis will try to give answers to these questions and achieve the aim of this paper, which is to draw attention to the indispensable connection between space and tourism as the main resource that can produce significant economic effects and contribute to economic development of this area.

Keywords: *Herzegovina-Neretva County, Spatial planning, Tourism, Attraction, Economic development.*

INTRODUCTION

Global events and changes in the behaviour of the consumers of tourist services and products lead to the occurrences of new trends in tourism and tourist destinations which give them a new look. Tourist consumers became very experienced in their travels, they combine two or more destinations, they spend more time on their travels even those that search for the cheapest offers are ready to pay something more in order to create a unique experience in their travels. Tourist activities become more diverse and in that sense they attract modern tourists who want an ecological, healthy and safe place. Herzegovina is a place with good spatial plans that can offer almost everything that nowadays tourists seek. The natural and geographical characteristics of this area are diverse. The abundance of natural beauties, the concentration of a large number of cultural and historical sights provide exceptional quality foundations for the perspective of tourism development throughout the year.

The instrument of implementing order and achieving strategic goals is definitely the Law on planning. For the puropse of this paper, a research has been conducted on 106 tourists who visited the capital of Herzegovina, Mostar. The researched approach was motivated by the challenges of modern society where today many countries, local administrations and self-administrations (cities, counties and states) are considering and trying to bring strategic decisions whose goal is to upgrade services so they can maximise tourists experience, with the goal of gaining profit.

SPACE

With the term space, we consider a realistic framework of life. Space can be natural and created (constructed), but with the classical definition (Euclid) it is set with three dimensions: width, height, length. In defining real space such as a frame of living we encounter natural characteristics of space (land, climate, morphology etc.), economical (level of production, employment), social (characteristics of the population), technical (infrastructural system) and super-structural system (Bublin, 2010, p. 9).

A man represents the most important factor in spatial planning. The world is changing and adaptation is inevitable which leads to the question of keeping the renewing of the existing environment. Recently, tourist engaged spaces are spreading, and captivate those objects that are not in focus of geographical research of tourist destinations with their attractiveness.

Ivo Kunst quotes that: “for the need of “tourism” space has to be beautiful and attractive (natural or modified by man) the space, for the need of tourism, is spent on the spot (it cannot be delivered as a resource from another location) man can keep or upgrade the value of space with his activities when it passes a certain border of operating, the space transfers into destruction” (Kunst, 2009, p. 2).

Like every resource in tourism, space requires special attention and planning. It is especially important that natural or man modified spaces has to be beautiful and attractive for the needs of tourism. For that requirement, it is unique and it can’t be replaced. Hence, actors in tourism need to secure or operate the value of the space (Bartoluci, 2013, p. 63).

SPATIAL PLANNING

Tourism is an economic activity that cannot produce, cannot trade nor transfer (even if it partially performs those activities), it performs service activities that create contribution (Markovic 1980:55). The expansion of tourism of the specific location provides many economic benefits to all market participants - private, public and non-profit sector as well as local population of the destinations (Cavlek and Sur., 2010, p. 253). From the regional point of view, there are three important questions, that planning solves and those are: residential systems, systems of infrastructure and surroundings. Fast social changes and internationalization lead to the changes in infrastructure, economic life and labour market, legislation and politics of residential construction. The social values and perspectives pass for changes because of growing mobility and cultural differences, which gives traditional and regional characteristics with a bigger, meaning (Bublin, 2010, p. 20). An attractive relief, fast rivers with waterfalls, sharp boulders, hills and mountains, plains and fields, caves are the natural beauties that can attract tourists to visit Herzegovina Neretva County. These alone are not enough to meet the needs of every demanding tourist. In order to optimally exploit tourist attractions in the space and to meet the standards of destinations quality management, it is required to build a good spatial plan.

In line with the legal regulation framework in the areas of planning and controlling the expansion, it is imposed that we need to establish a formal government body in order to secure adequate planning, evaluating, implementation and research of realization of strategic priorities for the HNC. In addition to the establishment of this formal body, the priority is securing its efficient functioning as an essential precondition in implementation of the law on development planning and development management in the FBiH (Official Gazette of the Federation of BiH No 32/17) as well as management of the development strategy and overall development of the HNC. The establishment of the body should be based on an analysis of the management system in the Herzegovina-Neretva County (strategy development of Herzegovina-Neretva County 2021-2027, p. 73).

TOURISM DEVELOPMENT STAGNATION

With the idea of emergence of supply and demand in tourism, a conscious market mechanism became involved, and thus acquired the character of economic energy. The result of its consumption has an impact on the economy and the economic balance of the country. On the other side of tourism, certain damages are generated that needs to be overlooked in order to be remedied. Tourism is travel for pleasure or business; also the theory and practice of touring, the business of attracting, accommodating, and entertaining tourists. The goal of each journey is an experience, which, in “leisure and tourism, can be described as the subjective mental state felt by participants” (Otto and Ritchie, 1996, p. 166).

Mass tourism significantly damages the environment with its activities, which causes a decline in the quality and attractiveness of some tourist destinations. Therefore, the concept of sustainable tourism has emerged as a necessity. It often results from the desire to make employment rates as higher as possible and this pursuit ends with neglecting the destinations environment and its protection. The notion of sustainable development of tourism refers to those forms that are in harmonious relationship with the physical, social and traditional environment. Sustainable development is a development that satisfies present needs, while not diminishing the possibility of future generations to satisfy their needs (loannides, 1995).

Sustainable development is not a fixed state of harmony, but a process of change in which the exploitation of resources is the direction of investment, the orientation of technological development and the institutional changes made in accordance with future as well as with present needs. World Commission on Environment and Development (1987) Our Common Future, Oxford University Press, Oxford. Therefore, it is necessary to understand the independence of tourism and the environment, because with the increase of tourist development, these resources will inevitably be subjected to the great pressures. If tourism is well planned, developed and managed, it can lead to important, positive influences on the environment. Here are a few of them:

- Provide funds for maintenance of important natural areas and attractions, including submarines, the development of national parks and reserves. This is especially important for countries that do not have sufficient funds for this purpose. - Provide funds for maintenance of archaeological and historical locations as tourist attractions. Otherwise, many of these sites would perish under the ravages of time. Often entire areas of cities are preserved and developed into tourism purposes.
- The quality of the environment is improving because tourists want to stay in attractive, clean and unpolluted places. Tourism gives a stream to control the air quality, water, noise levels and visual pollution. Also, well placed and archaeological well designed facilities intended for tourism can contribute to attractive areas (Urban and Rural). With the development of tourism, it improves infrastructure (water supplies, prevent waste of water, solid waste).
- There is greater awareness of local population, especially young people about the importance of protecting the environment. If tourism is not well planned, developed and managed, it can lead to the more negative impact on the environment. These effects are:
- Water pollution because of inadequate solution for wastewater of hotels and other facilities. That can lead to river pollution, lake pollution and sea pollution.
- Air pollution because of large uses of transport (cars, buses, motorcycles etc.) in tourist areas. Planes also cause air pollution and problems with noise.
- Noises as a result of concentration for a big number of tourists and transportations that are used.
- Visual pollution for numerous reasons – poorly designed hotels and other facilities intended for tourism, the usage of big and ugly advertisements etc.
- Solid waste disposal problems (if no good solution is found).
- Ecological pollution of natural areas because of excessive and unprofessional use of these areas and tourist purposes. Coast, sea, mountains and deserts are especially sensitive to ecological pollution.
- Damage to archaeological and historical sites because of their excessive and unprofessional use, and unprofessional tourist development
- Damage to the whole environment while using land for bad planning, poor placing tourist attractions and facilities (Magaš et al., 2018, p. 111-112).

RESEARCH

With this paper, it is important to point out the importance of the geographical spatial plan of the city Mostar as an instrument that determines the development of tourism in a particular area that was the main focus of this paper.

The research approach is set up as a model that shows how destinations can achieve competitiveness through transparent planning. Mostar is located at the south of Herzegovina, in the centre of Herzegovina. The urban area (Mostar and its environment) can be described geographically as a hub of the Northern Southern Western and East Herzegovina; the Neretva flows through the centre of the city, so Mostar is known by the nickname "the city on the Neretva". The most known mountains around Mostar are Hum, Stolac, Fortica, Žovnica, Planinica and Brkanovo brdo. The two most famous mountains of Mostar are Velež and Prenj. Mostar is like most of Herzegovina towns, very rocky. (https://bs.wikipedia.org/wiki/mostar, retrieved: 20. 5.2021). Mostar has Mediterranean climate with mild but cold winters and very hot summers. It's position is of exceptional tourist importance because it is 60 kilometres away from the Adriatic sea.

Figure 1: Geographical location of Bosnia and Herzegovina - map (source: https://bs.wikipedia.org/wiki/Geografija_Bosne_i_Hercegovine#/media/Datoteka:Bk-map.png)

Tourism is one of those branches of the economy that are associated with changes in society. The devastation of the war, the years-long stalemate and the appearance of the corona virus have had a negative impact on this economic branch. There is no doubt that tourism will face significant changes, both in terms of demand and supply.

On the basis of studying the problematic of geographical spatial planning in the City of Mostar, the following hypotheses were established:

- 1st Mostar as a tourist destination has a great deal to offer tourists, which would, through the improvement of spatial planning, directly influence an increase of standards and quality of life for the local population.
- 2nd Spatial planning in the area of HNŽ's capital, Mostar, is a system which is not yet fully evolved and adapted to the needs of the modern tourist.

Empirical research has been conducted for this purpose that included 106 respondents who visited the capital of Herzegovina- Mostar around January 20th to May 17th 2021. The used method of quizzing was the method of self-filling anonymous survey. The questionnaire contains a series of questions that served the purpose of obtaining impartial and reliable information on tourist preferences and key shortcomings in the chance to visit Mostar.

Table 1: Gender of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	47	44,3	44,3	44,3
	female	59	55,7	55,7	100,0
	Total	106	100,0	100,00	

Source: Author´s processing in statistical program IBM SPSS Statistics 26

We can see that the respondent structure by gender in the conducted empirical research was mostly equalized, however, a larger number of female respondents was encompassed (55,7 %).

Table 2: Age group of respondents

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 30	28	26,4	26,4	26,4
	31 to 40	39	36,8	36,8	63,2
	41 to 50	21	19,8	19,8	83,0
	51 or more	18	17,0	17,0	100,0
	Total	106	100,0	100,0	

Source: Author´s processing in statistical program IBM SPSS Statistics 26

The conducted empirical research detected that the highest number of tourists, who had visited the city of Mostar, were from the age group 31 – 40 (36,8%), and significantly lower number referred to the age group 51 or more (17 %).

For centuries, Bosnia and Herzegovina has been a meeting point and the place of coexistence of different nations and cultures, and according to its religious and cultural heritage, Bosnia and Herzegovina is one of the richest countries in Europe (https://visitbih.ba/vjerski-turizam-u-bih-visestoljetno-mjesto-susreta-i-suzivota-razlicitih-naroda/, retrieved: 24.5.2021). It has three large religious communities, each with its own significant shrines. Table 3. shows that one of the reasons for visiting the tourist destination of Mostar was religious tourism (18,9%). The cultural environment is closely related to tourism and travel. Some regions with their culture can be attractive to tourists which shows a clear trend because guests have a greater interest in culture and food instead of traditional attractions.

And tourist products can also become the part of a country's culture. Victorian, grand tour, honeymoon, pilgrimage to Mecca or Lourdes, and even British traditional seaside holidays are cultural symbols and tourist products (Moutinho, 2005, p.42).

Table 3: Reasons that influenced tourists to visit Mostar

		Frequency	Percent	Valid Percent	Cumulativ Percent
Valid	Holiday	13	12,3	12,3	12,3
	Visiting family and friends	7	6,6	6,6	18,9
	Religious tourism	19	17,9	17,9	36,8
	Fun and recreation	13	12,3	12,3	49,1
	Social sites	16	15,1	15,1	64,2
	Natural resources	12	11,3	11,3	75,5
	Climate	8	7,5	7,5	83,0
	Speed of the Adriatic sea	13	12,3	12,3	95,3
	Tradition (way of life, customs and hospitality)	5	4,7	4,7	100,0
	Total	106	100,0	100,0	

Source: processing author in statistic program IBM SPSS Statistics 26

For tourists, a big interest for visiting the City of Mostar, are its social sights and activities (31,1%), the proximity of the Adriatic Sea (19,8%), as well as other fun and recreational activities which tourist destination has to offer. This confirms our 1st hypothesis, which states that Mostar has a lot to offer tourists. Following the global trends in tourism and based on the potential of the City of Mostar, it is visible that in addition to the cultural and historical tourism, other types of tourism can be developed such as rural tourism, sports tourism and adventure tourism. By investing in the development of tourism, the City of Mostar would attract a larger number of guests who would stay longer and thus contribute to the strengthening of the local economy (Strategic Plan for Tourism Development of the City of Mostar 2020-2026).

The obtained results of the conducted research in Table 4. show the shortcomings that affect the absence of tourists in the City of Mostar. One of the reasons is the insufficient number of parking spaces in the city (25.5%). According to the criteria and elements for categorization, hotels must have a secured parking space or car garage. Most hotels charge for garage services, while parking is either charged directly at the hotel reception (if the car park is owned by the hotel) or guests have to pay for the use of the parking space to the concessionaires (Galić, 2017, p. 202).

However, the planned parking spaces that were treated within the spatial planning documentation are generally not implemented. Investors who build their facilities, although they have the obligation to provide a certain number of parking spaces (according to the norms), usually do not fulfil this standard. Recently, there has been an outstanding trend that many facilities are trying to be located in the central city zone, although its capacity is limited both in space and traffic. The entire management system, which contains the function of planning, construction, use and payment of parking lots, has been reduced to parking fees, and the funds obtained from parking fees are not used for the construction of new parking lots. In the central area of the city, only four parking lots are organized with a total of about 400 parking spaces, which does not meet even 50% of the needs. Parking is done on roads, sidewalks, squares and green areas, which disrupts current and pedestrian traffic and contributes to the increase of traffic

accidents (Strategic Plan for Tourism Development of the City of Mostar 2020-2026). This confirms our 2nd hypothesis, which is that spatial planning area of HNŽs capital city, Mostar, is a system which is not yet adequately developed and adapted to the needs of modern tourists.

Table 4: Reasons for non-attendance of tourists in tourist destinations

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Environmental pollution	20	18,9	18,9	18,9
	Lack of garbage cans	24	22,6	22,6	41,5
	Lack of parking spaces	27	25,5	25,5	67,0
	Inadequate amount of toilets	21	19,8	19,8	86,8
	Lack of green surfaces	3	2,8	2,8	89,6
	Illegal construction	1	0,9	0,9	90,6
	Unfinished buildings	2	1,9	1,9	92,5
	Polluted air	2	1,9	1,9	94,3
	Inadequate traffic infrastructure	2	1,9	1,9	96,2
	Overcrowding of accommodation facilities	1	0,9	0,9	97,2
	Inadequate communal infrastructure	1	0,9	0,9	98,1
	Noise	2	1,9	1,9	100,0

Source: Author´s processing in statistical program IBM SPSS Statistics 26

CONCLUSIONS

The times we live in are demanding and challenging. The world is changing and adaptation is inevitable. Tourism takes place in a certain area and is directly related to it. In fact, there is one big global transformation going on where people often behave irresponsibly towards space. The tourism industry is changing space and affecting the ecosystem. Excessive construction, illegal construction, air pollution, excessive noise are just some of the problems that arise when making business plans. Responsible management, i.e. spatial planning with a good spatial plan can contribute to the progress of the whole society. Having in mind primarily the research conducted within this paper, done through a survey questionnaire, we come to conclusion that it is of great importance to take into account the balance between 3P focuses: planet, people and profit. Geographical planning in the City of Mostar was not run efficiently. The capital of Herzegovina, Mostar, will have the increase in current forms of tourism, but the tourist offer must be developed and increased and all shortcomings that stop modern tourists to visit Mostar must be removed. In order to survive in the market, it is necessary that all destinations strive to build their own image. Only those who are devoted to this goal will be recognizably different from the competition within the global social system and these will be interesting in the flood of supply (Magaš et al., 2018, p.5). Herzegovina-Neretva County has a potential that can set this region apart and differentiate it from other tourist destinations. With a good spatial

plan, it can convey its authentic offer profile to the guest, which is different from other countries and this can become a significant source of economic gains in using this region potential.

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GIScience for Healthy Urban Regeneration. A Case Study in Rome

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ABSTRACT

The paper presents a theoretical and applied research that investigates the structural components of an urban portion of the "Tuscolano" neighborhood in Rome. So that, this contribute analyze on the one hand the morpho-typological aspects of urban fabrics and the local climate, on the other hand reflect on the potential implications of the urban form in terms of health and well-being of the inhabitants. The study join with the debate on the urban development planning careful to the quality of life and the territory demand, which is increasingly explicit at a national/international level, for healthier, fairer and more inclusive cities. To this end, the study analyzes two opposite urban structures of the "Tuscolana" road axis that divides and connect two different urban context: on one side the high-density fabrics of private buildings and on the other historical examples of Social Housing such as the "INA-Casa Plan" of the fifties. The digital elaborations examine, through multi-scale and multi-disciplinary Scientific Indices, the specific characters of this densely urbanized area which nevertheless maintain a high historical-identity and landscape-cultural value. In consequence, the research produces: i) a socio-climatic-morphological profile through data/tools referable to the field of GIScience; ii) food for thought on the role of the public/private open space system as an infrastructure capable of facing the current health and climatic emergencies and also as a fertile ground for experimentation. In conclusion, the research proposes a geo-informatics workflow to be combine with current cognitive tools so as to implement "new" knowledge bases and support decision-making processes. As a result, the research perform a case study using objective and qualitative-quantitative analyzes, with which could be possible to hypothesize different evolutionary, adaptive, resilient and eco-oriented scenarios in order to protect the health of citizens as well as the quality of the urban space.

Keywords: *Community, Health, GIScience, Urban risk map, Open space.*

INTRODUCTION

"*If the purpose of planning is not for human and planetary health, then what is it for?*" (UN-Habitat, World Health Organization, 2020, p.12).

The World Health Organization (WHO) and in particular the European Healthy Cities Network (EHCN) are some of the main cultural reference on the urban/territorial planning role in relation to the health and well-being of inhabitants, especially cities. Various considerations are linked to the city-health dynamics concerning, for example, the average life expectancy in Europe and the percentage of elderly living in urban areas which, according to the most recent estimates[1], is destined to grow in the coming decades.

Considering the current socio-demographic framework and the expected trends, the "Healthy Cities" movement and the objectives[2] proposed by the WHO in Europe for the 21st century acquire further importance. These goals in fact recognize in "healthy and safe environments" (n° 10), in "a healthier life" (n° 11), in "multi-sectoral responsibility for health" (n° 14) and in the principles of equity, accessibility and quality of life, some of the cornerstones for a renewed health protection policy on psychophysical and social level that must be promoted by all levels of city governance for people well-being.

At present, the EHCN is facing the 7th cycle[3] (2019-2025) of works since its genesis (1988) on the basis of a "transformative approach for safe, inclusive, sustainable and resilient societies" (WHO, 2018); an approach that was presented at the Copenhagen Consensus of Mayors (2018) and which renews the invitation to network between the cities involved in order to: i) promote strategies for the care of living places; ii) experimenting with innovative tools/methods/processes; iii) extend the principles of the Healthy City to increase the number of administrations involved.

Some of the document's passages invite local governments to invest in health and prevention, in green/blue infrastructures and in the creation of multifunctional places bearing in mind the potential repercussions of the choices on resident communities, on vulnerable population groups, on accessibility to indispensable services, on the protection of common goods or local specificities in the perspective of a "healthy spatial planning" and "sustainable urban planning".

In relation to the proposed contribution, the UN-Habitat dossier (2020) highlights the inseparable relationship between the health and the socio-climatic crisis, pointing out how careful planning can respond simultaneously to various emergencies (fig. 1):

Risks and challenges to health are also arising from global phenomena such as climate change, and ecosystem and biodiversity loss [...]. Urban and territorial planning influences how we use and access resources, land-use patterns, urban form and urban spatial design, biodiversity and nature, transport investments [...]; all of which are determinants of health outcomes and health equity. (UN-Habitat, 2020, p.26)

As highlighted, they are related issues that will inevitably affect many of the programmatic choices of the coming years and which at European level are already reflected in the 2030 objectives within the Agenda for Sustainable Development

1 By 2030, over 20% of the European population will be at least 65 years of age: https://population.un.org/wpp/Graphs/Probabilistic/POP/65plus/908, accessed on 16/06/2021

2 https://www.euro.who.int/__data/assets/pdf_file/0003/88590/EHFA5-E.pdf, accessed on 16/06/2021

3 https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/publications/2019/implementation-framework-for-phase-vii-20192024-of-the-who-european-healthy-cities-network-goals,-requirements-and-strategic-approaches-2019

(SUDs, 2015) and the New Urban Agenda[4] (2016). Specifically, objective 11[5] of the SDGs concerning the safety, sustainability and equity of urban policies, outlines precise goals for the livability of cities in the near future, including (UN, 2020):

a) Safety, accessibility and transition to more sustainable public/private transport systems;

b) Adaptation to climatic impacts and extreme weather events (heat waves, floods, etc.);

c) Mitigation/adaptation policies in contrast to land consumption and air pollution.

Figure 1: Relationship between planning, health and climate risk assessment. Images from UN-Habitat, 2020, p. 26 (left) and IPCC, 2014, p. 21 (right).

As highlighted, they are related issues that will inevitably affect many of the programmatic choices of the coming years and which at European level are already reflected in the 2030 objectives within the Agenda for Sustainable Development (SUDs, 2015) and the New Urban Agenda[6] (2016). Specifically, objective 11[7] of the SDGs concerning the safety, sustainability and equity of urban policies, outlines precise goals for the livability of cities in the near future, including (UN, 2020):

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- Adaptation to climatic impacts and extreme weather events (heat waves,

4 https://habitat3.org/the-new-urban-agenda, accessed on 14/06/2021
5 https://unstats.un.org/sdgs/report/2020/goal-11/, accessed on 14/06/2021
6 https://habitat3.org/the-new-urban-agenda, accessed on 14/06/2021
7 https://unstats.un.org/sdgs/report/2020/goal-11/, accessed on 14/06/2021
8 https://habitat3.org/the-new-urban-agenda, accessed on 14/06/2021
9 https://unstats.un.org/sdgs/report/2020/goal-11/, accessed on 14/06/2021

floods, etc.);

- Mitigation/adaptation policies in contrast to land consumption and air pollution.

It is evident that many of the European indications directly/indirectly already address the issue of health in the urban environment, aware that it is possible to respond locally to contain the clear common critics (e.g. production/presence of climate-altering gases, reduction of ecosystem services, widespread impermeability).

Based on these knowledge, various States[10], some of which situated in the Adriatic-Balkan area, are currently involved in the 7th EHCN cycle thanks to the support provided by the WHO Europe network that involve various cities and administrations, including:

- Croatia (Rijeka, Zagreb)
- Greece (Agii Anargiri Kamatero, Igomenitsa, Orestiada, etc.)
- Italy (Modena, Padua, Udine)
- Montenegro (Podgorica)
- North Macedonia (Skopje)
- Romania (Oradea)
- Serbia (Novi Sad)
- Slovenia (Celje)

Investigating the latest publications carried out by some of those States[11], it is clear that improving the state of health of a country, from healthcare to the choice of territorial development policies, requires a collaborative effort between different skills, levels of governance and sectors of society in which public and private collaborate for the well-being of the community. That's challenge is not easy and requires the adoption of plans/policies[12] to respond at an urban level with actions aimed at the management of aging[13], obesity-sedentary lifestyle, diseases of the cardio-circulatory and respiratory systems or common dysfunctions such as hypertension or diabetes.

While some of the States listed have initiated processes to improve public health care (Slovenia), others have conducted studies on the interaction between infrastructures and health (supply of drinking water[14], energy and industrial production, etc.), or on the consequences in terms of pollution and premature deaths[15], highlighting the correlations between planning and potential impacts on inhabitants health.

The incipit interrogative sentence invites experts and decision makers to bring urban planning closer to the real needs of people and in this sense it underlines

10 https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/who-european-healthy-cities-network/membership/list-of-phase-vii-healthy-cities, accessed on 15/06/2021

11 Were considered mostly the Nations participating in the HURBE 2021 project

12 Healthy Living National Program (2016-2022), Croatia; Zone Plan for the health and social well-being of the Modena District (2018-2020), Modena

13 North Macedonia (https://apps.who.int/iris/bitstream/handle/10665/339644/9789289055420-eng.pdf) worked on the topic of Health Aging and qualitative-quantitative profiling of the elderly population at the state level. At a local level the city of Udine (D'Onofrio, Trusiani, 2017)

14 https://www.euro.who.int/__data/assets/pdf_file/0003/398433/20190328-h1715-sdg-topic-montenegro.pdf, accessed on 15/06/2021

15 On the relationship between particulate pollution and deaths in the urban environment: https://www.euro.who.int/__data/assets/pdf_file/0020/412742/Health-impact-pollution-Serbia.pdf, accessed on 15/06/2021

how the issue is already supporting the international cultural debate on the subject.

INTRODUCTION TO THE CASE STUDY

The research analyzes a portion of the consolidated city in the east/south-east part of Rome inside the VIIth Municipality, the most populous with over 300,000 inhabitants. In particular, the study examines a part of the city that develops along the longitudinal axis of the Via Tuscolana from "Porta Furba-Quadraro" to "Piazza di Cinecittà" which, along its path, separates two different urban landscapes and urban areas: "Appio Claudio" and "Tuscolano-Don Bosco" (fig. 2).

Despite the physical proximity of the two areas, within which the axis of Via Tuscolana is configured as a "zipper" and at the same time an urban break, the areas are characterized by structural and shape diversity as well as prevailing building typology. In fact, the Tuscolano is inhabited from almost double the resident population (about 19,000 people, by 2020) and is characterized by the presence of a high density building fabric built up in the second half of the 21st century, in which the presence of open spaces is extremely limited.

Figure 2: Classification of the study area: axiality and built fabrics. In red, the perimeter of the macro area and sub-area of interest. Scale ratio_1: 25 000. Personal processing.

Indeed, the opposite front, the "Appio-Claudio" neighborhood, characterized by a predominantly residential and medium-high density fabric in the southern quadrant, identified itself on the presence of the largest INA-CASA plan in Rome

(from the 1950s) designed by important italian architects (A. Libera, M. De Renzi, S. Muratori etc.). An area that in the greyness of an intensely urbanized part of the city can be defined as a "happy island", within which the housing units are merged with open spaces, public/private green areas, proximity services and places of aggregation which constitute a permeable urban connective of significant social and landscape value[16]. This portion of the city has certainly the potential to counteract the extreme climatic events and during this pandemic emergency has certainly allowed its inhabitants to "resist" and adapt better to the various restrictions. Thanks to this open spaces system, the residents takes advantage of neighborhood places in which maintain interpersonal relationships, both inside and outside the area, considering also the presence of the nearby parks of historical-archaeological and landscape value of "Tor Fiscale" and "Aquedotti".

THE PROPOSAL OF A METHODOLOGICAL APPROACH: BEYOND TRADITIONAL COGNITIVE TOOLS

The research and the proposed method invite us to reflect on the one hand on the potential implications of the urban form in terms of health and inhabitants well-being and on the other hand evaluate the (different) response capacity of the two areas referring to health and climate emergency. To this end a geo-computer workflow is proposed below; an informatics process that could renew and support the cognitive tools of urban planning contributing to the production of new critical and scientific knowledge.

The study with a multi-disciplinary approach analyzes the urban configuration through tools (Remote Sensing, software/hardware/GIS[17] tools), processes and methods (Spatial Analysis, Scientific Indices) related to GIScience. Part of the work developed re-elaborates the methodological indications provided by the Intergovernmental Panel on Climate Change[18] and the proposed "chain of impacts" (visible in fig. 1) in order to identify the vulnerable areas which suggest inevitable considerations on the socio-health crisis and perceived well-being.

The work, starting from Open Source-Open Access macro scalar data, evaluates the fragility/ potential of the area and in particular focuses on the INA-CASA "Tuscolano" Plan and on the opposite urban front, both developed along the transversal axis of "Via del Quadraro-Via dell'Aeroporto".

From the studies, a dynamic and updatable morpho-socio-climatic dataset was created. An output that has been produced from qualitative-quantitative data first measured and then returned spatially on a hexagonal grid of about 200 square meters; this geo-spatial dataset constitutes a "cognitive framework" different from traditional static cartography and that reveals, if interrogated, the degree of site-specific vulnerability of the areas as the relationship between:

a) Density and vulnerable population;

b) Trees and shrubs and permeable/impermeable urban surfaces;

c) Surface temperature during/after a summer heat wave;

The information returned by the geo-processing operations allow us to reflect from another point of view on some emerging issues of urban planning and highlight a critical urban system on which articulate and experiment qualifying actions and

16 http://www.urbanisticainformazioni.it/IMG/pdf/ui289si_sessione_speciale_5.pdf; this paper represents a methodological-applicative advancement of the contribution presented within of "XII Giornata di Studio INU- BENESSERE E/O SALUTE? 90 anni di studi, politiche, piani", on 18.12.2020

17 Geographic Information System

18 https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-PartA_FINAL.pdf, accessed on 16/06/2021

climate-neutral scenarios to enhance the landscape-city-neighborhood system and protect the health right.

Data and sources

- Landsat 8 satellite images (Bands 10 and 11, Thermal Infrared Sensor-TIRS) with geometric resolution of 30 m/px;
- Sentinel II satellite images (Bands 4 and 8), with a geometric resolution of 10 m/px;
- ISTAT "population-housing" census (2011);
- Thematic layers of Lazio Region database;
- National operational plan for the prevention of heat effects on health, summer bulletin (DEP Lazio, 2017);

PROCESSES AND METHOD APPLIED

After the layers recognitions, the first geo-processing activities in the GIS environment focused on the rationalization of the Municipal perimeter and of the limits of the census sections in relation to the study area. Because of the study area go beyond the administrative limits, some of these spatial limits, on which ISTAT releases specific data[19], were then processed manually where they would have invalidated the quality of the data with other territorial informations.

Once the pre-trial operations for the construction of the database were completed, the SAVI index (Soil-Adjusted Vegetation Index[20]) was calculated, using the Sentinel II multi-spectral image of 20/07/2017[21] through the formula:

$$SAVI = (NIR\text{-}RED)/(NIR+RED+L)*(1+L)$$

where L is a regulation factor which has been assigned the value of 0.5 by scientific literature (Huete, 1988) and where NIR (Near Infrared) and RED are the electromagnetic bands in which the vegetative response is particularly visible. The index returns not only the distribution of the vegetated areas with reference to the date of acquisition of the image (in a range from -1 to 1), but above all expresses the vigor of the vegetation and presence intensity of chlorophyll in the plants.

After a heedful observation, a threshold value (0.4) was selected to extract the natural and anthropogenic components (vegetation, buildings, roads, etc.) through the "spectral signature" of the elements themselves (fig. 3).

The permeable-vegetated surfaces were then distinguished from the waterproof-artificial ones proving that the calculation optimally identifies the arboreal-shrub presences. Instead the semi-automatic process leaving out large portions of park areas as resulting as "bare soil" devoid of vegetation at the time of the satellite shot and for which manual corrections have been made (fig. 4).

19 https://www.istat.it/it/archivio/104317, data acquired from ISTAT DBs

20 For a brief overview: https://wiki.landscapetoolbox.org/doku.php/remote_sensing_methods:soil-adjusted_vegetation_index

21 The choice of the year is related to the heat waves on Rome in 2017, on which the thermal analyzes are based. The month and day depend on presence of images without cloud cover and the seasons with vegetative activity

Figure 3: SAVI Index; vegetated (green, values over 0.4) and non-vegetated (red, values under 0.4) areas of the VIIth Municipality of Rome. It can be noted that some agricultural areas are not highlighted due to the absence of crops and vegetative activity (bare soil). Scale ratio_1: 100 000. Personal processing.

Created the Atlas of Urban Green, a thermal analysis was conducted using GIS tools and Remote Sensing methods, processing two Landsat 8 satellite images that acquire thermal information on the earth's surface. The days were chosen after an investigation of the material available about the most recent and impacting heat waves in the Lazio Region and in Rome (DEP Lazio, 2017). In this regard, summer 2017 was selected, recorded as the second hottest season since 1800 in Italy after 2003, which reported a positive anomaly in terms of average temperature of + 3 ° C for the month of August (compared to the climatic value of reference, 1971-2000). In this period, local hospitals have seen an increase in access to emergency rooms but also an increase in the mortality of over 65s during the August heat wave (fig. 5).

Figure 4: Atlas of Green and Surfaces, permeable (green) and impermeable (pink). The meadows or agricultural areas inside the Parks, manually digitized, are highlighted in light green. Personal processing.

Referring to the documentation consulted, a first satellite image was selected on 07/08/2017, during the full heat wave (1-10 August) and reported as the maximum risk (3); a second one was acquired on 23/08/2017 at "zero" risk for several days. Subsequently mathematical formulas[22] were applied to the two thermal bands (B10 and B11) of the images to develop the LST (Land Surface Temperature) index and convert the raw data into temperature expressed in degrees Celsius. This index measures the surface temperature, specifically related to the Urban Boundary Layer (Oke, 2006), that is the coverage of the urban area above the average height of the buildings. The Index results depends on systemic factors[23] of anthropogenic nature as the albedo/reflectance of the materials, the degree of artificialization of the soils, the tree cover/presence or the humidity and the type of green areas (Oke et al, 2017). So, the macro-scalar processing does not return the temperature perceived by people at street level (0-2m), which would require precise measurements collected by sensors and micro-scalar simulations, but highlights the system of the areas most subject to heat-stress at an urban-territorial level. These areas in fact absorb most of the direct daytime radiations and then release them during the night, thus contributing to the phenomenon of "Urban Heat Island", locally powered by the morphology of the city and by the globally tropicalization of the European climate[24].

Figure 5: Data about Rome for the period May-September (DEP Lazio, 2017). Source data from HHWW (Heat Health Watch Warning System) and Daily Mortality Surveillance System. In evidence the risk classes associated with August (top) and the relationship between the increase in mortality in over 65s and the heat wave (bottom).

The elaborations carried out confirmed the heat wave that hit Rome in the first decade of August 2017 and show firstly that even the parks not tree-covered are dried and particularly hot; secondly highlights as both areas seem to respond homogeneously to thermal problems with the exception of the "Tuscolano III" area

22 The index was developed starting from the procedures explained in Anandababu D., Purushothaman BM, Suresh Babu S., 2018 and in Coelho ALN, Correa WSC, 2013 which convert the Digital Numbers (DN) of the individual pixel into atmospheric radiance, temperature to satellite, emissivity of the earth's surface and finally in temperature at ground level

23 For more information on the relationship between the shape of the city and the urban micro-climate: https://aerisfuturo.pl/wp-content/uploads/2018/09/Urban_Climates-1.pdf

24 An interesting study by the European Data Journalism Network-EDJNet: https://www.europeandatajournalism.eu/eng/News/Data-news/Climate-warming-in-Europe-municipality-by-municipality; the general Web-GIS: https://climatechange.europeandatajournalism.eu/en/map; a focus about Rome https://climatechange.europeandatajournalism.eu/en/italy/lazio/roma/roma; accessed on 17/06/2021.

of A. Libera (1), “Monte del Grano” (2) and “Forte Casilino” (3), all of which are largely vegetated (fig. 6). Furthermore, the analysis of the data underlines that the high temperatures persist both before and after the heat wave (albeit with different degrees of difference) and at the same time introduces, considering the different risk classes attributed to the two days, that in addition to the temperature there are other variables concurrent to the generation of thermal risk in urban areas, such as wind and above all humidity.

Figure 6: Average of the LST calculated starting from satellite measurements with 30 m/px resolution; comparison of a day within the heat wave (7 August, left) and an outside day (23 August, right). In evidence, the highest average T° and three more resilient vegetated areas (one of which is residential). Scale ratio_1: 25 000. Personal processing.

RESEARCH POTENTIAL, LIMITS AND DEVELOPMENTS

Once the applications ended, the outputs were referred to a homogeneous spatial entity (hexagons) so that to create a single relational file-database that returns a multiplicity of parameters/information, numerical or textual, expressed in the form of an average or sum (tab. 1).

At the end, the data produced were spatially interrogated and graphed to highlights the most discomfortable and vulnerable areas. In this way, it was possible to relate the information on the population density and the weak section

of the population (minors, elderly, widows, education level) to the climatic data (LST of the two calculated days) and to the urban morphology (Atlas of Green and Surfaces). As already hypothesized, the topological query of the dataset highlighted a vulnerable system mainly concentrated in the "Tuscolano-Don Bosco" area characterized by a higher percentage of residents "at risk", a lower presence of the "landscape component" and a widespread impermeability that it seals those few open spaces present, residual to the buildings, often addressed to parking (fig. 7).

Tab.1: Extract of some of the indicators of the dataset; the quantitative data refer to hexagons-areas subject to risk.

Id_esag	Pop.D. pop/mq	N°Pop. Age <=14	N°Pop. Age >=65	N°Res. Low Educat.	Imp.tot.mq (SAVI+build.)	Imp.sup.mq (SAVI)	Trees-Crown mq	07.08.2017 LST avg T°	23.08.2017 LST avg T°
5804	4,55	31,00	100,33	189,50	182,41	182,41	12,41	39,5	34,5
8179	4,39	27,00	85,33	188,00	121,28	40,65	73,53	40,5	35,5
10706	8,02	52,33	175,00	414,50	182,48	108,38	12,32	37,0	32,5
16587	4,13	26,83	86,17	215,75	194,82	193,32		40,5	34,5
16687	3,33	25,67	67,00	149,00	194,81	41,74		42,0	39,5

The Risk Map produced relates to the parameters investigated and does not consider other competing variables in the definition of the physical and social vulnerability/resilience of an urban habitat, such as proximity to the public mobility system, proximity services, quality places or urban centralities. These are other parameters would need to be studied separately and which could be the subject of future applications.

In addition to the limits highlighted, it can be observed that some specific areas, such as the "Tuscolano III" by A. Libera (fig. 5, box 1), respond well to individual assessments (surfaces and greenery) and then re-enter within the "vulnerable system"; that's because, in this case, the individual buildings host different groups of populations and, due to their favourable exposure, faced to direct radiation (in fact, many roofs are covered by photovoltaic cells).

These informatic dynamics depend on the aggregation of data, the type of spatial query and the semi-automated calculation procedures.

Finally, the work presented, albeit with limits referable to the quality of accessible data[25], accurately point out a critical macro-system, classified on an objective-scientific basis, to be deepened with micro-spatial diagnostic studies and to be designed with evolutionary/adaptive scenarios based on contemporary bio-eco-oriented techniques/solutions[26].

25 E.g.: ISTAT release data aggregated on every census section, not specific information about each building's residents. Furthermore data are related to 2011 census

26 For an in-depth analysis on de-sealing practices, Sustainable Urban Drainage System and water sensitive design and in general for an Italian overview of Nature Based interventions for green & blue infrastructures, see: Regione Emilia-Romagna, (2020)

Figure 7: Urban Risk Map. Spatial query in GIS environment: relationship between urban morphology, thermal stress and vulnerable population groups. Scale ratio_1: 25 000. Personal processing.

The research, as it has been structured, could therefore continue from macro to micro, acquiring accurate an site specific data as well as experimenting with more resolute tools, such as: i) updated and not spatially aggregated registry censuses; ii) micro-climatic simulation software; iii) Remote Sensing applications based on multi-spectral images with centimeter resolution, iv) digital terrain models and/or laser scanner surveys, just to name a few.

CONCLUSIONS

The geo-information outcome of the research leads to a renewal of the analytical-evaluative methods of urban systems; that multi-disciplinary and innovative study method could support the traditional works, especially in reference to contemporary issues of climate resilience/adaptation and public health which require data/measurements and knowledge from other disciplines. A data processing that doesn't have to replace the traditional multi-system and cartographic approach but can certainly support urban planning analysis with a variety of two-dimensional or three-dimensional information and studies. This range of new tools should power the current cultural debate concerning the future of cities supporting researches about the transports, production and consumption, land "saving" and more generally about the co-implications of urban planning in terms of health and well-being of citizens.

With a view to more efficient urban governance, the decision-makers and the various intersectoral departments within the PA, could be certainly supported by the world of research and by the new geo-spatial expertise. With foresight, these auspicated new public-private synergies will be able to address investments[27] towards a healthy, climate proof and sustainable planning.

27 Investments that will count also on funds financed for the National Recovery and Resilience Plan (PNRR); for further information: https://www.governo.it/sites/governo.it/files/PNRR.pdf, accessed on 21/06/2021

The contribute tried to highlight the close relationships between city planning, climate crisis/adaptation and quality of life and public health that configure as theoretical cornerstones and macro-objectives to be achieved for cities vivability and citizens wellbeing. A proactive urban and territorial planning therefore, which no longer understands Health in its hygienic-sanitary meaning, but in a new performance (quantitative) and perceptive (qualitative) role capable to ensure the psychophysical inhabitants well-being and answer to the demand of the territory.

An overview that presupposes the transition to more equitable, healthy and human-sized development/progress models that cities and before all central governments, must be able to undertake as soon as possible to achieve environmental, social and economic benefits.

In this context, the socio-health crisis of the last year has highlighted the importance of the social role of the city, the aesthetic-perceptive function of the landscape and urban green, the relationships between space and time, the usefulness or uselessness of some home-work trips and above all it has given voice to those hidden places "behind the house" that have been inevitably re-discovered. A crisis that has led to sudden changes reshaping habits and lifestyles in relation to the use of the city (e.g. from "the stay" to "go through"). That new behaviors and needs have been reflected in various provisional interventions on Rome and in the VIIth Municipality, focused on inter-intra city mobility. An "extraordinary" interventions Plan thought for the networking of a slow cycle-pedestrian mobility in support of public transport, in this phase under-used, which also involved the "Tuscolano"[28] area. These temporary and not yet definitively configured solutions, address towards a rethinking of urban mobility and of the system of open spaces as an urban system capable to overcome the fragility of cities and revitalizing spaces for the communities health.

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28 The Municipality of Rome, responding to the health emergency and in continuity with the guidelines of the PUMS (Urban Plan for Sustainable Mobility), has started the construction of 150 km of transitory cycle paths on the main strategic axes: https://roma-mobilita.it/it/progetti/pumsroma/piano/realizzazioni; https://romamobilita.it/it/muoversiaroma/ciclabilita, accessed on 21/06/2021

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Involving Teenagers in an Inclusive Planning Process for Healthy Urban Environment in Sofia, Bulgaria

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ABSTRACT

Planning for healthy urban environment is broadly acknowledged as a priority area of urban planning. Developing inclusive planning approaches could make citizens' voices better heard in the planning process but also help citizens to develop responsibility for their own health. A growing body of empirical urban knowledge about health-related challenges in Sofia outlines teenagers as one of the vulnerable groups. A PhD research initiative has focused on the capacity of participatory GIS to enable teenagers (schoolchildren aged from 13 to 18) to creatively join in conceptualizing the needed spatial transformations in the open public space of their neighbourhoods. The methodological approach, practical guidance and intermediate results of a pilot study undertaken in a periphery housing estate in Sofia in the spring of 2021 are discussed and major strengths and weaknesses of the digital tool under the peculiar spatial and sociocultural context are outlined. The author claims that the effective involvement of teenagers in dialogue with planning and urban design experts could be expected to contribute for a better understanding of teenagers' way of life in the city and their perceptions of health, but also for estimating their awareness about the importance of healthy urban environment and raising their responsibility to actively contribute for its planning and design.

Keywords: *Teenagers, Urban planning, Participatory GIS, Healthy urban environment, Inclusive cities.*

1. INTRODUCTION

Nowadays, the quality of the urban environment has been acknowledged to significantly contribute for numerous health issues among the urban population. UN Habitat and World Health organization have joined their efforts in addressing cities as key drivers for change and urban policy and planning as specific instruments for reaching significant impact (WHO, 2016). The topic is central for both the New Urban Agenda (UN-HABITAT, 2016) and the Sustainable Development Goals (UN, 2015) calling for inclusiveness in tackling critical issues such as climate change, environment degradation, housing, transport, and economy. Goals 3 and 11, focussed respectively on "health" and "cities", promote targets in ensuring healthy lives and promoting well-being for all and at all age in sustainable and inclusive cities. In this perspective World Health Organization adds another special focus in the topic of health and sustainable development by setting children and youth in the global discussion. In terms of living in the cities and planning the group of adolescents still appears to be among those seriously neglected. This is specifically true for the city of Sofia where different factors such as bad air quality, car-oriented development and rising social inequalities, negatively influence urban health. All these affect teenagers' physical and mental health, mobility habits, safety, etc.

The reported study is motivated by the search for effective communication tools that would attract teenagers and enable their dialogue with planning experts. The dialogue within a mapping exercise with teenagers was expected to provide reliable information about teenagers' way of life in the urban environment – their preferences concerning mobility habits, safety, and free time spent outdoors. The application of an interactive digital mapping tool (PPGIS) with a focus on individual creative action for mapping was expected to give insight about teenagers' technical competence and skills for using ICT but also to provoke participants' awareness about health -related issues and their motivation to actively contribute for improving the quality of the urban environment through urban planning and design.

2. PARTICIPATIVE /INCLUSIVE APPROACHES IN PLANNING FOR HEALTHY ENVIRONMENT

Health is nowadays a central topic in the process of reaching sustainability on a global scale (WHO, 2016; UN Habitat, 2016). Urban planning as a practice that most directly addresses the linkage between quality of the urban environment thus influencing urban health has become even more sensitive under the perspective of climate change and the covid-19 pandemic. Creating community resilience is claimed crucial for facing contemporary challenges. Community resilience, defined as "the ability of a system, entity, community, or person to adapt to a variety of changing conditions and to withstand shocks while maintaining its essential functions." (World Bank, 2015), strongly relies on building trust and improving relationships between different stakeholders, which is achievable through the active engagement of all social and age groups (Bigs et al, 2015). When talking about teenagers, participation is even of bigger importance. In 1992 Roger Hart elaborated "The ladder of children participation", stepping on the conceptual framework of Arnstein's Ladder of Citizen participation. Hart defined "children" as all those from preschool-age children to adolescents, explaining that the purpose of the ladder is to help professionals in understanding the way they communicate and involve children in the process of planning (projects and programs). The eight levels of Hart's ladder are structured in two bigger groups –

one that indicates events considered by the author as unsuccessful participation and the other one that combines "different levels" and occasions when children are actively involved in the process. The 8th rung represents the highest level when children (primary teenagers) share "decision, management, or power with adult partners and allies." (Hart, 1992) This specific form of participation, Hart explains, empowers young people to have a significant impact on policies, projects that are usually under the exclusive control of adults. Other authors suggest that youth involvement in the decisions that affect them can enhance young person's sense of connectedness, belonging and valued participation, and thus impact on mental health and wellbeing (Oliver et al, 2007). Through this type of participation, the adolescents gain knowledge and skills about different topics, as well as problem solving, working in a team, and communicating with adults and their peers. Participation and inclusion are sometimes considered different dimensions of the public engagement. Quick and Feldman argue in 2011 that participatory approaches are focused mainly on collecting input for decision makers, whereas inclusion practices work for building capacity. Latter is reached through establishing connections between people, events and phenomena through sharing knowledge and skills to tackle future problems and make decisions.

2.1 PPGIS

In his article "GIS: History", Nigel Waters traces the development and evolution of geographic information systems. Starting with the names of Roger Tomlinson (father of GIS) and Ian McHarg (Ian McHarg's method to overlay analyses) during the "pioneer period" of 1950s-1970s, Waters goes to the beginning of 21st century - years marked with the emergence of volunteered GIS, cloud computing and big data. In the history review, he gives insights on the specifics in the international context, correlating with some significant events such as the quantitative revolution in geography, the progress of computing technology and the change in the professional dialogue on GIS – from systems to science. As Waters explain, latter was developed mainly as an academic discipline in the mid-1900s, shifting the focus from technology to data processing and exploitation. In 1996, during the National Center for Geographic Information and Analysis (NCGIA) Workshop in Orono, Maine, PPGIS (public participatory GIS) was coined as a term for the first time. It was used to define an approach to community planning that activated marginalized and neglected groups (young, poor, elder, ethnic minorities, women, etc.) in the process of changing their environment. Whilst PPGIS was gaining popularity as a tool for capacity building and community empowerment, some critics questioned its identity and real contribution. Pickles, for example, argued that PPGIS was an "instrument of capital control and surveillance" and Sieber further developed that "use of the technology lends the illusion of control over decision making when actual control remains within the governing class." Nonetheless, PPGIS has proved to be a successful tool in numerous cases and especially in the child-centered research. According to Kyttä the method allows analyses on urban environment and its characteristics alongside with subjective perceptions of place that are of serious importance in studying children's wellbeing and health in the city. (Kyttä et al. 2018)

2.2 The specific group of teenagers

The group of teenagers is considered specific due to its heterogeneity derived from the different cultural, social, and economic backgrounds of the group members. What is, however, common and valid for all of them are the physical and psycho-emotional transformations that characterize this development phase in life. Self-affirmation and communication with members outside the family

group along with the increased importance of building connections with peers are dominating over parental authority. In this specific period, teenagers become more independent in their day travels and tend to explore the surrounding environment. Teenagers are frequent users of public space, traveling from home to school or workplace and looking for entertainment. Being outdoors they look for privacy and break from home responsibilities and parents' control. In public space they test different identities and barriers through their behaviour, fashion, or other activities (Owens, 2002). A group of teenagers lingering in the streets or occupying younger children's playgrounds is not necessarily an appealing sight. Yet, activities performed by the teenagers in the outdoor environment often bring safety considerations. Leiberg (1995) argues that as teenagers have no right to spaces of their own, they go to outdoor public space where they often encounter conflicts with other groups. Crime and vandalism as well as imposed public order regulations are among the topics that have provoked discussions on society's prejudice to teenagers and teenagers' right to the city mainly in the Western world. Building satisfying social relationships is an important task of adolescence and it is a prerequisite for the development of psychologically healthy adults (Larson & Richards, 1989).

2.3 Teenagers in Bulgarian urban planning context of Sofia

For many years, the knowledge about young people in Bulgaria has been mainly a subject of studies in the fields of psychology, sociology, and geography. Nowadays, identified urban ecological issues and negative tendencies in mobility habits, nutrition and free time occupation are already recognized as leading factors threatening teenagers' health. Lacking or inappropriate public spaces could be considered among the major deficiencies of Bulgarian cities. Today the topic of healthy spatial planning is already present in public discussions and expert debate, but the linkage between planning and health remains underestimated in practice.

The prefabricated housing estates from the second half of the 20th century still shelter a considerable share of the urban population of Sofia. Although shrinking due to continuing investment pressure, the abundant public green space there accommodates various activities and enables pedestrian movement, leisure, and contacts for various groups of inhabitants (Tasheva-Petrova et al, 2020). Teenagers are among the most frequent users of these spaces, yet their specific needs are still largely neglected by planners and authorities.

3. RESEARCH AIM AND METHODOLOGY

3.1 Research aim and main research questions

The research aimed to test the effectiveness of the Participatory Geographic Information System (PPGIS) as a communication tool in the expert dialogue with teenagers by providing information about (1) teenagers' technical competence and skills for using ICT; (2) teenagers' way of life – their preferences concerning mobility habits, safety, and free time spent outdoors and their awareness about health-related issues in the urban environment; (3) the capacity of the interactive digital mapping tool (PPGIS) to provoke individual creative action for mapping and pupils' interest to actively contribute for improving the quality of the urban environment through urban planning and design.

3.2 Research methodology - a workshop in online environment

The main method applied for testing the PPGIS effectiveness was group-based qualitative research through a workshop for participatory mapping that was followed by qualitative and quantitative analyses of the collected data. Google My Maps web-based application software was used for the elaboration of the teenagers' maps.

The participants in the workshop were expected to create their individual school route maps and to visualize specific places on the route, which they liked or disliked. Participants were also supposed to share subjective feelings about the chosen spots, to share their ideas for possible improvements and their readiness to get involved in practical action. The topics of health and spatial planning were not explicitly mentioned in the workshop tasks, but relevant links were identified in the respondents' comments on their personal physical and emotional balance while visiting the chosen places.

Figure 1: A) GIS Guidebook Cover
B) Page content – Representation of physical environment in GIS explained.

Setting an online workshop was not an initial choice but rather an alternative option because of the restrictions enforced in the country at the time of research due to covid-19 pandemic. The online schooling was an encouraging fact as pupils had been already provided with devices and had acquired initial skills for online training and practical experience with a platform for online interactions. The online environment significantly affected the choice of the GIS product. The argument for choosing Google My Maps was its popularity among users which was considered crucial for overcoming an initial performance-related stress.

The workshop was planned in two phases, 45 minutes each. During the first one a brief overview was to be provided on GIS technologies, their use, and possible

benefits for teenagers in their everyday life. It also included a demo mapping work to prepare participants for the second phase. The work in the online environment was considered an advantage as it could allow sharing a presentation and demo mapping in real time on a personal display. The second phase was intended for the mapping exercise. Six empty google maps to be used during the exercise were prepared in advance and shared with each of the participants. The workshop moderator had access to each map during the work of the respondents. This accessibility was also considered an advantage in terms of risk management and monitoring the quality of performance.

Figure 2: Demo map

In the spring of 2021, a workshop with teenagers from Nadezhda housing estate in Sofia was organized[1]. the workshop was held as an online event via Microsoft Teams platform. The pupils' group included six participants – 4 girls and 2 boys at the age of 14, all of them classmates in the local secondary school. Taking into consideration the specificity of the age group, and the method and tool chosen, the researcher developed a short guidebook about GIS as tool in advance. Several preliminary steps were also undertaken: (1) receiving relevant administrative permissions and signed confirmation forms of informed consent; (2) setting a

1 The workshop was intended as part of a PhD research in progress, but it was synchronized with ongoing European URBI-NAT project (Horizon 2020) – meant to build upon already accumulated empiric data and established contacts with the local community and authorities.

digital classroom; (3) preparing a PPT presentation, a demo map, and individual digital maps for the respondents. The direct and indirect feedback received from the participants during the workshop was then analyzed and interpreted to answer to the two research questions posed.

4. RESULTS

For the purpose of analysis, the research results were organized in two groups: the first one concerning the technical and task performance of PPGIS application; and the second one related to the range of space- and health-related topics dealing with qualitative information, based on respondents' subjective evaluation of the urban environment.

4.1 Technical and task performance of PPGIS application

This part of the results provides an insight about the technical side of the process and technical quality of data received. Also, it helps to draw conclusions about the technical suitability of the chosen software for this specific study. The results show that 4 out of 6 respondents managed to successfully finalize their maps. The teenagers demonstrated good understanding of objects' representation in GIS as points, lines and polygons and their visualization. There were some minor inaccuracies that were not essential for the specific work. From those who could not finish, one was using a mobile application and the other did not want to share what the problem was (tab. 1).

Table 1: PGIS application. Technical performance – difficulties faced by participants.

	Technical performance			
	Technical equipment	Difficulties with internet connection	Difficulties with layers	Difficulties with feature creating tools
R1	Laptop	No	3 layers according to geometry	No
R2	Phone	No	No layers	Yes
R3	Laptop	No	2 layers; 1 with mixed geometry	No
R4	Phone	No	No layers	Yes
R5	Laptop	No	3 layers; features do not correspond to layers' geometry	Route drawn with a polygon tool
R6	Laptop	No	3 layers; features do not correspond to layers' geometry	No

Table 2: PGIS application. Task performance – coverage of task aspects.

	Task performance		
	Geometric features (1 route and 3 places)	Attribute information	Clarity
R1	1 route, 9 places (7 points and 2 polygons)	Yes	Yes
R2	0 features	No	
R3	1 route 4 points	Partial	Yes
R4	0 features	No	
R5	1 route, 7 places (5 points and 2 polygons)	Yes	Yes
R6	1 route 3 places	Yes	Yes

Figure 3: Participatory mapping results. A) Respondent 1 map B) Respondent 5 map.

4.2 Space and health-related data in the responses

The stored data showed that respondents had not covered all the questions posed. Their focus was set mainly on places they liked while negative aspects and ideas for change were scarcely presented. A serious problem identified was the quality of the information filled for each of the places.

The topics addressed by the respondents concerned teenagers' physical well-being and their mental health. They could be summarized as follows: 1) Nutrition habits - fast food kiosk and pizza restaurants; 2) Access to and maintenance of green and blue areas - parks, local green areas, the riverbed; 3) Spaces and urban furniture for social interactions - gazebos, benches, amusement facilities; 4) School environment.

The mapped objects revealed information about their everyday habits in terms of mobility, free time activities and nutrition, as well as how the surrounding environment affected them. In all the cases, the routes to school were entirely pedestrian whilst one of the respondents reported for increased traffic next to schoolyard that was caused by parents who used to drive their children to school. It became clear from the maps that all participants lived in the neighbourhood, in the school's 25-minute isochrone, which explained the positive results about teenagers' pedestrian activities. The open green spaces of the housing estate that was built in line with modernist principles also facilitated the usage of non-motorized means of transportation. One of the respondents marked a pedestrian zebra next to the school building indicating problems of safety that

she experienced there. The prevailing number of places that were considered attractive for visiting by the respondents were the green areas – local park, smaller green areas, and the riverbed. There was a distinctive variety of activities performed there – sports, relaxation and observation, meetings with friends, reading a book and studying. The negative characteristics of the most favourite places were related to bad maintenance, (overgrown greenery and litter) as well as safety considerations about presence of homeless people, stray dogs, and lack of streetlights during dark hours. Urban furniture - gazebos, benches, tables, etc., received special attention. It was estimated to attract visitors, thus making the environment nicer and safer. The riverbed was mentioned only once, as the respondent made comments on the relaxing effect of water sound that he could have enjoyed from a tiny bridge if it was not for the bad smell, insects, and overgrown greenery. The sport playgrounds were marked as places for active physical training and received positive evaluation, too. The commercial objects such as fast-food kiosks and pizza restaurants were mapped among teenagers' favourite places. Only one respondent marked a whole street as a favourite place. He particularly enjoyed the concentration of commercial objects and the liveliness there. The school yard and the school building were present in all the maps as a place for free interaction with classmates. That was one of the few spots that received ideas for change. Two respondents commented the need for more colourful environment, an outdoor classroom, more greenery and running paths.

Table 3: Questions answered, and topics covered by the respondents.

	Route	Places characteristics			Subjective feelings	Ideas for change	Readiness for partici-pation
	Route evaluation	Positive	Negative	Elements			
R1	Uncovered	Yes, for all points	Yes, for all points	Partially covered	Partially covered	Partially covered	Partially covered
R2	Uncovered	Uncovered	Uncovered	Uncovered	Uncovered	Uncovered	Uncovered
R3	Uncovered		Uncovered	Partially covered	Uncovered	Uncovered	Uncovered
R4	Uncovered	Uncovered	Uncovered	Uncovered	Uncovered	Uncovered	Uncovered
R5	Uncovered	Yes, for all points	Yes, for all points	Yes, for all points	Partially covered	Uncovered	Uncovered
R6	Uncovered	Yes, for all points	Yes, for all points	Partially covered	Uncovered	Yes	Uncovered

5. DISCUSSION

5.1 The applicability and effectiveness of the approach to teenagers' age group

Participatory mapping proved good applicability during the work with teenagers and could be recommended as a promising tool for actively involving teenagers in a participatory planning process. Both the task and the tool were accepted well and provoked excitement during the workshop. The positive attitude could be considered as an important factor that could contribute to successful results. The respondents' feedback was generally positive, and teenagers considered the tool to be valuable and helpful. One of them shared that they would need more activities like the workshop organized. Some encountered minor technical problems (e.g. "how to do?", "where is it?", "I don't see.") resulted in providing mutual help assistance in the group and contributed to the teamwork and interest

in the topic. The pupils demonstrated good operational level of ICT knowledge and skills. In terms of quality of results, the method showed some limitations. It was noted that technology was overwhelming and that negatively affected the qualitative information provided by the pupils. Although, they communicated freely and the facilitator could observe the process, the online interaction was not considered to be beneficial as two of the maps remained empty. Their owners participated in the conversation but not in the map creation claiming they were changing devices. Despite all this, PPGIS was a good starting point for establishing a dialogue with the teenagers and for testing their attitude towards the method. The results confirmed the need for more tailored solutions that are specifically elaborated for online environment (e.g. Maptionnaire) and for further quantitative research methods to be applied.

5.2 Teenagers' health awareness and health-related considerations about the urban environment

The results showed that teenagers intuitively made the link between the characteristics of the urban environment and the way it affected their general comfort without articulating it specifically. That was most noticeable in the part where they were sharing subjective feelings about the specific places. Natural environment was associated with stress free conditions for active relaxation and sport. Walking activities were also estimated as stress reducing but were also considered as moments of connecting and nurturing the sense of belonging to the life of the neighbourhood. The topics related to sport and leisure were a priority, whilst nothing was mentioned about needing space for culture and art-related activities. Health considerations raised the topic of quality and overall accessibility of public spaces, which are still the ultimate medium where teenagers spend their time. Mixed-use areas easing pedestrian movement and providing liveliness, provision of facilities for sport and amusement, proper maintenance and design are key to better environment that was favoured by the teenagers.

5.3 Proactive attitude to the urban environment

Proactive attitude is essential for the creation of resilient communities and socially responsible citizens. The feedback received as part of the conversation with the participants included a valuable statement made from one of the respondents who expressed specific interest and explained he had never thought about and looked at his neighbourhood in this way. Yet, young people shared feeing of insecurity making comments about the urban environment and feared incompetency. They also had difficulties visioning the space of their own and pointed at little children's playgrounds as an appealing asset that satisfied them.

Reflections on this statement include thoughts about the urgent need for youth civil education and adoption of inclusive practices in the planning process.

6. CONCLUSIONS

The research results confirm that participatory mapping could be an effective tool for the inclusion of young people in public dialogue on healthy urban environment. There are some considerations related to the further sophistication of the process and the tool that were used. They concern the technical functionality in terms of improving information quantity and quality on the subjects that were supposed to be covered (e.g popping windows that remind the questions that need to be answered). A serious gap in involving young people from the planning practice

and the urban topic in general needs to be urgently overcome. Scarcity in data collection, communication, and strategic action in the sphere of participation and inclusion should be considered as a serious threat for nurturing active citizenship among youngsters and building sustainable communities in the local context.

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Quality, Environmental Comfort and Safety in Public Spaces

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ABSTRACT

Climate change and health emergencies require integrated responses to mitigate the effects of the phenomena on urban realities and citizens and increase their resilience.

In line with the principles enshrined in the international summits, the paper illustrates an experimental approach aimed at integrating urban quality, micro-climatic comfort, saving and enhancing the water resource and the reintroduction of nature in the city. The experimentation focuses on the regeneration of public space and at a neighbourhood scale in the dimension of "everyday" living. As enshrined in the New Urban Agenda of 2016, public space plays a central role in helping to increase sustainability, social integration and develop conviviality in urban contexts. The experimentation aims to build a multidisciplinary framework that includes the impacts of climate change and those brought by the experience of the Covid-19 pandemic. The objective is to enrich the concept of urban quality by integrating it with ecological and environmental quality with particular reference to the mitigation of the effects of climate change on urbanized areas. Today, in regenerating the city and designing in the direction of an ecological transition, it is necessary to assume an integrated methodology. The multidisciplinary is in fact the key issue of the proposed experimentation to be able to multiply the quality of urban design. The aim is to meet the needs related to the well-being of the citizen through the integrated analysis of different disciplines related to: urban microclimate, the role of rainwater, the presence of plants and green spaces, land consumption, drainage systems, the connection between the parts of the city and the perception of citizens.

The experimentation illustrated proposes an integrated approach to the regeneration of neighbourhoods in the city of Rome by prospecting "neighbourhood green networks" punctuated by interventions of different sizes, applying the principles of urban acupuncture.

Keywords: *Urban outdoor spaces, Adaptation, Sustainability, Urban well-being, Urban liveability.*

INTRODUCTION

Urbanization and its adaptation to climate change are now being discussed worldwide. It is important to address the resulting problems at all scales and certainly urban design has a key role: it can respond to the problems related to climate crisis mitigation and promote sustainable resource management (Marry, 2020; EKLIPSE, 2017). Nature Based Solutions can be considered as a term that encompasses different concepts or technologies ranging from blue-green infrastructures (BGI) to natural water redemption measures, to ecosystem-based adaptation (European Commission, 2020; Nesshover et al., 2017; Pauleit et al., 2017). Public space is at the heart of the proposals for the regeneration of cities proposed by the research. The liveability of spaces and their environmental quality can make a difference in the evolutionary process of cities towards sustainability (Ravanello, 2018). Open spaces must be well designed, enjoyed by citizens, and meet environmental comfort requirements (Brown, 2010). The comfort caused by good design is strongly linked to the use of natural elements. Only in the last sixty years it is understood that a balanced environment must contain all of the ingredients necessary for biological prosperity, social cooperation, and spiritual stimulation of humans (McHarg, 1969). These factors are addressed by ecology, one of the disciplines that led to the results of these studies. A project must be based on human perception and environmental needs, as well as their relationship. In this way, the quality of life of citizens is increased (Nikolopoulou & Steemers, 2003; Nikolopoulou & Lykoudis, 2006; Givoni et al., 2003). In this sense, the research was developed according to the 2030 Agenda for Sustainable Development Goals (SDGs), adopted by all United Nations Member States in 2015, in particular points 3, 6, 11, 13 (United Nations, 2019). A key aspect of the project was the assessment of human perception of thermal comfort conditions in urban spaces, as it has important implications for the development of cities and the living conditions of urban residents (Cohen et al., 2013). Those involved in urban planning need to understand how the community assesses the image of their city. This can be done with city assessment maps in which places of historical, structural, or natural significance can be influenced (Nasar, 1997). Any urban system, to be comfortable and liveable must integrate the two conceptual frameworks: psychological and physical. The environmental and perceptual aspects are considered the key starting values for the ecological conversion of a quality neighbourhood; quantity alone is insufficient (Rusta, 2017). Urban space, in fact, is a combination of systems that express needs related to use and environmental factors (Dessì, 2007). The main objective of this research is to redevelop the Portuense neighbourhood of Rome by conducting a preliminary analysis that is attentive to both the environmental and perceptual aspects of the inhabitant. The environmental analysis was carried out starting with the use of BAF index and the perceptual analysis was guided by Kevin Lynch's mapping method.

STUDY AREA

The selected area is the Portuense district, in the southwest quadrant of the city of Rome and, in particular, in the Municipality XI of the City of Rome. The district is located along the first stretch of the Via Portuense, to which the district owes its name. This ancient road dates, in its current layout, to the first century B.C. and connected Rome with the maritime port of Porto, from which the name of the street comes (Cianfriglia et al., 2015). Portuense is bordered to the east by the Tiber River, to the west by the axis of Via Portuense and to the south by the A91, the Rome- Fiumicino freeway.

METHODOLOGY AND MATERIALS

For the methodology, four types of analysis were conducted simultaneously. Then, projects were developed to meet the needs of the citizens from a perceptual, environmental and ecological point of view.

1. Kevin Lynch mapping method

Perceptual analysis was conducted through the method of Kevin Lynch (1918-1984). The method he suggests, teaches how to read cities (Lynch, 1964). He suggests how will be able to deal with visual form at the scale of the city, offering some first principles for urban design. The public city, for Lynch, exists as a public image since it is the superimposition of many individual images. Lynch's proposed analysis is limited to the effects of perceptible physical objects. There are other influences on his "figurability", such as the social significance of an area, its function, and its history. The goal is to discover the intrinsic role of form. In urban imagery, content referable to physical forms can be classified into five types of elements: paths, edges, neighbourhoods, nodes, and landmarks. The elements were identified in the Portuense neighbourhood in order to construct its image through the interrelation between the various elements. Lynch emphasized that "city design" is not only about the physical arrangement or adaptation of what satisfies the needs of the moment, but also invests in fundamental human values and rights, such as justice, freedom, access, and dignity. The city is not only about reproducing environments that have the image of the current order, but more importantly what it should and could be (Banarjee & Southworth, 1990). This was the first investigation carried out on the area, which will be integrated with environmental investigations.

2. BAF index

First, from an environmental perspective, the research began with the calculation of BAF. Biotope Area Factor (BAF) is an index first applied to the city of Berlin that measures the permeability of an area and evaluates planning based on the ecosystem functionality of the built environment, as a function of ecological land use (Ahern, 2007; Keeley, 2011; Becker & Mohren, 1990). Soil sealing is one of the biggest problems found in cities today and is a reason for several natural disasters (Prokop et al., 2011; Naumann et al., 2018). Lately, our cities are much more frequently victims of floods or flooding and despite this, the urbanization process is continuing to expand and cover natural or semi-natural areas with asphalt and concrete (Artmann & Breuste, 2015). Soil sealing is a very important fact and the wellbeing of both humans and ecosystems depend on it. Some examples among the benefits that soil gives us are: carbon sequestration, microclimate regulation, biodiversity protection or food production (Gardi, 2017; Wessolek, 2008). The index is often used, as in our case, to simulate an alternative mitigation scenario in a specific area of the city and enrich the debate on land consumption by giving support to sustainable urban planning (Peroni et al. 2019). The analysis using the BAF index, mapping the green areas of the Portuense neighbourhood, and then assuming to increase them in the next project phase. The BAF index ranges from 0, that means completely impermeable surfaces, to 1, complete permeable surfaces, and it's calculated using a specific equation (Becker & Mohren, 1990).

3. Rainwater harvesting system

After the calculation of the BAF and the estimation of the permeability of the areas and the presence of green areas, the research on the rainwater harvesting system of Portuense has begun. Rome has a unitary urban sewage system and the district of Portuense is the place where two main pipes that collect both white water and wastewater pass through.

Figure 1: Portuense's rainwater harvesting system. (Source: Silvestrini's Master thesis).

The two collectors are connected to two flood spillways that are present in the risk zone of the Tiber River (fig. 1). Spillways come into operation every time the rains fill the collectors and so increase the already poor water quality of the river. In addition to the polluting factors, it is important to remember that with a unitary sewage system, it is not possible to reuse rainwater in any way. A good part of the area of the district falls within a risk band AA, i.e. they are floodable areas referable to ordinary floods of the river Tiber. These areas must ensure maximum flow of river water for the hydraulic protection of the city of Rome. This collection system research will be followed by design ideas with multiple goals, including splitting the water collection system and reusing rainwater (explained in Results and Discussion chapter).

4. Water demand analysis

A final study, before the deductions and design phase, was about the water needed. To make a district sustainable and allow it to be self-sufficient in water recycling, it is necessary to know its consumption. The needs have been calculated for some specific uses:

- The first calculation was conducted on street washing. Roads must be washed twice a month using 4 lt/sqm.
- The second estimate was conducted on roadside beds. It was considered that 2 lt/sqm was needed 120 times per calendar year.
- The last element considered for estimating water needs was the public green. It was considered necessary 5 lt/sqm for a total of 120 days per year.

The total requirement was 204,461,817 liters, considering an average annual rainfall in Rome of 800 mm.

RESULTS AND DISCUSSION

Following the preliminary investigations that have been described, solutions suitable for the area under study have been designed. The solutions used in the project are nature-based and very attentive to sustainable storm-water drainage.

SuDS (Sustainable Drainage Systems)

A brief introduction should be made to the importance of sustainable drainage systems and their function in the city. Cities can be places with higher temperatures than surrounding regions. This occurs because of the built environment that characterizes most urban lands. Pavements have become an important contributor to altering the land cover of large portions of urban areas. Among the ways studied to mitigate heat island effects are vegetated pavements (Cambridge Systematics, 2005). By reducing heat island effects, it will be possible to benefit from improved air and water quality, as well as increased comfort and human health. The use of vegetation to replace vertical surfaces or horizontal paved surfaces can be an attractive decorative method. The vegetation can maintain the surface temperature close to that of the surrounding air and plays an excellent role in environmental control (Dessì, 2007).

Figure 2: SUDS mapping in rainwater harvesting sub-basin (Source: Silvestrini's Master thesis).

The presence of impermeable pavements in the city can also influence in a decisive way the water cycle. One example is the sloped pavements that can cause an extremely rapid run-off of water during rain events. The water, containing a large amount of sediment and pollutants reaches the underground pipes or rivers, causing enormous damage (European Commission, 2012). In addition to water run-off, permeable pavements reduce the water available for evaporation. In this regard, the project considered incorporating sustainable drainage systems into the neighbourhood. The term SuDs - Sustainable Drainage System or SUDS - Sustainable Urban Drainage System, describes storm water technology. Storm water guidelines were published as early as 1992 with the "Scope for Control of

Urban Runoff" (CIRIA, 2001). In UK practice, but typically in all approaches, SUDS consist of techniques and technologies to drain storm water in an increasingly sustainable manner (Fletcher et al., 2014). SUDS sustainability goals consist of: not systematically increasing concentrations of substances extracted from the Earth's crust and produced by society, not systematically increasing degradation by physical means and lastly, human needs should be met worldwide (CIRIA 2007).

Sustainable urban drainage systems support the ambition of achieving a sponge city and below are the accommodations designed within the district (fig. 2).

Protoes

The project foresees the realization of three prototype areas in the neighbourhood: the first is a large linear park in the risk zone of the river Tiber; the second is the train station of the FL1 train line, with the parking area and the area in front; the third one is an avenue located in the center of the neighbourhood.

Figure 3: Prototype n°2 – Zenith view of the self-sufficient park (Source: Silvestrini's Master thesis).

The first prototype area demonstrates the possibility of designing a self-sufficient park with autochthonous vegetation (fig. 3). The peculiarity is its division into bands that gradually lead from the urbanized area of the neighbourhood to the totally natural area of the river. It has been designed according to the "transect theory" of the urban planner Geddes.

The second area has as main objective the de-waterproofing of the train station and the parking area and the creation of a "pocket park" (fig. 4). The pocket park has been designed with efficient vegetation for the abatement of pollutants and as a semi-natural space of aggregation and rest for citizens.

Figure 4: Prototype n°2 – Localization, zenith view of the project area and 3D view of the Pocket park (Source: Silvestrini's Master thesis).

The third prototype area is the "boulevard" (fig. 5). The boulevard has been divided into three parts with different functions. Each part of the boulevard is characterized by a thematic color, like the Superkilen project in Copenhagen. The vegetation of the area takes on a triple function: decorative, functional for pollutant abatement and highly draining for rainwater runoff.

Figure 5: Prototype n°3 – Zenith view of the "boulevard" (Source: Silvestrini's Master thesis).

Epa-SWMM simulation

With regard to the survey conducted on the water collection system of the neighbourhood, the project idea was to divide the collection system in two, and then collecting rainwater separately. There are four hypothesized project collectors, two of which terminate in a first phyto- depuration plant in the northern part of the reference area, and two in the southern part of the Portuense district. Phyto-depuration is a natural treatment technique reproduces natural purification processes. Each collector connects storm water from a sub-basin identified in the project area. The schematic of the water collection is shown below in figure 6.

Figure 6: Schematisation of the rainwater collector system (Source: Silvestrini's Master thesis).

The project collectors have been sized starting from the data related to the rainfall heights of the rainfall station of Roma Eur. After finding the rainfall possibility curve, it was possible to start the actual dimensioning of the collector dimensions. The dimensioning has been carried out through the method of correlation and the curve number method with the volumes of inflow and outflow of each section of the collector passing through its reference sub-basin. The first step was to calculate the tributary flow rate in the closure section of each basin (Qc). Finally, it was assumed that the fluid inside the collector moves with uniform motion according to Chezy's law. Then it was possible to calculate the flow rate out of each closing section, establishing a suitable diameter and a degree of filling between 50% and 70% of the height of the speculum. The minimum velocity considered was 0.5-0.7 m/s, and the minimum slope considered was 3‰.

The simulation of a rainfall event was made possible through data entry and modeling in the Epa-SWMM software (fig. 7). The data reported were those concerning sub-basins, collectors and manholes previously sized with the spreadsheet. In particular it has been assumed an inspection well every 25 meters, as established by the general prescriptions on public sewerage of Acea Ato 2. They are also present in correspondence of singular points such as jumps or changes of direction of the pipeline. Prefabricated manholes in high-strength vibrocompressed concrete were chosen for the project.

Figure 7: Epa-SWMM simulation for each collector (Source: Silvestrini's Master thesis).

Constructed wetland

To make the neighbourhood a part of a potential Sponge City, two artificially constructed wetland plants were designed to purify rainwater by reducing concentrations of Chemical Oxygen Demand (COD), Total Nitrogen (TN) and Ammonium Nitrogen (NH3-N) (Zheng et al., 2020). These are located in the terminal part of the collectors designed to collect rainwater. The terminal collection system as a whole consists of an initial collection tank, then in the passage into the constructed wetland plant, and finally, into a collection tank directly connected to the pitches. The last passage of the water will be in the tankers in order to reuse it. The constructed wetland plant plays a fundamental role in the rainwater harvesting cycle. The plant configuration depends on many factors including: the qualitative characteristics of the water to be treated, the specific purification objectives and the characteristics of the intervention area. Normally, this type of plant is used to adopt simple operations in a small space, increasing environmental benefits and water waste (Dou et al., 2017).

Figure 8: Location of rainwater harvesting facilities (Source: Silvestrini's Master thesis).

The designed tank has some characteristics that optimize the water's depurative operation; it is a rectangular tank with a bed slope of 3% and a ratio between its length and width equal to 3. The feeding takes place by gravity thanks to the pump that precedes the system. In the two inlets there is a crawl space made of inert material of large size and one meter long to limit clogging. The two outlet sections are realized with a draining pipe placed on the bottom at the foot of the slope of the basin and connected to a well containing a device that guarantees the regulation of the water level inside the system. The respective surface areas of the North and South plant are 4480 square meters and 6720 square meters (fig. 8).

The plant species chosen for the planting are autochthonous species commonly used for constructed wetland in Italy: Schoenoplectus lacustris, Typha latifolia and Phragmites australis. In particular, each planting has a different threshold of root penetration and depending on the position in the tank, the most appropriate is planted. The density established was 4 plants per square meter.

CONCLUSIONS

In conclusion, the project was entirely elaborated with the objective of responding to the needs of both citizens and environment. The project has given evidence of the possibility to make the public spaces of a neighbourhood self-sufficient through different punctual interventions. The overall yield of these interventions of "urban acupuncture" has been possible thanks to the green network that has been created in the neighbourhood. The interventions designed for the project have been attentive to many different environmental aspects. The first is the hydraulic aspect that has great weight in the project. The idea of reusing much of the rainwater that falls on the neighbourhood is the main ecological intervention. The second aspect is related to air quality and climatological aspects: through the de-waterproofing of the soil and the introduction of vegetated spaces the neighbourhood becomes more liveable and healthier for the citizens, as well as safer because it prevents events such as flooding. The third intervention concerns the biological aspect, through a careful choice of plantings based on their resistance, the shading that allow to have, their ability to coexist with other species and their ability to reduce pollutants. The fourth aspect is related to urban planning, carefully analyzed through surveys of the neighbourhood, covering both perceptual and morphological aspects and choosing the most suitable solution for each type of area. The urban planning intervention has had ample space in the project. The district was subjected to a SWOT analysis from which the main potentialities and criticalities emerged, including: the presence of numerous green areas, the proximity of the Tiber river, the presence of important urban infrastructure and degraded and undeveloped areas. The multidisciplinary approach adopted for the project aims to demonstrate the importance of participation between different skills and the indispensable contribution of each of them.

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Towards a More Walkable City – Case Study Savska Street in Zagreb

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ABSTRACT

Sustainability has been a fundamental principle of urban planning for the past few decades, and its role and importance will certainly influence many spatial policies in the decades to come. This is especially true for those policies focused on mobility because many cities, including Zagreb, face challenges with inefficient public transport and car traffic congestion.

The paper is conceived as a project-based research conducted at the Graduate workshop course at the Study of Architecture and Urbanism at the Faculty of Architecture in Zagreb. The focus of the research is the concept of sustainable mobility tested at the area of Savska street, one of the oldest and most important traffic access routes to Zagreb.

As a result of critical review of relevant literature, planning documents and site analysis, a concept of urban transformation is proposed at two levels. The first level refers to the planning scale at the wider area of city district, and the second level is the urban design project of one of selected new public outdoor spaces.

The planned city transformation is evaluated by established criteria and indicators divided into general topics of traffic, green space and land use.

In conclusion, it was found that the proposed scenario represents a possible model of establishing different aspects of sustainability based on increasing the share of parkland that provides a green infrastructure system, as well as a new network of pedestrian and bicycle routes in a newly planned mixed-use city development area. In such manner, the basic preconditions could be achieved for a more accessible, inclusive and healthier city, as well as the promotion of an integrated public transport system.

Keywords: *Sustainable mobility, Green infrastructure, Zagreb, Teaching methodology.*

INTRODUCTION

Sustainability has been a fundamental principle of urban planning for the past few decades, and its role and importance will certainly influence many spatial policies in the decades to come. This is especially true for those focused on sustainable mobility. Sustainable transport and increase of city walkability are becoming one of the preconditions for ensuring a healthier city of the future. The aim of this paper is to show how the spatial, morphological and functional transformation of urban space can contribute to the aspects of sustainability and health.

The paper is conceived as a project-based research conducted at the Graduate Workshop course at the Study of Architecture and Urbanism at the Faculty of Architecture in Zagreb. The focus of the research is the concept of sustainable mobility tested at the area of Savska street, one of the oldest and most important traffic access routes to Zagreb. Based on the review of relevant literature and planning documents, as well as a site analysis, the criteria and indicators for the evaluation of proposed city transformation were set.

THE ROLE OF TRAFFIC IN URBAN PLANNING

One of the most important components that influence the appearance and the sense of order of the city is its street network. The perceptual and emotional experience of the city arises through the traffic sequences that make up the overall mental city map. Therefore, the consciously planned road experience has the potential to establish visual order and affect the coherence and recognisability of the city's image (Appleyard, Lynch & Myer, 1964).

An important topic in urban development research is transformation of peripheral roads into urban streets focused on future enhancements by preserving most important existing spatial values. Transformations of streets such as Savska in Zagreb help us discover the historical value of a street network, while demonstrating how it can be important for the urban network system. The historical street matrix is an identity element of the city. Street transformation process can and should preserve value together with new projects and changed usages (Marić & Bojanić, 2015).

In the previous decades urban streets were usually planned for purposes of fast arrival. However, transportation touches different aspects of city life - economic, social, health and ecological (Tumlin, 2012) and is becoming one of the biggest issues of many European cities. With excessive usage of motor vehicles, traffic has transformed from stimulator of urban development into an obstacle of future development and mobility. The volume of traffic often exceeds the absorption capability of a city affecting the quality of life and natural environment (Plevnik, 1997, p. 141). Therefore, some of the biggest planning challenges nowadays are achieving sustainable urban growth and decongesting transport networks.

Sustainable mobility

Interest in transforming urban streetscapes has especially grown in recent years with increase of sustainable mobility policies and strategies. The goal of sustainable mobility is to ensure mobility with rational usage of space, primarily in urban areas, while also ensuring a healthier and higher life quality.

The sustainable mobility implementation process that started in many European cities implies establishing conditions and framework for more inclusive public space. The changes are visible in the new ratio of street usage between

motorised traffic and sustainable transport means. Streets are no longer being used exclusively for traffic and transportation - instead, the coexistence between mobile and stationary functions of public spaces is encouraged. (Šenk & Pogačar, 2019), and its social function is emphasized (Gehl, 2010; Jacobs, 1995).

European initiatives strive to create liveable urban spaces and design systemic solutions that will allow more efficient transport and accessible public space. New programmes support this vision by fostering innovation and transformation that can decarbonise mobility, improve the general quality of life, and make Europe's economy more competitive (EIT Urban mobility). From the social, economic, and environmental point of view, one can notice increased number of positive examples resulting from street transformations with this vision (Von Schonfeld & Bertolini, 2017).

The success of the implementation of the concept is measured with several different Sustainable Urban Mobility Indicators (SUMI). In the context of achieving a healthier city, it is important to point out Air pollutant emissions indicator, Noise hindrance indicator, Greenhouse gas emissions indicator, Congestion and delays indicator, Energy efficiency indicator (European Commission – Mobility and Transport).

Figure 1: Benefits of Sustainable mobility according to EIT Urban Mobility.

From the historical garden city movement to the contemporary digital era, good urban design has always involved the intention to provide walkable urban forms - spaces tailored to pedestrians as opposed to those subordinated to the car. Among the variety of individual spatial measures of walkability, connectivity, mixed land use, and urban green infrastructure are most commonly used (Guan, Keith & Hong, 2019). Urban greenery is important in forming the city's walkability by criteria like visual attractiveness, safety and environment quality.

CASE STUDY SAVSKA STREET – MASTER THESIS RESEARCH

Savska street is one of the busiest streets in the city of Zagreb, which also played a significant role in its historical and spatial development. It serves as a south western entrance to the city centre.

The focus of the Master thesis[1] is research of potentials of the area along the southern part of Savska street (spanning 1,5 kilometres from Zagrebačka street to river Sava) with purpose of establishing sustainable mobility principles.

The project-based research methodology encompasses two scales of urban structure into consideration - the first level refers to the broader city area, while the second refers to selected public space. The aim is to set criteria and indicators for the evaluation of city transformation thesis proposal, divided into topics of traffic (roads, public transport, parking and public garage, pedestrian space, bike transport), landscape (public green area, tree line) and land use (mixed use development).

Figure 2: Location of Savska street in the city of Zagreb (pink) stretching from the city centre (1) towards the Sava river bank (2). source: Sladović, 2021.

THE ROLE OF SAVSKA STREET IN THE SPATIAL DEVELOPMENT OF THE CITY

Savska street has been present in the maps of Zagreb from the 19th century as one of the very few existing roads that connected the city to the south by crossing the Sava river. Its importance grew as Zagreb built its first railway system in the

1 The Master thesis Pedestrian links on Savska cesta – Urban planning proposal for public spaces (student: Mihaela Sladović, mentor: Assoc. Prof. Sanja Gašparović, PhD, 2021)

1850's, which also passed along Savska street. (Knežević, 2003). The Regulation plan of Zagreb from 1865 treats the area around Savska street as the city periphery. Despite that, the plan suggests broadening and straightening Savska street as the main communication between the city and the river.

As the population grew during that time, the city also expanded in an unplanned way, concentrating mostly along the railway route. More detailed regulation plans of Zagreb did not encompass the southern peripheral part of the city until 1918 when the city expanded all the way to the regularly flooding river (Andrijević, Bašić, Tutek, 2005).

Savska street was also one of the first main public transport corridors from the beginning of the construction of the tram line in 1891. Depot for horse-drawn tram cars was placed on the northern end of Savska street, while the southern end of the tram corridor reached all the way to the river bank, which for some time remained as one of the bigger recreational areas of the city (Zdunić, Žarić, 1982).

Figure 3: Genesis of Zagreb 1890 – 1910 – 1970 – intense spatial development of the city towards the southwest along the railway and Savska street.

The second half of 20th century is marked by the expansion of the city towards the south across the river Sava, suddenly turning Savska street into the main connection between the city centre and New Zagreb in the south. The 1971 Master plan suggested relieving the car traffic on Savska street by constructing a new road – Šarengradska street – which should extend parallel to Savska street on the other side of the railway. The road was supposed to form a ring that connects the new part of the city with its historic centre.

More detailed urban plans from this period suggested several traffic solutions for Šarengradska street, in the end opting for a bidirectional elevated city highway, that was supposed to significantly relieve Savska street from its car traffic and turn it into a primarily pedestrian street.

In 1964 Zagreb was hit by a natural disaster in the form of a big flood, followed by a process of urban renewal of the affected areas. Even then the renewal did not encompass the area between Savska street and the railway, consequences of which can still be seen today.

In the decades that followed, many residential, hotel and business towers have been built in the north part of Savska street, turning that part of a city into a representative city avenue. Even though the 1986 Master plan continues the idea of extending Šarengradska street, the idea has not been realised even today.

The more contemporary period, after 2000, is marked mostly by housing constructed fragmentarily and each one individually without a clear and recognisable urban vision of a whole area along the important city access street. The new buildings are usually either family houses on existing plots or five-story residential buildings with office spaces on the ground floor.

Figure 4: Analysis of transformation of the building structure along Savska street from 1865 to 2020, based on cartographic plans and aerial photos from 1865, 1944, 1968 and 2000. source: Sladović, 2021.

The current Master plan from 2017 envisions the mixed use development along the southern part of Savska street and extension of Šarengradska street as the main city avenue but without a clear vision of the street traffic and the facilities that would be created along it.

The railway extends along Savska street in all historic and current plans. Contemporary plans indicate the railway as a particularly important corridor in the city's public transport. The tracks are to be widened and several new railway stops along Savska street are planned, connecting it to the inner-city railway network. Some detailed plans consider the potential of the planned bus and train stop as a functional area on the southern end of Savska street, deeming it important for the development of sustainable mobility. Connecting the car, bicycle, tram, bus, and railway traffic and implementing a Park & Ride system with a public garage would significantly relieve the car traffic towards the city centre.

The potential problem with contemporary plans and studies is the non-unified perception of urban and traffic development of the city. The plans do not offer a gradual execution in phases that would offer sustainable mobility from the first phase. The plans also often neglect the possibility of separating the tram from the road traffic, as well as the changes in traffic usage in the case of completion of the Šarengradska street (Civitas Elan, 2010). Spatial development in the form of planned structures and functional changes of the analysed area is planned independently from the traffic solutions, evident in the urban plans for this area which do not include the traffic solutions given in the Master plan and other planning documents.

SAVSKA TODAY – DEVELOPMENTAL POSSIBILITIES AND LIMITATIONS

In the last few decades Savska has become one of the busiest traffic roads in the city. The northern area of the street, closer to the city centre, is characterized by a distinct walking area achieved with a recognizable urban pattern, formed by public spaces and representative architectural works dating from 1930s to 1980s.[2]

Southern area of Savska street is still unconsolidated despite the many urban plans and studies that have been created for this area. It is surrounded by a structure with a relatively small share of public, green and pedestrian areas, heavy traffic load and a structurally uneven urban pattern and many substandard and/or abandoned buildings. Such an inappropriate image of a main entrance to the city creates an uncomfortable space, especially for pedestrians. The insufficient number of crossings over the traffic barriers (Savska street and the railway embankment) also contributes to this image, making it even more difficult to connect the neighbourhoods.

Like in the rest of the city, the landscape is fragmented and unconnected, despite the proximity of the Sava river. Landscape planning is based on the concept of individual projects without a clear idea of connecting a comprehensive system of green infrastructure (Gašparović & Sopina 2018). One of the potentials for development is the creation of a landscape link along Savska street which would connect slopes of Medvednica and the historic Tuškanac park in the north with river banks and recreational areas around Sava (Jarun and Mladost) in the south.

The cycling infrastructure of Zagreb has also not been fully established yet. In most of the city area, the bicycle network is partial – formed on shorter sections, not forming a meaningful network that would connect more parts of the city such as the city centre with Sava, Medvednica and other recreational areas. Savska street is also missing a continuous bicycle path from Sava to the city centre, as well as transverse bicycle connections that would connect traffic-separated neighbourhoods (Trešnjevka-south and Trnje).

Public transport is generally insufficient (frequent delays and inappropriate timetables for buses and trains). The Railway, which runs parallel along Savska street, is not integrated into suburban public transport, although it has the potential to connect more peripheral parts of the city.

2 The most significant ones are (chronologically): State Craft School (arch. Ivan Zemljak, 1937), Women's Real Gymnasium of the Sisters of Charity (Zvonimir Vrkljan, 1937), residential and business building Fiat (Hinko Bauer, 1940), exhibition hall for the Zagreb fair, today's Technical Musem (arch. Marijan Haberle, 1949), Industrogradnja skyscraper (arch. Grozdan Knežević, 1969), Hotel Intercontinental, today's Westin (arch. William Bonham and Slobodan Jovičić, 1970), Vjesnik skyscraper (arch. Antun Ulrich, 1972), Zagrepčanka skyscraper (arch. Slavko Jelinek, Berislav Vinković, 1976), Cibona tower skyscraper (arch. Marijan Hržić, 1987).

PROPOSAL FOR URBAN TRANSFORMATION OF THE AREA ALONG SAVSKA STREET – MASTER THESIS

Analysis of the observed developmental possibilities and limitations, current spatial plans and relevant traffic studies resulted in the starting points for the proposal of urban transformation of the area based on sustainable mobility. The main goal of the thesis was the transformation of Savska street by improving the system of green infrastructure (squares and parks), pedestrian and bicycle network and public transport system. The concept of transformation has been proposed on two levels: at the spatial planning level - for the entire southern part of Savska with contact areas and at the project level - design for selected smaller space - a new public square and park.

Urban development plan

The plan is based on the scenario of traffic, landscape, structural and functional transformation of the entire 1.1 kilometres long stretch, including the surrounding contact area.

The traffic solution envisions the realization of an intermodal P&R terminal, a widening of the railway line and a railway elevated on columns (instead of embankments). In addition to the existing tram system, the railway is more strongly integrated into public city transport in order to reduce car traffic towards the city centre and enable pedestrian connections between the divided districts.

The increase in the share of public green areas and networking in the green infrastructure system is achieved by a linear park along the railway connected to other new and existing parks in the vicinity of Savska street.

Figure 5: Urban structure of the analysed area before transformation (left) and the proposal for the new structure (right) with markings (black circles) of three proposed new pedestrian connections / public spaces establishing links between settlements: Savska – Prisavlje link in the north, Intermodal hub link in the middle and River Sava link in the south. source: Sladović, 2021.

The structure is transformed significantly by removing most of the existing substandard buildings, while retaining certain cultural and historical architectural features. The planned structure of mixed-use development enables active and representative ground floors, a lively and attractive ambience of public spaces as well as the quality of sunbathing and ventilation necessary for a healthy and comfortable life of the new neighbourhood.

Figure 6: Graphic comparison of existing and the evaluation of planned city transformation in context of sustainable mobility. source: Sladović, 2021.

In the analysed area, three important places were identified as potential new pedestrian connections between today's unconnected settlements. One is conceived as a landscape-recreational link in the south along the Sava River; the second is "infrastructural" link with intensively used space of the intermodal hub, and the third is a place of meeting and socialization at the intersection of Prisavlje and Savska street.

Table 1: Sustainable urban mobility indicators for the evaluation of proposed city transformation.

SUMI	Before transformation	After proposed urban transformation
Road (m')	1995	3215
Parking (m²)	1185	48010
Public garage (cars)	0	320
Tram stops	4	8
BUS stops	14	29
Railway stops	0	4
Pedestrian path (m')	2485	4785
Bicycle path (m')	270	3525
Public green area (ha)	1,2	4,7

Urban-architectural project of the pedestrian link Savska – Prisavlje

Below the planned extension of Prisavlje Street, a continuous linear park with pedestrian-bicycle and recreational areas under the viaduct is planned, creating a square that connects pedestrian paths with the surrounding park areas and neighbourhoods.

The new neighbourhood square is located between the existing and planned traffic corridors at different levels. Pedestrians are enabled to descend from the noisy and dynamic traffic atmosphere into a park square rich in greenery and elements of urban facilities.

Figure 7: Visualisation of the public space – park with pedestrian and bicycle communications – a new link under the former traffic barrier. source: Sladović, 2021.

The open-air underpass offers much more than a safe pedestrian cycling connection below the traffic corridor. Multi-purpose pavilions are planned in the open areas as microarchitecture adaptable to various needs and events (fair, fast food, bicycle rental and repair). The structural elements of the pavilion stand in the square as sculptures that can be upgraded for various purposes - they can be publicly available as spaces for rest, recreation, children's play, and planting plants.

By unstimulating car traffic and introducing more efficient integrated public transport, conditions have been created for more inclusive public space, allowing coexistence of different kinds of mobility, an increased ratio of green space and better quality of public life.

CONCLUSIONS

The results of the conducted project-based research are a city transformation scenario that represents a possible model of establishing different aspects of sustainability based on increasing the share of parkland, establishing a green infrastructure system as well as a new network of pedestrian and bicycle routes in a newly planned mixed-use city development area. In such a manner, the basic preconditions could be achieved for a more accessible, inclusive and healthier city, as well as for the promotion of an integrated and more efficient public transport system.

Multiple contributions of the conducted research can be recognized in:

- improving the educational process - by encouraging the research approach and including the most current topics crucial for the future of sustainable city planning in student work,
- an establishment of integral and multidisciplinary research and planning approach of the process of city transformation, which includes preserving parts of historical urban identity as well as modern traffic, landscape and urban solutions,
- innovative perception and revaluation of the new role and importance of Savska street in the future development of the city of Zagreb, which has been so far observed primarily from the traffic point of view.

This research highlighted the role of Savska street as an important element of a city's identity, but at the same time pointed out its potential in achieving various aspects in long-term planning.

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Urban Corridors as Common Pool Resources: the Case of Nova Gorica and Rijeka

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ABSTRACT

The concerns for climate change and the increase of urban population made cities fundamental in finding solutions for a more sustainable dwelling to increase resilience and quality of life. Cities have to turn from infinite consumption and waste spaces to incubators of innovative narratives able to re-balance the coexistence between human beings and nature. Relying on growing awareness of urban metabolism and circular economy theories and practices, interesting ideas are spreading worldwide. Based on researches on common goods management and cultural urban landscapes preservation, a recent approach is offered by the urban conceptualisation of corridor. Urban corridors are well-bounded planned areas meant as shortcuts but mainly simulate co-creation and co-monitoring in a comfortable and healthy environment. Well-being is given by integrated services based on nature, cultural and social economy and characterised by openness, accessibility, and recreation. From these theoretical frameworks, the paper will present two case- studies of co-planning of urban corridors, one in the border urban area of Nova Gorica (Slovenia) and Gorizia (Italy) promoted under the URBINAT project and the second in Rijeka, Croatia, proposed during the CLIC project. In Nova Gorica, an urban corridor is under investigation through a co-assessing, co-designing, and co-implementing methodology using NBS, Nature-Based Solutions, to valorise the Koren stream as a connector of the two border cities. In Rijeka, an actual cultural corridor has been designed through the original approaches called "Heritage Innovative Partnerships" and "urban seeding" to revitalise the city's historic core characterised by the Rječina river towards the waterfront. Thanks to the co-creation processes that have been initiated, both corridors are expected to become new social common places for the well-being and represent a paradigm for the sustainable regeneration of both cities with potential emulation in other contexts, especially in South-Eastern Europe.

Keywords: *Cultural and Healthy Corridor, Common Pool Resources, Historic Urban Landscape, Co-Creation, Situated learning.*

INTRODUCTION – COEXISTING IN LANDSCAPE

The world we live in results from our persistent necessity to adapt and build homes and dwellings. Expanding from homes to public spaces and, beyond, to landscapes, we may affirm that the wider socio-spatial context is generally considered as our common household or home. As in the etymology of the words economy and ecology, Earth is considered an oikos, a collective home of a wider and extended community of living beings. Moreover, living beings have always imagined Earth as a home, a set of available things in precise positions, ruled by different orders and hierarchies. This also means that, in addition to human designs and production, other living beings are also active in "home" designing and co-producing. We all build, consume and influence our environments and, backwards, these environments build, consume and influence us and the production processes of all living beings (Coccia, 2018). The continuous creation of such a home does not merely depend on direct, focused intentions but also on the indirect facts and events that occur, as movements and displacements. This is what we may define as the migratory dimension of our co-design with others ... and this productive interaction cannot simply be regulated or governed through traditional human-based mechanisms.

This understanding of migratory co-design processes with "the rest" of nature is embedded in the same landscape definition (CoE, 2000). It is precisely the awareness of being just co-producers that are in permanent relation with other beings and their dimension of time and space that further challenges any linear, straightforward dimensions of projecting, as proiectare. In fact, any landscape project implies a thorough relationship with different dimensions and grammars of time and space imposed by other beings and processes. Often in landscape design, biographic traces and residuals that have crossed the territory account for much more than dwellings and represent the constitutional part of the landscape design process, in a place-making perspective (Cresswell, 2004; Tuan, 2011; Zukin, 2011). If observed through the lens of landscape "as perceived by people" (CoE, 2000), radically different, opposite experiences give additional meanings": multiple voices can claim their ownership over its identity (locals, tourists' flows/ migration flows, etc.). A landscape does present the most powerful and explicit expressions of our culture and art of living and not only of occupying the soil (Illich, 1984):

> *"To dwell is human. Wild beasts have nests, cattle have stables, carriages fit into sheds, and there are garages for automobiles. Only humans can dwell. To dwell is an art. Every spider is born with a compulsion to weave a web particular to its kind. Spiders, like all animals, are programmed by their genes. The human is the only animal who is an artist, and the art of dwelling is part of the art of living. A house is neither nest nor garage."*

What matters in any art of living, much more than building itself, is how to manage the coexistence, the space between here and elsewhere, between our capacity to reside, build dwellings and ... migrate. This article refers to the exercise of co-designing and co-creating an urban corridor as an upscaling of the historic and intrinsic connection between inhabiting and migrating in a common space.

CORRIDORS AS COMMON POOL RESOURCES

Corridors are usually intended as ways for privileged flows of things and/or living beings (ecological, humanitarian, etc.). They act like a "user-friendly"

axis that facilitates privileged users' access and safe and continuous movements. However, the model that mainly identifies the corridor idea is the rapid, safe and linear connection between two destinations. It is mostly about the construction of space which is driven by measurable standard dimensions, needed to calculate distances between two different points, which fully matches the model of Earth

as space. Its design is homogeneous, continuous and isotropic: the cause, the interval, the effect or the subject, the distance, the object of observation (Farinelli, 2003). On the other hand, corridors do also happen spontaneously, when systems that are in relation result as partly or wholly unconnected.

Ecological corridors have been on the agenda since the '60s, focusing on the movement of animals. The beginning theory highlighted that the rate of extinction on a given island is determined by that island's size and relative degree of isolation (MacArthur & Wilson, 2001). Consequently, for the sake of biodiversity, some safe pathways for species, "bridges between islands" on the move, had to be provided. Today, ecological corridors are established between residual ecosystem patches, being one of the most adopted strategies to preserve ecosystems in fragmented landscapes. As conservation biologists know (MacArthur & Wilson, 2001), the connection of two disconnected patches also lead to collapse and even overturn. The Suez Canal and the slow invasion of tropical alien species in the Mediterranean is an overturn example. The world is about order: Oikos traditionally is about household management, about the hierarchy of rules. Ecosystems preservationists know how orders might be changed with the invasion of species and how unwise a corridor could be.

Hence in socio-spatially incoherent or jeopardised neighbourhoods, thinking, conceiving, designing, establishing one or more connecting corridors imposes the acceptance of migration. Sometimes though, corridors offer the condition of in-betweenness as the constitutional part of life and place-making. It means that these communication "shortcuts" lose the efficient "economy of pathway", and "crossers or migrants" stop, hesitate to proceed, and the flows of continuity start to stagnate, in a state of *flânerie* (Benjamin, Tiedemann, & Benjamin, 2000). There are many examples of infrastructures that overcome the obstacle and permit faster connection but act as an authentic *Place* where people and things stop, and the dynamism of movement gains another dimension. Here people still move, but differently: *Ponte Vecchio* in Florence or *Rialto* in Venice, or the *Passages* in Paris are shortcuts and places to exercise different social dynamics. However, this in-between condition imposes accepting life in its incompleteness as an open process, where the well-being from new meetings contrasts with potential unexpected clashes. In disconnected, deprived or non-resilient urban contexts, a challenge is to establish, design, build and inhabit the thresholds, create conditions for residents on the move, generate these *passages* of leisure and coexistence. Corridors themselves tend to transcend administrative-territorial limitations, and often they overcome even physical morphological limitations. Being trans-functional by their nature, corridors often deactivate traditional urban or territorial dichotomies such as centre/periphery and the conception of *Place* as an immovable organism and *Nonplace*, as spaces of transience, mere means of communication (Augé, 1992).

Looking at the definitions of corridors so far, we see spaces characterised by borders, boundaries, where an unlimited mass of users pass or stroll. "Closed" spaces which by definition, are open to an unlimited number of users. If these spaces are used as said, they may become places characterised by no excludability but full latent rivalry, where users may claim rights. Moreover, the "perfect"

corridor is the one that might prove equally attractive and comfortable to different people, communities, or even for the extended communities of living beings that includes all forms of users and creators of the place, as bikers and workers, families in their time for recreation, as well as nesting birds and migrating insects.

In such a space out of the property, users should be enabled (also obliged) to co-design their coexistence on the move. Such a co-designed space seems to respond to the characteristics of the commons and potentially fall under the rules for common-pool resources governance (Ostrom, 1990). By simply defining or identifying boundaries, corridors may turn from spaces to places through collaborative adaptive actions that consolidate existing "communities" or create new ones, either aesthetic (Greffe, 2017) or heritage (CoE, 2005) communities. Such achievement, the establishment of a co-creative action in an almost defined space, may generate the other conditions for the governance of the commons, beyond the clearly defined boundaries, as:

1. Congruence between benefits and costs, thus efficiency and efficacy of actions
2. Users make their own rules jointly;
3. Regular monitoring of the users and the resource conditions;
4. Mechanisms for conflict resolution;
5. Recognition by the local authorities;
6. Nested enterprises or other kinds of beneficial businesses performed;
7. Graduated sanctions in case of transgressions.

In the two cases studies presented below, corridors became the occasion to test special co-creation and co-monitoring social exercises, inspired by urban regeneration necessities, performed with different leading motifs: one on the border area of Nova Gorica (Slovenia) and Gorizia (Italy), promoted within the Horizon 2020 URBiNAT Project and the second in Rijeka (Croatia), promoted within the Horizon 2020 CLIC Project, but partially inspired by the first.

IMPLEMENTATION - THE CORRIDOR OF NOVA GORICA AND GORIZIA

The city of Nova Gorica, named derived from the nearby Italian "old" Gorizia, was built in line with the principles of modernism in newly-formed Yugoslavia in 1947, developed along the border drawn after the end of the 2nd World War. It is a planned town that reproduces the tangible effects of the public dimension of the socio-economic space, where the built and natural environment is common with no private ownership, in opposition to the Italian city developed throughout the ages around the concept of privately owned (used) land. For years the border has generated among locals' different perceptions of the socio-economic spaces. Regardless of the factual intangible commonalities of the two societies rooted in the territory, it had not cancelled the citizens' attitudes from both sides to merge. Once the border fell, the need to cross its ghost was no more based on economic attractions but socio-cultural and environmental motivations. If one asked two critical inhabitants of Nova Gorica and Gorizia to describe their cities' cultural profiles briefly, the most probable answer in Nova Gorica would be: "My city has no soul" and in Gorizia: "My city has no life". Two urban centres of a culturally rich and interesting region are struggling to fully realise their potential" (Rusjan Bric, Humar, De Sabbata, & Del Bianco, 2020). However, it is a fact that today the

cities are always displayed as a single urban agglomeration, although connectivity is not given. Struggling to establish new socio-economic sustainability: Nova Gorica invested in an environmentally, sporty and creative city image, while the Gorizia focused on the cultural heritage and its history. As a result, the cities' cross-border cooperation has led to a unique and successful candidacy for the European Capital of Culture 2025 (Slogan: Go!Borderless), which will territorially reconnect the two cities through its cross-border dimension into the first ECoC stretching through two countries.

Within such spatial and socio-economic context, and in the opportunity given by the EU Horizon Funded initiative named URBiNAT[1], the city proposed the revitalisation of a social neighbourhood characterised by the city's inner waterway, the Koren stream, which has been for decades mostly the urban sewage canal, stretching underground through Italian land to flow into the Isonzo stream. Adopting the valorisation of the Koren stream bed as potential leverage for citizens well-being as well as a connecting line between the two cities, the Nova Gorica URBINAT joint team proposed a linear corridor, using the path of the Koren, oriented towards the border area, aiming at reconnecting historical and cultural assets that may act as social catalysers. The corridor is meant to provide a new form of healthy migration in the city made by the set of different NBS, Nature-Based Solutions, options offered by the URBiNAT project, and utilising co-design and co-creation efforts. Considering that the built environment and its cultural richness exponentially enhances the production of relational goods and social capital (Blessi, Grossi, Sacco, Pieretti, & Ferilli, 2014), the valorisation of the dense cultural area along the Koren stream as a playground for participatory co-design processes was needed in such a multicultural urban agglomerate.

Figure 1: the main spots of the URBiNAT healthy corridor in Nova Gorica, to be considered in the co-design process.

1 Nova Gorica is an URBiNAT so-called "follower city", entitled to "learn" the lessons and experiences of the three front-runner cities that could test the implementation of Healthy Corridors, given their mature experience in implementing Nature-Based Solutions.

The experience in Nova Gorica so far - including the recent emergency given by the pandemics of COVID-19 - is acknowledging that a truly well-designed corridor is not necessarily about designing the best route for any of migrating categories of users but is rather about conceiving the quasi-optimal "migrating" context for multiple users. Here is where the co-design and the co-implementation find their optimising role, namely in making users accept the existence of others. Relating is indeed what the city of Nova Gorica is planning to achieve through such a healthy corridor. The proposed Nova Gorica's Healthy Corridor should include:

- the regeneration of the *Koren/Corno* stream with its river banks and surrounding empty fields. At present, the stream and its banks do not offer any leisure (fig. 2 and fig. 3), a part from a biking route that is going to be implemented by the municipality but with important design concerns by local architects;
- the path towards *Kostanjevica* Monastery and down towards the *Rafut Villa* and its park;
- the connection towards *Rafut Villa* and its park towards the Gorizia Castel;
- the connection backwards from Gorizia to *Kostanjevica* Monastery through the historic Calvary path from the city of Gorizia.

Figure 2: The Koren stream and its banks – view toward Panovec Woods.

Figure 3: The Koren stream and its banks – view towards Gorizia.

The steps for achieving such an outcome foresee intense co-assessment work understanding the local needs and expectations, a co-design phase where different NBS will have to be chosen by the local community living lab, and a final implementation under the support of the local authority. The co-assessment, co-design and co-creation process has already started by engaging users of the area through a willingness to participate approach, which relies on the project's tools to feed the local living lab. The interventions to make the corridor possible will include technological and territorial NBS, as generally conceived, and socio-economic NBS, as local solidarity initiatives, social centres, circular economy practices enabled by the corridor community. Having set boundaries, an aesthetic community (the healthy NBS living lab) and receiving the trust of the local government, the corridor in Nova Gorica is expected to be a test of the common goods management theory. Once achieved, the experience in Nova Gorica will have the elements of a common pool resource, given that its manageability will depend on the committed community and its awareness for the need of a sustainable coexistence in a hybrid cultural and natural space.

THE CORRIDOR IN RIJEKA

A different path was done in Rijeka. The City of Rijeka in Croatia, a dynamic urban agglomerate in the northern Kvarner Bay, is in transition from a past strong industry and former socialist economy to a more contemporary light reality, aiming at innovating its traditions, cultural diversity and social capital to become a cultural and creative city with excellent well-being. Such awareness of its cultural richness let Rijeka become the European Capital of Culture 2020 under the slogan Port of Diversity, stressing right on the multicultural social dimension.

Figure 4: Cultural Corridor Map with transverse connection to the Benčić Cultural Complex: Synthesis map of HIP 3 Proposals & Preparation for HIP 4 Urban Seeding as of November 2019.

The works carried out within the CLIC (Circular economy leveraging investments in cultural heritage adaptive reuse) project, starting from the valorisation of four initially proposed cultural assets in the city centre, such as RiHub – an incubator of a creative city, the Rickard Benčić Complex as culture and museum district, The Galeb Ship – former president Tito's Yacht, as a living museum and accommodation facility, and the Energana power-plant as an ICT and Cultural and Creative Industries incubator envisaged an intense participatory and co-design process named Heritage Innovation Partnerships (HIPs), entirely based on the principles of the circular economy on heritage adaptive reuse. Such process included information gathering among citizens and stakeholders, leading to an action planning for cultural heritage adaptive reuse embracing the circular economy principle (ARUP, 2016; Dobričić, Jokilehto, & Acri, 2019; Foster, 2020), which capitalised on the stakeholders and young citizens' vision of the city revitalisation focusing also on new governance models, actions and the launch of circular heritage-oriented business initiatives. Connecting these

assets, the needs and the alerts from the growing "aesthetic community" in the city, a testing-cultural space was identified and named Cultural Corridor. Such corridor, characterised by defined area along the Rječina river bed towards the sea waterfront, by a monitoring and co-creating community, by the leading principles of circular economy and by a supportive presence of the City, became the focus to experiment new forms of governance to achieve more sustainable use of urban heritage, thus evoking the international efforts to preserve the historic urban landscape, HUL (Bandarin, Oers, & Bandarin, 2015; Dobričić & Acri, 2018; Gracia Aldaz, Zhang, Bokova, & Unesco, 2016; UNESCO, 2011).

As such, the Cultural Corridor can be intended as a model to the common-pool resources, driven by the principles of the circular economy and sustainable historic urban landscapes and act as an integrated urban spatial system, generating a new paradigm of sustainable reuse of inner-city underused or deprived spaces. Different scales of circular principles are applied within the Cultural Corridor: urban/territorial, building/object and social/community scale to achieve the transformation by enhancing the use-cycles maximisation of building stock and continuity of settlement while promoting community-led initiatives. The Cultural Corridor is considered a dynamic model, which can be achieved through different approaches, such as regular urban planning and management or merging small bottom-up actions, adapting to a specific spatial situation or citizens' needs.

To test the cultural corridor in Rijeka, a so-called "urban seeding" process/tool was put in place (Acri, Dobričić, & Debevec, 2021), which stimulated situated learning for participation (Lave & Wenger, 1991) through architectural-urban workshop methodology, promoting the field practice for assessing and testing circular models and undertake systematic step-by-step small regenerative actions. By establishing cooperation of interdisciplinary experts-groups as a living lab, several topics were tackled as accessibility, walkability and safety of the area by enhancing the urbanscape of Rijeka. As such, the *Urban Seeding* may be defined as a socio-cultural and planning tool based on spatial experimentation, targeting the local public and private sector, non-governmental and civil society organisations, and knowledge and research sector, to participate in the co-creative revitalisation process. The process is envisaged as a versatile and dynamic process acting as a catalyst for revitalisation by the systematic step-by-step implementation of the urban low-cost and small scale interventions called *seeds*. Densification of urban seeds and diversification of offered programs would aim to attract people to settle in the area as a resident, user, migrant and business. The Urban Seeding in Rijeka was tested by creating teams of students in the later stages of their academic education and young professionals in a mentoring process. The involvement of local youngsters, winning the academic or professional credits, both assured their commitment in the process and grasped their spatial perception and experience of a city that will potentially host them as citizens. Should the cultural corridor be achieved in the next year, it will simulate the common pool resources governance given its clear adherence to the rules identified by Ostrom. The cultural corridor, geared by an aesthetic community sharing the principles of heritage valorisation, circular economy and nature respect, will be such only if proper self-maintenance would be guaranteed, under local government's endorsement.

CONCLUSIONS

The experience of the Nova Gorica and Rijeka have shown that conceptualisation of "corridors" is not a neutral gesture, since it carries many considerable issues that not merely refer to accessibility, as the original meaning of corridor tells, but also to environmental, social and cultural coexistence and interaction. The

Cultural Corridor in Rijeka was driven mainly by the idea of generating a place enhancing the social and heritage/cultural capital, while users' migratory social capital drives the Healthy corridor in Nova Gorica; both represent a paradigm of new commons governance. The two spatial and social realities need to engage locals to develop resilient and sustainable places, adopting collaborative forms. The two spaces intended as commons have the potential to investigate the migratory dimension of conviviality and experiment with the possibility of place-making in the state of "in-betweenness", as well as regenerate urban cultural, natural and historically important spots that are underused or in an advanced state of decay.

Paradoxically what these two urban realities have most in common to promote is quality of life. All their efforts are concentrated in rediscovering commonplace identity right in the heart of the urban agglomerate, being the focus presence, relationship, connectivity, proximity. Strategically using the principles of the commons in "clearly" defined areas permit the creation of those "aesthetic and heritage" communities that hold the capacities to transform territorial matter in various forms. Should the two experiments in Rijeka and Nova Gorica (hopefully also the other healthy corridors in URBiNAT) be successful, a new form of sustainable territorial enhancement will be available, depending on governance more than on government and focused more on landscapes and places than on administratively bounded territories.

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Rising the Significance of Green Infrastructure in Belgrade, Serbia: Pedestrian and Bicycle Mobility Changes during the COVID-19

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ABSTRACT

The response to the COVID-19 pandemic brought about significant changes in urban mobility and the city usage patterns. This paper elaborates the effect of lockdown measures on the pedestrian and bicycle use of urban green spaces in Belgrade, Serbia (May 6 - September 29, 2020). Mobile Limitless Application and bicycle counters data from thousands of pedestrian and bicycle users were used to detect spatial and temporal changes in activities. It is estimated that outdoor pedestrian activity increased by 23% from the beginning of COVID-19 safety measures implementation, compared to an average detected during the last 2 years in the same time frame. Both pedestrians and cyclists intensified activities on lanes within green areas or along them. Finally, pedestrian and bicycle mobility have increased in urban parks, peri-urban forests and riverbank pedestrian lanes, emphasizing the importance of access to green open spaces, especially during the COVID-19 distress.

Keywords: *Urban mobility change, Urban green infrastructure, COVID-19.*

INTRODUCTION

In the context of COVID-19 situation and measures of its prevention, green infrastructure could be considered as a provider of human well-being and health. In addition to the ecological function of preserving biodiversity, providing ecosystem services, and reducing pollution, human interactions with urban green spaces have to be taken into account. Many urban biodiversity patterns arise in response to, and are maintained specifically by, repeated human activity. Irvine et al. (2010) refer to a social-psychological perspective of urban nature as an important component of the quality of life and the research focused on benefits gained from "nearby nature" also consider a proximity to or the amount of green space (even a window view). Scientific literature mentioned above reveals many benefits which green infrastructure can have for human health and well-being. Impacts on the local community are also significant because the availability of nearby nature is shown to promote social interaction and a sense of community (Kim and Kaplan, 2004; Simic et al., 2017).

Also, the term green infrastructure appears in recent studies as an important element of planning and design strategies targeting sustainable development and resilience (Voghera and Giudice, 2019; Pinto, 2014; Barton and Pretty, 2012), as well as climate change adaptation (Heidt and Neef, 2008). Supporting a set of ecological and cultural functions (Shashua-Bar and Hoffman, 2000), it also represents a contribution to the urban health and general well-being of people (Biotope Area Factor, 1990; Benedict et al., 2002; Kruuse, 2011). Such network of greenery consisting of urban parks, peri-urban forests and other types of open spaces (eg "urban green infrastructure") provide many environmental and health benefits for citizens, e.g. cooler temperatures for microclimate adaptation (Irvine et al., 2010; Simic et al., 2017) and cleaner air and water (Zareba, 2014).

However, the opportunities for city users to receive mental and physical health benefits from urban green spaces may become even more important during the times of distress, such as the COVID-19 pandemic. Occasionally, residents face health and economic crisis, isolation, and limited mobility during the implementation of social distancing policies (Brooks et al., 2020; Venter et al., 2020). Some of the recent studies (Goldstein and Kilgannon, 2020; Samuelsson et al., 2020; Coker et al., 2020) link increased mortality from COVID-19 to the increased levels of PM 2.5 particles, shading a new light on the role of green infrastructure in urban air purification.

The response to the COVID-19 pandemic brought about significant changes in urban mobility and the city usage patterns. The interdependance between lockdown measures and outdoor pedestrian and bicycle activity increase in urban green spaces has become noticeable. The issue of distancing measures also considers the role of urban green spaces (including publicly accessible trees, parks, natural vegetation and peri-urban forests) in the process of adaptation of city users to pandemic containment measures. This emerging topic already provides the data confirming the increased number of visits to green urban spaces, as well as a shift of their perceived importance during COVID-19 (Fisher and Grima, 2020; Venter et al., 2020; Goldstein et al., 2020). Regarding this, the increased demand for recreational activities in nature has been detected, as well as the positive effects on both mental and physical health. The potential of urban green infrastructure in enhancing the resilience of urban population during the pandemic has also been noticed (Samuelsson et al., 2020). However, access to urban green spaces is not distributed equally in cities, and is often considered as an issue of social inequality (Rigolon, 2016). Consequently, reconsidering the use of public space is important during the COVID-19 pandemic, influencing

important changes to the future urban design and the perception of public space (Honey-Roses et al., 2020).

Green infrastructure should be currently seen as a multi-functional outdoor space which provides two main groups of benefits: 1) the provision of clean air and comfortable outdoor spaces contributing to both individual and general health and well-being and 2) upgrading of urban mobility and daily activities, used frequently during COVID-19 distress. It also represents an important mitigation factor for the overall COVID-19 effects on urban population.

In order to collect the information on the effects of the COVID-19 containment measures on the patterns of use of Belgrade green infrastructure several sources were used: the mobile tracking data and the Google mobility data from the Limitless Android Application (Stupar et al., 2019), as well as the data collected by the bicycle counters positioned on the Sava river dock. The survey was conducted within the Municipality Stari Grad (Belgrade, Serbia) and it revealed the increase of outdoor pedestrian and bicycle activities in green infrastructure during the implementation of the COVID-19 safety measures. The importance of the access to green open spaces in cities was confirmed during the time of distress, especially its influence to an overall resilience of both the built environment and local communities.

THE RESEARCH POLYGON

Municipality Stari Grad was chosen as a study areas due to the high intensity of both pedestrian and bicycle mobility. Centrally located, it covers 698 ha and is populated by approximately 70,000 people representing the urban downtown and the epicenter of urban happenings. Five city parks, riverbank promenade (along the rivers Sava and Danube) and one peri-urban forest (Veliko ratno ostrvo) link this area with the municipalities of New Belgrade and Savski Venac. Cycling in this area is especially intensive between May and October. There are around 20km of bicycle paths, mainly along the riverbank (Cycling routes and bike maps in and around Belgrade, 2020).

Figure 1: Municipality Stari Grad: boundaries and urban green infrastructure (Teofilovic et al., 2016).

The green spaces of the municipality Stari Grad represent a part of the wider city green network, including the Danube riverbanks and the anticipated linear park in an ex-railway area. The Green regulation of Belgrade defines this green core as a continuous green area whose backbones are river banks, as green-blue corridors with a system of parks and multifunctional facilities in their immediate vicinity (Cvejić et al., 2010). The planned linear park (4.5 kilometers), should represent a pedestrian link between the central zone and the lower part of the municipality, providing a riverbank promenade, bicycle lanes, children's playgrounds, exhibition spaces, sports facilities. It is supposed to affect the reduction of air pollution, also mitigating summer heat waves.

Figure 2: Area of Stari Grad municipality with the existing bicycle routes and urban green infrastructure (Belgrade SUMP - Smart Urban Mobility Plan, 2019).

Figure 3: The pedestrian routes in the Municipality Stari Grad (Pedestrian routes plan of Stari grad, 2017).

Figure 4: The anticipated green pedestrian route along the riverbank (Belgrade Line Park plan, 2020).

MOBILITY PATTERN CHANGES

Limitless GIS Application

The data obtained by the Limitless GIS Application were used to analyze spatio-temporal changes. This mobile app, supported by the Google maps software, was developed in 2018 by the University of Belgrade-Faculty of Architecture, the Ministry of Social Affairs and the Limitless NGO, dealing with pedestrian accessibility (Stupar et al, 2019). The operationalization of ICT support primarily identifies users with urban mobility problems (including cyclists and pedestrians), enabling them to map/update the tracks and obstacles in urban space (e.g. pedestrian areas, sidewalks, parks, peri-urban forests), via the Google Maps application.

Figure 5: The Limitless GIS application. Left: the intro page. Right: Mapping the elements that define the ranking of pedestrian routes and areas in Belgrade - via the Google Maps application (Stupar et al, 2019).

Bicycle counter

The bicycle counter is situated on the Sava river dock near “Beton hala” and Kalemegdan fortress. The listed values are shown on the display. This system serves as a tool for the capacity adjustment, identifying the ratio of bicycles and people and, consequently, managing riverbank parks, planning city activities (urban mobility, etc.) or establishing track-time trends.

Figure 6: A riverbank bicycle counter, municipality Stari Grad (Bicycle counter, Flickr photo).

RESULTS

To identify the effects of COVID-19 lockdown measures on pedestrian and bicycle activities, we measured the trend change in year 2020 (May 6-September 29) and compared it to an average detected in the same period of 2018 and 2019.

Pedestrian activity

According to the Limitless GIS app and Google Maps, the municipality Stari Grad contains over 7000 km of streets and trails utilized for recreational purposes. The first step of the analysis was focused on pedestrian activities, counting counts users` pins and the change of their intensity along most frequent directions: Dubrovacka and Tadeusa Koscuska street, the Danube promenade and the Sava dock area. The positive trend was detected, along with the growing user-base of the app. There was also a growing trend for the pedestrian movement - 4950 pedestrians per day (starting from March 15, 2020 until the end of September) vs. cca. 3900 pedestrians per day in the same period of 2018 and 2019. Additionally, the mobility trends for places like national parks, public beaches, marinas, pet-parks, plazas, and public gardens increased 23% compared to the baseline of the Belgrade Metropolitan Area (Google COVID-19 Community Mobility Report, 2020).

Figure 7: Mapped locations before and after the initiation of the COVID-19 measures (Limitless application, 7a-2019, 7b-2020).

Table 1: The frequency of the pedestrian movement in four zones in Stari Grad, Belgrade.

	May-September		
	2018	2019	2020
Zone 1 - Route of Kralja Petra and Dubrovačka street (maroon pins)	1189	1254	1486
Zone 2 - Route of Tadeuša Košćuška Street (green pins)	713	699	898
Zone 3 - Route of the riverbank promenade “25.maj” (blue pins)	1071	1157	1334
Zone 4 - The route of the “Sava” riverbank promenade (yellow pins)	993	901	1235
Total	3966	4011	4953

*Average frequency of movement per day for a period of five months (May-September)

Cycling activity

Approximately 18600 bicycles are counted per month between May 6th and the end of September 2020, comparing to the same time period in 2018 and 2019 (cca. 16000 bicycles per month - Danube bicycle route counter in 2018/19).

Table 2. Average frequency of bicycle mobility per day in selected zones, according to the data obtained by bicycle counters (May 6- September 29, 2018/2019/2020).

	2018	2019	2020
Zone - Route of the coastal promenade “25.maj”	540	533	610

The observed growing trend of pedestrians and cyclists may also reflect the avoidance of public transportation due to the pandemics. In Municipality Stari Grad, pedestrians preferred the directions of Dubrovačka and Tadeuša Košćuška Streets, the Danube and Sava riverbank promenades. According to the Google urban mobility data the pedestrian activity increased by 23%, especially regarding the visits to parks and other green areas. This condition might also be the result of temporary closure of indoor training and exercise facilities. Additionally, the lack of privacy in dwelling units was apparent, especially in small apartments without balconies and families with three or more members (Maričić, 2020). The analysis also revealed the higher intensity of activities during the daylight hours, instead of the morning-evening peaks typical for the pre-COVID period. This change is more evident for cycling, especially in urban areas with high density.

CONCLUSION

The presented results indicate the increased pedestrian activity in urban parks, inner spaces of residential blocks, peri-urban forests, as well as along green pedestrian lanes, emphasizing the importance of an easy access. The availability of urban green infrastructure has a significant influence on emotional and physical well-being, especially during the periods of distress and pandemic conditions (Holmes et al., 2020). Assessing the available data, this paper could be used as a trigger for further studies and policies which would support the preservation of existing urban green infrastructure and the allocation of open green areas promoting pedestrian and bicycle activities and mobility. For example, redesigning streets and public spaces would allow additional space for these activities and provide a direct and indirect impact on different public health goals (Jennings et al., 2012). Assessing bicycle network sustainability comparing the state detected during the period of May 6th - September 29th 2020 and the data from the same periods of 2018 and 2019, this paper may provide policymakers and planners with strong additional evidence to support the preservation of existing urban green infrastructure and the allocation of open green spaces that promote bicycle activity and mobility. For example, recommendations in the case of Public space redesign in Toulouse (Civitas Initiative, 2020) included redesigning of public spaces in green infrastructure, by maintaining existing and installing new bicycle paths by:

- Creating and enlarging access-controlled and “clean zone” areas. direct cycle routes between housing areas and major destinations make cycling the most pleasant and easy way to travel around.
- Improving the access restriction policies for sensitive areas. convenient cycle in-frastructure means avoiding stop-start travel caused by obstructions, lack of priority, and narrow pavements shared with pedestrians. Good cycle parking completes the journey.
- Reducing the physical ascendancy devoted to cars: speed of travel on a bicycle can be quicker than by car through an urban area if cycling infrastructure is made integral to newly-designed streets.

The implementation and development of the Belgrade green infrastructure has its own limitations which are the result of the strict planning hierarchy. For example, the Master Plan of Belgrade 2021 (2016) subordinates all other plans and regulations at lower spatial levels. Along with this legally binding document, the urban development is guided by the Strategic Development Plan of the City of Belgrade (2010) and local environmental development plans (LEAP, Belgrade), which recognize the importance of local community initiatives, but

do not have a legally binding character (Cvejić, 2010). Therefore, the possibility of implementation is significantly reduced due to the lack of adequate official mechanisms for the inclusion of local communities. However, a certain progress in this field has been made in a recent procedure for developing a regulation plan for the linear park in Dorcol, involving diverse stakeholders (local communities, institutions, investors, non-government organizations) through several participatory urban design workshops (New linear park in Belgrade, 2020).

The analysis presented in this paper also indicates that the easily accessible open green spaces, combined with social inclusion, can mitigate the anticipated negative health effects of moderate mobility restrictions, while reducing the risk of disease transmission. It is obvious that urban green areas increase long-term resilience to similar shocks in the future. Importantly, the COVID-19 pandemic shed light on some aspects of everyday life and their questionable sustainability, raising numerous new issues regarding the higher housing density and reduced long-distance travel, the need for local recreational opportunities but also the problem of increased pressure on urban green spaces (Russo and Cirella, 2018). Therefore, the urban resilience has to be reevaluated in accordance to our new reality, hopefully generating some applicable solutions for the crises to come.

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Architecture in Epidemic/Pandemic Conditions: Towards a Protocol for the Resilient City

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ABSTRACT

The actuality of last year and this year (2020-2021) related to the spread of Covid-19 pandemic, makes us reflect on the problem of the spread and management of pandemics and similar epidemiological situations in general. Where are we today globally towards this issue? Aside from being a health problem, is the pandemic actually a problem of architecture and living space? Should this critical moment be considered as a call to reflect on the architectural design and city planning?

It is the duty of architects and urban planners to think and act more on the connection between health, people and buildings. Based on this idea, this paper creates a reactive protocol for the city, from an architect's point of view, that will answer questions about how architecture develops in epidemic/pandemic conditions, how architects should act and design, and how can they help the healthcare system in cases of epidemics/pandemics.

The research methodology involves the combination of qualitative research, respectively, theoretical review and phenomenology, and quantitative methods (diagrams, interviews and thematic maps). The paper finds that the measures to prevent the spread of COVID-19 coincide with the ones taken during many other known epidemics/pandemics in history, and that the spatial/functional organization of housing, workspaces and the city in general does not meet the needs of a healthy environment. Based on the findings, the paper concludes with the creation of a protocol for the resilient city, which will contribute or complement public health protocols focusing on epidemics/pandemics by the WHO. This protocol anticipates the response and interaction between health and architecture, in order to create a preventive and reactive platform for cities in the framework of contemporary commitment to a healthy and sustainable city.

Keywords: *Architecture, Resilient city, Epidemic/pandemic conditions, Public-urban health protocol, World Health Organization.*

INTRODUCTION

In the context of the COVID-19, this study highlights the potential of architecture and urban planning in the prevention and management of epidemics/pandemics, as well as in playing an active role in human health. The paper goes over historical airborne epidemic/pandemic approaches, analyses the "Healthy Cities" concept, parameters and strategic objectives in pandemic conditions, and then portrays the present pandemic situation. Taking into consideration all of the findings, the paper reveals a reactive protocol, based on architectural and urban solutions, towards a health-engaged architecture.

WHAT HAS HAPPENED TO CITIES DURING KNOWN EPIDEMICS/ PANDEMICS OF THE PAST?

Throughout history, disease outbreaks have constantly affected and threatened the planet, causing havoc on entire cities and villages and killing millions of people worldwide. Despite the abolition or successful treatment of many epidemics and pandemics in recent years, the reality of the last year leads us to believe that the risk of recurrence or the emergence of new diseases is always present. This paper will begin with a journey through history, through known airborne epidemics and pandemics, from the most ancient ones to the most recent COVID-19 coronavirus, digging through significant historical facts, in order to answer the question of what has happened to cities during disease in the past. As we confront the new "normality" of COVID-19, with terms like "social distancing" and "isolation" already engraved in our collective minds, it is critical that we remember and learn from our ancestors' courage and wisdom, and gain insight into what our future holds.

Diagram 1: A chronology in time of known airborne epidemics/pandemics in the past, starting from the first plague pandemic (541-747) to COVID-19 (2019-?). Drawing by E. Bexheti.

The first disease of this chronology, first plague pandemic (541-747), as presented in Diagram 1, was a series of repeated attacks within a period of 200 years, which is believed to have been spread through trade, especially from seaports to cities. The society of the sixth-eighth century described the plague's massive devastation as the result of an angry God, and the ancient Greco-Roman traditions on which they were based on turned out to be powerless against the rapid spread of the pandemic. Measures undertaken by the Roman Empire against the pandemic include the rapid disposal of corpses, while usual responses by people were exorcisms or flights. This pandemic is believed to have contributed to the transitions between the ancient and medieval period of western history, whereas the archaeology of massive graves proves the serious demographic impact and the small scale of building during the period after 540. During the first smallpox epidemic in Japan (735-737), on the other hand, the density of rural

settlements influenced a rapid spread of the epidemic, while the Japan measures against the disease, as shown in Table 1, were providing care for the sick through herbal remedies, cutting taxes in order to provide food supply for those infected, restriction of movement and performing of religious rituals (Hays, 2019, p.24-33).

The first milestone of this chronology happened during the second plague pandemic (1346-1844), emphasizing the impact of human traffic and trade in the spread of disease. English cities for instance, were characterized with extremely overcrowded and densely populated suburban areas, where the poor, trade markets and barns provided an ideal breeding ground for plague. As a result, villages and farms were at a higher risk of being infected than cities (Hays, 2019; Shoals, 2018; Snowden, 2019). The history of the epidemics of the 1630s in the northern Italian city-states shows the development of complex and sophisticated government mechanisms, which contributed to ending the second plague pandemic in northern Italy and served as an early model for public health regulations worldwide. These measures include the use of health boards, quarantine, isolating the victims at home or in pesthouses and food supply, placing of sanitary cordons, burning the possessions of the sick, rapid disposal of corpses, use of herbal, chemical remedies or costumes by doctors to ward off disease, prohibition of religious gatherings and authorization of health passports. These measures were adopted by a lot of other countries worldwide, with little or no difference (Hays, 2019, p.103-170).

During the eighteenth-century, smallpox followed plague as the biggest epidemic disease in Europe, being constantly present in the large and dense cities of the continent: London, Copenhagen, Paris, Berlin, Vienna, Amsterdam and Madrid. Therapies and responses which had evolved during the previous epidemics continued to be applied, however, the most important group of responses of this century were in the area of prevention rather than cure. The triumphs of experimental science of this century include the further refinements of inoculation, which became an accepted medical technique in most of Europe since 1760, and Edward Jenner's development of vaccine in 1790 (Hays, 2019; Snowden, 2019).

The biggest disease outbreak of the nineteenth-century west is considered Smallpox in Europe (1870-1875). The rapid urbanization that characterized Europe during this century contributed to the spread of smallpox, with the rapid movement of the disease through congested urban neighborhoods and the development of the fast and reliable railway transport (Hays, 2019; Snowden, 2019). As can be realized by the map on figure 1, the second influenza pandemic (1889-1890) also illustrates the great impact that rail, air and sea traffic had on the spread of the pandemic in between continents (Hays, 2019, p.315-320).

Another milestone of this story happened during the third plague pandemic (1894-?), with the evolution of human understanding on the causes and epidemiology of the plague, followed by the discovery of the causative microorganism Yersinia Pestis in 1894, and the improvements in hygiene and housing. For instance, post-earthquake San Francisco initiated the construction of securing buildings from rats, by raising them from the ground, replacing wood with concrete and destroying rat-friendly wooden structures. Twentieth century brought new measures against the spread of epidemics, such as: encouraging children to avoid crowded places, encouraging personal hygiene, avoiding physical contact, wearing gauze masks in public places, spraying infected things and places and sharing photos of diseases to raise people's awareness of the epidemic (Hays, 2019; Shoals, 2018; Snowden, 2019).

Finally, SARS-CoV-1 (2002-2003) was the first major threat of a disease in the twenty-first century. During this pandemic, ironically, despite the high quality of technology, pandemic control policies were based on traditional methods dating from public health strategies against the plague of the seventeenth century and the foundations of epidemiology as a discipline in the nineteenth century. In comparison to the other past epidemics/pandemics, WHO in cooperation with other international organizations, took swift action to issue global alerts, monitor the disease progression and supervise containment strategies (Snowden, 2019, p.470-473).

Figure 1: A world map of the origin and spread of known airborne epidemics/pandemics of the past. Drawing by E. Bexheti.

In conclusion, historically, epidemics/pandemics have originated from rural settings, due to the close connection of pandemics with rodents and fleas. However, disease outbreaks and their rapid spread have always been triggered by the high density of people and buildings in urban areas. The major development of cities and transport during the nineteenth and twentieth century have had an irreversible impact on a far larger geographical spread of diseases, leading to major economic, political and social effects. This whole story corresponds with the present COVID-19 conditions. Contradictions and different beliefs accompanied the disease since its very beginning and the preventive measures undertaken from the authorities are practically the same as all those aforementioned, e.g., quarantine, self-isolation, social distancing, etc. Despite having the knowledge and experience of previous epidemic/pandemic contexts, we failed to prevent the damage to the economy, healthcare, political and educational system, and the mental health of people in a global level. In early 2000s, it was believed that SARS-CoV-1 had forever changed the way the planet should be treated and the healthcare system should be managed (Snowden, 2019, p.473).But did we really learn this lesson and how effective was the world in preparing for a possible future scenario? Were we actually ready for a second SARS comeback? And what happened in the case of COVID-19?

Table 1: Preventive measures and responses against the spread of known airborne epidemics/ pandemics in history. The table by E. Bexheti, based on historical data.

MEASURES		First plague pandemic (541-747) PL_1	Smallpox epidemic in Japan (735-737) S_J	Second plague pandemic (1346-1844) PL_2	Epidemics in sixteenth-century America A_{XVI}	Smallpox in Boston (1721) S_B	Smallpox in eighteenth-century Europe S_{E1}	First influenza pandemic (1781-1782) I_1	Smallpox in Europe (1870-1875) S_{E2}	Second influenza pandemic (1889-1890) I_2	Third plague pandemic (1894-?) PL_3	Poliomyelitis in America (1916) P_{A1}	Third influenza pandemic (1918-1919) I_3	Poliomyelitis in America (1945-1955) P_{A2}	Tuberculosis TB	SARS-CoV-1 S_1
Supervision of containment strategies	53	X	X	X	X	X	X	X	X	X	X	X	X	X	X	✓
Monitoring the disease progression	52	X	X	X	X	X	X	X	X	X	X	X	X	X	X	✓
Authorization of DOTS strategy	51	X	X	X	X	X	X	X	X	X	X	X	X	X	✓	/
Sharing photos of diseases to raise awareness	50	X	X	X	X	X	X	X	X	X	X	X	X	✓	/	/
Spraying infected things and places	49	X	X	X	X	X	X	X	X	X	X	X	✓	/	/	/
Wearing gauze masks in public places	48	X	X	X	X	X	X	X	X	X	X	X	✓	/	/	✓
Encouraging personal hygiene	47	X	X	X	X	X	X	X	X	X	X	✓	/	/	/	✓
Avoiding physical contact	46	X	X	/	X	/	/	/	/	/	/	✓	/	/	/	/
Encouraging children to avoid crowded places	45	X	X	X	X	X	X	X	X	X	X	✓	/	/	/	/
New constructions secured from rodents	44	X	X	X	X	X	X	X	X	X	✓	/	/	/	/	/
Use of antibiotics	43	X	X	X	X	X	X	X	X	X	✓	/	/	✓	✓	/
Passenger control	42	X	X	/	X	/	/	/	/	/	✓	✓	/	/	/	✓
Raising awareness on vaccination	41	X	X	X	X	X	X	X	✓	/	/	/	/	/	/	/
Approving the technique of vaccination	40	X	X	X	X	X	✓	/	✓	/	✓	/	✓	✓	✓	/
Approving the technique of inoculation	39	X	X	X	X	✓	✓	/	X	/	X	/	X	X	X	/
Stopping of public life	38	X	X	✓	X	✓	/	/	/	/	/	✓	✓	/	/	✓
Authorization of health passports	37	X	X	✓	X	/	/	/	/	/	/	✓	/	/	/	/
Cleaning the buboes of the infected	36	X	X	✓	X	✓	✓	✓	/	X	/	/	/	/	/	/
Treating the sick with heat/cold	35	X	X	✓	X	✓	✓	✓	/	X	/	/	/	/	/	/
Treating the sick through bleeding	34	X	X	✓	X	✓	✓	✓	/	X	/	/	/	/	/	/
Closure of public restrooms	33	X	X	✓	X	✓	/	/	/	/	/	✓	✓	/	/	✓
Prohibition of selling old clothes	32	X	X	✓	X	/	/	/	/	/	/	/	/	/	/	/
Closure of pubs	31	X	X	✓	X	✓	/	/	/	/	/	✓	✓	/	/	✓
Regulation of trade	30	X	X	✓	X	/	/	/	/	/	/	/	✓	/	/	/
Encouraging smoking	29	X	X	✓	X	/	/	/	/	/	/	/	/	/	/	/
Discharge of guns in the streets	28	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	X
Cleaning the streets from waste	27	X	X	✓	X	✓	X	X	X	X	X	X	X	X	X	X
Isolating or killing stray animals	26	X	X	✓	X	/	/	/	✓	/	/	/	/	/	/	/
Authorization of punishments	25	X	X	✓	X	/	/	/	/	/	/	✓	/	/	/	/
Controlling and restricting funeral rituals	24	X	X	✓	X	/	/	/	/	/	/	/	/	/	/	/
Tracing the infected	23	X	X	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Tax increase	22	X	X	✓	X	/	/	/	/	/	/	/	/	/	/	/
Prohibition of religious gatherings	21	X	X	✓	X	/	/	/	/	/	/	/	/	/	/	/
Use of chemical remedies	20	X	X	✓	X	/	/	/	/	/	✓	/	/	✓	✓	/
Use of costume by doctors to ward off disease	19	X	X	✓	X	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Burning/disinfecting the possessions of the sick	18	X	X	✓	X	/	/	/	✓	/	✓	/	/	/	/	/
Isolating the sick into a pesthouse	17	X	X	✓	X	✓	/	/	✓	/	✓	✓	/	/	✓	✓
Placing of sanitary cordon	16	X	X	✓	X	/	/	/	/	/	✓	/	/	/	/	/
Isolation of the victims	15	X	X	✓	X	✓	✓	/	✓	/	✓	✓	/	/	✓	✓
Declaration of quarantine	14	X	X	✓	X	✓	✓	/	/	X	✓	✓	✓	/	/	✓
Use of health boards	13	X	X	✓	X	/	/	/	/	/	/	/	/	/	/	/
Prohibition of wealth display	12	X	X	✓	X	X	X	X	X	X	X	X	X	X	X	X
Fire lighting	11	X	X	✓	/	X	X	X	X	X	X	X	X	X	X	X
Restriction of movements	10	X	✓	✓	/	✓	✓	/	/	/	✓	✓	✓	/	/	✓
Performing of religious rituals	9	X	✓	✓	✓	/	/	/	/	/	/	/	/	/	/	/
Food supply	8	X	✓	✓	/	✓	✓	/	✓	/	✓	✓	/	/	✓	✓
Tax cuts	7	X	✓	X	/	/	/	/	/	/	/	/	/	/	/	/
Use of herbal remedies	6	X	✓	✓	✓	✓	✓	✓	/	✓	/	/	✓	/	/	/
Providing care for the sick	5	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Flight	4	✓	/	✓	✓	✓	/	/	/	/	/	✓	✓	/	/	/
Rapid disposal of corpses	3	✓	/	✓	/	/	✓	/	/	/	/	/	/	/	/	/
Exorcism	2	✓	/	✓	/	X	X	X	X	X	X	X	X	X	X	X
Ancient Greco-Roman traditions	1	✓	X	X	X	X	X	X	X	X	X	X	X	X	X	X

"HEALTHY CITIES" IN RELATION TO THE PANDEMIC

History has taught us that the weakest moments that cities have experienced were those of epidemic or pandemic outbreaks. However, those exact moments were the ones that influenced great recoveries, new rapid growths and developments of cities (Hays, 2019, p.342). The story of fragile, incapacitated and devastated cities, presented in the previous chapter, inspires us architects and urban planners to think of which aspects of the city should be addressed, in order to prevent the negative effects of such events? Does this lead us to an ideal world, an ideal version of the city which we aim to create? A city within which we can live healthy, treat the consequences of previous diseases and prevent future epidemics/pandemics? Can the concept of "Healthy Cities" (a project by WHO/Europe) apply to cities in pandemic conditions?

Table 2: Parameters of the Healthy City, argued by Duhl and Hancock (Leeuw, Simons & Forbat, 2020).

11 qualities a Healthy City should strive to provide	Sustainable development objectives (SDGs)
A clean, safe, high quality physical environment (including housing quality)	6, 13, 17
An ecosystem which is stable now and sustainable in the long term	7, 11, 12, 13, 14, 15, 17
A strong, mutually supportive and non-exploitive community	5, 10, 11, 17
A high degree of public participation in and control over the decisions affecting one's life, health and well-being	4, 5, 16, 17
The meeting of basic needs (food, water, shelter, income, safety, work) for all the city's people	1, 2, 6, 17
Access to a wide variety of experiences and resources with the possibility of multiple contacts, interaction and communication	4, 11, 16, 17
A diverse, vital and innovative city economy	8, 9, 17
Encouragement of connectedness with the past, with the cultural and biological heritage and with other groups and individuals	4, 11, 17
A city form that is compatible with, and enhances the above parameters and behaviours	9, 11, 17
An optimum level of appropriate public health and sick care services accessible to all	3, 17
High health status (both high positive health status and low disease status	3, 17

The city is the crucible of human experience, human development and human health. It is the beating heart of our industrialized world and a hotbed of innovation and creativity; therefore, it is an obvious starting point in debating and working for better health and a better society. A Healthy City is so much more than a city with adequate health-care services and a healthy population, and Duhl and Hancock argued that this concept is understood in many different ways, based on our own interests and training, as well as culture and beliefs (Duhl & Hancock, 1988, p.9-23). The WHO European Region launched the Healthy Cities Project in 1985, aiming to improve the health of cities and their residents through the development of health-promoting initiatives and processes. The definition of a healthy city is a fairly broad one, while the WHO uses the Healthy Cities definition of Duhl and Hancock: "A healthy city is one that is continually creating and improving those physical and social environments and expanding those community resources which enable people to mutually support each other in performing all the functions of life and in developing to their maximum potential" (Duhl & Hancock, as cited in WHO Western Pacific Team, 2015, p.3). The WHO Commission on Social Determinants of Health's report emphasizes the impact of urbanization and urban surroundings on our physical and mental

health, highlighting the need to "place health and health equity at the heart of urban governance and planning" (WHO Western Pacific Team, 2015, p.2).

The Healthy Cities concept by WHO/Europe addresses current concerns about the health of cities and society, and aims to develop and promote healthy and resilient cities. The strategic parameters and objectives of this approach address many of the problems that have historically characterized the city in epidemic/pandemic conditions. We can include aspects such as: vulnerable groups of society, urban regeneration, expertise and methods for health promotion, national and local cooperation, community involvement, solidarity and cooperation between European cities and networks, which are all extremely important for the health of the city and its inhabitants.

The "Healthy cities" concept provides an ideal solution to the very actual health care or sick-care concern, in the framework of preventive measures and resilience. But what happened with Healthy Cities during the COVID-19 pandemic? Is there anything we can add to the already defined parameters and objectives of the Healthy Cities Project? Is there anything we can learn from the COVID-19 experience?

ARCHITECTURE AND URBAN DESIGN/PLANNING IN THE CONTEXT OF COVID-19

During the current situation, the world is facing unprecedented restrictions, as quarantine, social distancing and self-isolation have become the crucial strategies to restrict the spread of COVID-19, according to WHO's public recommendations. These methods not only go against people's urge for social interaction, but they also go against the way that cities, parks, squares, subways and shared spaces are designed. Designers and planners, therefore, are left with numerous questions about the tendency in design toward developing social relations and the need to separate individuals during a pandemic (Elgheznawy & Eltarabily, 2020, p.75).

Population density (as history has showed) is one of the most important factors affecting the spread of the pandemic, therefore WHO's regulations indicate avoiding crowded and closed places, leading to the closing of cafes, restaurants, shopping malls, theatres, schools and universities. People are required to keep a distance of 1.5 m from each other, while public facilities provide fixed seats and distinguish individual's place with signs on the ground. Social distancing on transport has the effect of reducing aviation and motorized traffic, as well as restricting movement. Public transport is asked to differentiate between entering and leaving the transportation stations, as well as proper and frequent cleaning and sanitizing hygiene of employees and passengers is required. Contactless screenings were introduced, methods such as drawing queues on floors or using obstacles are used to maintain social distance, while cleaning techniques stepped up by providing hand sanitizers everywhere and disinfecting touched surfaces. People are also asked to undergo temperature screenings when entering public buildings (Fezi, 2020; Salama, 2020).

During this time, public buildings or spaces such as stadiums, conference centers, vacant hotels or arenas are being retrofitted for health care, repurposed as emergency hospitals, as the existing ones turned out to be insufficient for the huge number of people infected and the health care needed (fig. 2).

Restricting of open spaces and parks within cities is also considered, and the necessity of more landscapes, green areas and public spaces for individual use is evident during this period. As a result of household isolation and being forced to

work and study from home, people have been spending a large proportion of their time indoors. Thus, their physical and mental health has been directly affected by their housing space, especially if the design was poor. Spatial organization, appropriate furniture or possession of balconies and nature/green views resulted in being key factors for enabling self-isolation and concentration for working online. These turned out to be an issue in the majority of houses and as a result, questions on how to reduce isolation stress and psychological effects arose. As one might imagine, in slum neighborhoods, with a high population density and lack of people's awareness, as well as in high-rise apartment buildings with shared entrances, indoor areas, stairs and elevators, the transmission of the disease and sanitizing routines were more difficult to be implemented. On the other hand, smart technology and digital data resulted successful in tracking people infected, rapidly developing testing kits and vaccines against COVID-19 (Elgheznawy & Eltarabily, 2020, p.78-80).

Figure 2: Part of University Clinical Center of Kosovo adapted as Coronavirus clinic.

COVID-19 has had a profound and unanticipated impact on human life, radically altering the way people interact and connect with one another (Horton, 2020, p.16). The Slovenian philosopher Slavoj Žižek, in perhaps the first serious response to the implications of Covid-19, argues that the continued spread of the pandemic has also caused a widespread pandemic of ideological viruses which were dormant in our societies, such as fake news, paranoid conspiracy theories, or outbreaks of racism (Žižek, 2020, p.55). It was and it is continuing to be a major challenge for all cities around the world, rich or poor, because the precautionary measures taken to control this global pandemic have a significant impact on these cities due to their economic structure, public health status and the ability to provide various services and livelihoods. Some cities have been effective in managing the crisis thus far but many have not.

TOWARDS A PROTOCOL FOR THE RESILIENT CITY

Taking into consideration the main issues and findings discussed in the previous chapters, the pandemic of COVID-19, which unfortunately continues to be current and its end can hardly be seen on the horizon, highlighted major problems with the spatial/functional organization of residential buildings, work spaces, public buildings and the city itself in general. This is evidenced by the great impact that the pandemic had on the mental health of society, globally. As a result, this paper calls for the creation of a reactive protocol, which will serve as an architects' agenda regarding strategies for the future of architecture and city planning.

In the context of social distancing measures, understanding the established rules of personal space and proximity relationships introduced in the mid 1960s is

essential. Edward Hall, the founder of proxemics, emphasizes the impact of proxemic behavior on interpersonal communication, which is valuable not only in assessing how people interact with others in daily life, but also in organizing the space in our homes, apartments and in our cities. Personal space determines how people relate socially and psychologically and can be represented by an area (bubble), which surrounds the person's body into which intruders may not come (Salama, 2020, p.7). Hall describes the interpersonal distances of people in four distinct areas: intimate distance (1 to 46 cm), personal distance (46 to 122 cm), social distance (120 to 370 cm) and public distance (370 to 760 cm and more). Consequently, there are four forms of human territory in the proxemics theory: public territory, interactional territory, home territory and body territory (Hall, 1966, p.112-128).

The pandemic's influence on how people perceive the comfort level of another person's distance from us and how we function within that space has resulted in a more elastic personal distance (Crosbie, 2020, p.2). Taking into consideration that the concept of comfortable personal space is one of the established standards for architects, urban designers and planners, the abovementioned nomenclature of human territories will be the canon for the development of a protocol for the resilient city.

Figure 3: Conceptual diagram of future home territory. Drawing by E. Bexheti.

As far as the home territory is concerned, based on visits, interviews and meetings, it was concluded that, after long periods of isolation, many families rediscovered and reprioritized the spatial components of their homes. This changed perception of space, of our own homes, came as a result of the need to perform multi essential activities which are new to the house concept. Hence, a complete reformulation of the new housing and neighborhoods design system and the development of regulations, standards and requirements that can produce more humane housing is urgently needed. People need houses that can effectively provide a healthy social isolation and offer protection from viruses and infections. Future housing needs to embrace the needs of each inhabitant, including space for work, study and recreation, while respecting their personal space (bubble). Consequently, the spatial organizations will change, focusing on flexibility; comfortable furniture; and multi-functional design able to couple living with working, to enable work-from-home routines that can not only facilitate performance efficiency but also individual's wellbeing. For high-rise apartments, where shared areas are unavoidable, the future should focus on the touchless experience from the front door to the apartment door itself.

COVID-19 taught us that connectivity with nature positively influences the psychological effects of forced isolation and the lack of social/professional life. Therefore, spatial elements to strengthen this relation, such as: large windows, balconies, gardens, rooftop gardens/terraces, inner courtyards and all other elements which guarantee providing natural lighting and ventilation, to avoid sick-building syndrome and enhance air quality, should be strongly required.

Since the bubble is carried everywhere one goes, the interactional territory should be approached similarly. Post-pandemic design should introduce more partitions between departments, therefore, ending the concept of open-plan spaces. New public buildings design strategies should emerge in order to respect personal spaces between people. This means wider corridors and doorways, many more staircases, flexible and adaptable spaces, better natural ventilation, to ensure avoidance of overcrowding and mixing in possible pandemic scenarios. Touchless technology, automation, voice technology, and facial recognition-based on artificial intelligence should definitely influence the post-pandemic architecture in public buildings (schools, shopping malls, administrative buildings, etc.).

Figure 4: Conceptual diagram of future public territory. Drawing by E. Bexheti.

In the public territory, the value of the residential neighborhood should be considered essential, because the quality of life does not rely only on housing, but on the urban context. Hence, the importance of the residential neighborhoods and how it facilitates a healthy, safe, social, human life and provides all community services and needs (health facilities, schools, and services), should be enhanced by connecting work, dwelling and leisure in a more overlapped, connected and compacted urbanity, rather than independent zones. Investments in affordable and adequate housing and slum upgrading should also be made, to ensure that marginalized groups have access to shelter that facilitates physical and mental health during the pandemic and beyond.

The protocol calls for the creation of a walkable, pedestrian and bike-friendly city, where people's mobility no longer depends on their access to individual vehicles or mass public transportation. Walking should be considered the primary mode of transportation, and all citizens should have access to all amenities, including health care, education, and urban parks within a 15- minute walk. This ensures

physical and mental health for the residents, as well as a more sustainable and resilient city. The COVID-19 actuality has encouraged an uncommon use of available parks and public spaces, therefore inspiring cities to create more parks and greenery, and alter busy streets and sidewalks into new shared places, allowing people to commute, eat, socialize or exercise, while maintaining their personal spaces.

In conclusion, the current pandemic has taught us that concepts about place attachment, personal space, interpersonal and group interactions, and closeness to nature, will need to be reviewed for the future design policies. The urban built environment configuration, as this paper has shown, plays a major role before, during and after the spread of epidemics/pandemic, and it is our duty as architects and urban planners to prevent and contain disease risks, as well as provide healthy, sustainable and resilient cities.

HOME TERRITORY

• Reformulation of the new housing and neighborhoods design system and the development of regulations, standards and requirements that can produce more humane housing;

• Housing design that can provide a healthy social isolation and offer protection from viruses and infections;

• Embracing the needs of each inhabitant, including space for work, study and recreation, while respecting their personal space;

• Spatial organizations focused on flexibility, comfortable furniture and multi-functional design;

• Designing high-rise apartments that focus on the touchless experience from the front door to the apartment door itself;

• Housing design that strengthens the connectivity with nature, through spatial elements such as: large windows, balconies, gardens, rooftop gardens/terraces or inner courtyards.

INTERACTIONAL TERRITORY

• End of open-plan space concept, introduction of partitions between departments;

• Emergence of new design strategies that respect personal spaces between people (wider corridors and doorways, more staircases, etc.) to avoid overcrowding and mixing in possible pandemic scenarios;

• Designing flexible and adaptable spaces;

• Ensuring better natural ventilation;

• Adapting of touchless technology, automation, voice technology and facial recognition-based on artificial intelligence.

PUBLIC TERRITORY

•Enhance residential neighborhoods values by connecting work, dwelling and leisure in a more overlapped, connected and compacted urbanity;

•Investing in affordable and adequate housing and slum upgrading, to ensure access to shelter and physical and mental health during pandemics and beyond;

•Creation of walkable, pedestrian and bike-friendly cities;

•Providing access to all amenities, including health care, education, and urban parks within a 15-minute walk;

•Creation of more parks and greenery, and altering busy streets and sidewalks into new shared places, allowing people to commute, eat, socialize or exercise, while maintaining their personal spaces.

Figure 5: A protocol for the resilient city, based on the theory of proxemics. Drawing by E. Bexheti.

CONCLUSIONS

This paper presents the need to revisit architecture and planning properties, and highlights the role of architects, urban designers and city planners in preventing or mitigating epidemic/pandemic-related risks and developing healthy environments globally. Based on the findings, a reactive protocol for the city is articulated, structured around three territories relying on the theory of proxemics. The conclusion emphasizes the need to transform cities globally for future resilience, involvement, and sustainability. This reactive protocol originates insights for areas where future design is critically required, in order to create an extended vision of future resilient cities and a health engaged architecture.

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The Open Air School Revisited – Architectural Strategies for Healthy Learning Environments

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ABSTRACT

The paper examines the architectural legacy of the Open-Air Education movement, its origins, conditionality, and strategies from the viewpoint of its impact and relevance today. While the pedagogical background of outdoor education can be traced to Jean Jacques Rousseau's idea of 'natural education' as both an upbringing in contact with nature as well one catering to a child's nature, the acute reason for a large number of open-air schools operating in Europe in the early 20th century were poor health conditions of children in large cities. First by necessity – a new architectural model of school emerged – the modernist pavilion school. This coincided with a wider physical and psychological hygienization of the living environment, formulated at the interwar CIAM congresses, thus producing a new paradigm. Several developments have brought the open-air education paradigm to the forefront of interest in recent years, parallelly from the standpoints of pedagogies and public health. On one hand, the growing need for environmental education with the goal to teach sustainability has resulted in an array of networks promoting learning from and through nature. On the other hand, several acute reasons ask for implementation of outdoor education, such as disorders stemming from a lack of interaction with nature during a child's development, an increasing dependence on virtual media and sedentary lifestyle, and most recently, the COVID pandemic. These motives point to a reconsideration of how a healthy school environment is defined today, what challenges it poses when facing the limited conditions of urban density and what challenges current energy consumption requirements pose on the quality of air. The paper examines contemporary school spaces viewed in light of emergent health requirements, drawing on lessons of over a century ago.

Keywords: *Open Air Education, Public health, Modern architecture, Contemporary architecture, Educational building.*

INTRODUCTION

The paper examines the architectural legacy of the Open-Air Education movement, its origins, conditionality, and strategies from the viewpoint of its impact and relevance today. While the pedagogical background of outdoor education can be traced to Jean Jacques Rousseau's idea of 'natural education' as both an upbringing in contact with nature as well one catering to a child's nature, the acute reason for a large number of open-air schools operating in Europe in the early 20th century were poor health conditions of children in large cities due to dismal living conditions, foremost tuberculosis, rachitis, anaemia and malnutrition. This prompted an emergence of open-air schools (Waldschulen, ecoles en plein air), initially organized in natural contexts, with classes realized in pavilions immediately connected to the outside and significant curricular shifts allowing outdoor activities and rest in between classes. The impact of this new school paradigm profoundly influenced the modern language of schools legible in canons of 20th century educational architecture. The turn of the 20th to 21st century saw the attention of schools as institutions increasingly focused on its community building aspect, an expression of social ambition extending its reach from the purely educational function to that of cohesion and inclusivity, followed by relaxed requirements for spatial conditions which allowed for these appropriations. However, climate emergencies, contemporary lifestyles and health concerns place topics extensively explored a century ago at the forefront of defining current goals in architecture aimed at educating in the broadest sense.

THE EMERGENCE OF THE PAVILION SCHOOL

The roots of the open-air education movement were twofold – one were the dislocated boarding schools in the countryside following Rousseau's, Pestalozzi's, Tolstoi's or philanthropists ideals of an upbringing in nature, learning with and from it. Placing importance on learning by doing, they can be observed as a part of the pedagogical, pedocentric revolution in turn-of the-century educational movements. The other origin of the open-air education movement was acute, resulting from the sudden migrations of working families into the city as industrialization radically changed environments and placed workers in dismal living conditions, which in turn caused an epidemic of poor health particularly affecting the youngest. The turn-of-the-century urban school edifices were built as representational palaces of education, their prominence in the city fabric aligned with their societal role. Optimal orientation, window size, natural ventilation, or adequate open spaces were not of significant importance in their architectural articulation. The classicist urban school could not meet the needs of frail children, exposure to sun or time spent in natural environments. The open-air classroom, first organized near health complexes as a temporary educational solution for sick children, became an integral and defining unit of an emerging school format across cities' outskirts.

The research into the first 'Waldschule' of 1904 in Charlottenburg, Berlin (Hansen-Schaberg, 2003), illustrates the dissolution of the traditional classroom over a short period of time: the first open-air classroom saw the recreation of the traditional classroom, with fixed benches repeating the frontal, ex-cathedra model in a wall-less environment; the second version loses the superfluous rigid furniture and finds children scattered around the teacher, under a tree, in a primal teaching arrangement, the third is however the seed of a new architectural unit which will very soon define the language of the 'new-school' - a roofed pavilion open to its surroundings, with moveable furniture, a flexible

building-block which will soon see its early architectural articulation in the 1911 Uffculme School by Cossins, Peacock and Bewlay (Saint, 2003), with an array of paradigmatic examples following in the interwar era.

Figure 1: Eugène Beaudouin, Marcel Lods: Open-air School in Suresnes, 1935 (Source: L'Enfant dans la Cite, "L'Architecture D'Aujourd'hui", 1949, 17(8): 30, image: R. Gallois).

Open-air schools of this period are a literal interpretation of the wooden pavilions: classrooms encased in flexible glazed surfaces offering direct interaction with open outdoor spaces. The apotheosis of this new school type was the Ecole en plain air in Suresnes by architects Baudoin and Lods, articulated of elements with a profound impact on new school architecture for years to come: the open pavilion classroom, Jean Prouve's light movable furniture, roofs used for recreation etc. This coincided with a wider physical and psychological hygienization of the living environment, formulated at the interwar CIAM congresses, thus producing a new paradigm, legible in seminal realizations in school architecture of the time, such as Jan Duiker's Openluchtschool in Amsterdam, Ernst May and Albert Loecher's Reformschule in Frankfurt or the early idealisms of Richard Neutra such as the Ring Plan School. These lessons in spatial articulation for better health standards, implicitly revising modes of teaching and learning, have since been acquired as prerequisite in the language of the 20th century school. However, the impact can be observed in a broader sense. The pavilion scheme was built to meet the demands of the open-air education movement, offering at the same time a more explicit differentiation of various functional zones of the school, as well as zoning according to age, which was a requested feature found in other variants of reform pedagogy. We can thus speak of an implicit influence in an architectural sense as well (Roth-Čerina, 2011). Moreover, a fundamental shift in architecture's language, in which the public health background of hygienizing living environments coincided with - as Beatriz Colomina argues - the profound impact of breakthroughs in medicine, health-obsession and how we thus observed the physical environment as one of transparency (or x-ray superposition), also changed the way we depicted and built architecture (Colomina, 2019).

CONTEMPORARY RELEVANCE OF OPEN-AIR EDUCATION

Climate change, detachment from nature, sedentary lifestyles of children and – most recently – the COVID-19 pandemic, have brought the open-air education paradigm to the forefront of interest in recent years, parallelly from the standpoints of pedagogies and public health. On one hand, the growing need for environmental education with the goal to teach sustainability has resulted in an array of networks promoting learning from and through nature, such as the Eco-Schools programme, the Outward Bound movement or Outdoor Councils. On the other hand, several acute reasons ask for implementation of outdoor education, such as disorders stemming from a lack of interaction with nature during a child's development, an increasing dependence on virtual media and sedentary lifestyle, and the distanced, protected, pandemic classroom.

Public health problems facing us today - and affecting school populations around the world - are systemic. Viral threats enhanced by human activity were made imperative by the acute and ongoing Covid-19 epidemic affecting both students and teachers. Developing much slower, equally dangerous, threats caused by lifestyle changes brought by the late 20th century are disproportionately affecting younger populations and will predictably show its effects in an ever- growing scale. Obesity epidemic and mental health issues are increasingly affecting the younger population with grave consequences on the quality of their lives. It has been shown that school building design can affect, both positively and negatively, these issues.

Furthermore, as energy consumption and efficiency develop architectural elements and envelopes which do not always overlap with the classroom's prerogative of openness toward the outside and natural ventilation, a rethinking of how spatial articulation can contribute to healthier, more sustainable schools ask for revising inherited schemes and learning from research in climatic architecture, even 'meteorological design' (Rahm, 2014). These motives point to a reconsideration of how a healthy school environment is defined today, what challenges it poses when facing the limited conditions of urban density and sustainability and what architectural elements and articulations it implies.

The discussion on healthy learning environments, but also environments for teaching about caring for the planet in a broader context, is part of the overarching concern on the shift towards caring for our environment and its future. If we acknowledge the environment as the Third Teacher, following the theory of early child development and relational space of Loris Malaguzzi (Rinaldi, 2001; O'Donnel et.al., 2010), what the educational environment implicitly teaches gains particular responsibility in raising children for a more sustainable future. The articulation of school-space thus addresses several matters of health, spanning the immediate and individual toward the long-term and environmental, and includes not only the role of open-air space and its use within the school, but also the didactic importance placed toward the soil, which implies 'alternative practical, ethical, and affective ecologies' (de la Bellacasa, 2017) and places the discussion into a broader political context of recognizing climate emergency (Latour, 2018).

ALIGNING HEALTHY EDUCATIONAL SPACES WITH SUSTAINABLE CONSTRUCTION

The very immediate need to fight climatic change and global warming is informing new teaching curricula and methods, but also, on a practical level, it is changing

ways we build new schools and retrofit existing school buildings. New building standards and regulations for old buildings, developed and enforced in recent decades, were at first mainly focused exclusively on lowering building energy consumption, but have recently started to offer a more comprehensive approach. Rapid Covid-19 spread and closing of schools in most of the world has brought a long- neglected aspect of ventilation in schools to the fore. Ventilation and indoor air quality are the most important factors influencing occupant's health in buildings (Eitland, 2021). Research has found that SARS-CoV-2 is a long-range airborne virus that can be dispersed throughout a room and can remain aloft for hours. It can infect people who are not in close contact if they inhale such air (Jones, 2020). The easiest way to estimate the quality of air is by measuring the concentration of CO2, exhaled by the people in the room. Recommended maximal values of CO2 concentration is 1000 ppm (Lovec, 2020), and higher values relate to increased student absences, different symptoms in children and lover cognitive function outcomes (Eitland, 2021). High values mean poor air quality, a result of poor ventilation, and high concentrations of other exhaled particles (including SARS-CoV-2, contributing to ongoing pandemic). Problems with indoor air quality and school ventilation are prevalent, for instance it is reported in over 50% of elementary schools in the US (Jones, 2020). Also, a number of mechanical systems recycle all or part of the indoor air without filtering. In countries of former Yugoslavia, most kindergartens and schools were built with respect to standards of natural ventilation in place (with adequate operable window area, cross ventilation etc), meaning that most school spaces are without mechanical ventilation. However, subsequent interventions and regulation changes disregarded ventilation issues, deteriorating air quality in schools. Air-conditioning is often sporadically installed in classrooms that recycle the indoor air, and disincentives occupants to open windows and ventilate. Also, single sided approach to rising energy efficiency by improving on building envelope often accomplishes high airtightness and prevents ventilation that naturally occurred with old drafty windows, especially over-night (Lovec, 2020). Interventions to existing schools should focus on rising awareness to appropriate (natural) ventilation and installing proper mechanical ventilation (Lovec, 2020).

Rise in energy cost and growing energy insecurity due to climate change and extreme weather are two main motors behind expected growth in application of passive energy and natural ventilation techniques in buildings (Passe, 2015). Apart from providing better climate experience, natural ventilation generally promotes connection between students and nature, beyond closed space, thus promoting their mental wellbeing. Current heavy reliance exclusively on mechanical air-conditioning and ventilation isolates students and their senses from the outside world, changes of day, weather, and nature. Mechanical ventilation systems are often used because of their simplicity in design and use. Complex, uncertain, and dynamic phenomena of natural ventilation still lack comprehensive design guidelines, but research of both traditional and new methods is expanding. Moreover, smart control systems that are at present much more readily available than in the past and can execute complex control strategies needed for naturally ventilated buildings (Passe, 2015).

In most countries number of obese children grew exponentially in last few decades. For example, EU average prevalence of overweight (including obesity) in children aged 7-9 is 28%. Of 13 EU countries where it was possible to examine trends over time, the results indicated that the prevalence of overweight had fallen in only five (WHO, 2021).

In public health, the built environment is seen as influencing health-related

behaviors, and physical and social environments are mutually dependent. Although numerous research have proven causal links between different features of schools' sites and buildings and students' physical activity, comprehensive guidance is unfortunately still lacking. Research points to "chair- enticing environments" as one of the causes of the obesity epidemic, and school environments, as we know them today, are exemplary of such environments. Interventions should focus on reducing sedentary behaviors and changes in the way in which sedentary time is spent. Frequent breaks in sedentary time are correlated with a lower body mass index (Brittin, 2015).

The ancient Latin saying Mens sana in corpore sano establishes an early link between a healthy body and healthy mind. Human body, and especially the child's body, needs regular physical activity to stay healthy. One of major factors in preventing obesity and being overweight among children is the promotion of physical activity (Brittin, 2015).

Children spend up to half their waking hours in school, they are sedentary during at least 70% of class time, including Physical education class, and most of the children remain sedentary during break and lunchtime (Brittin, 2015). Some of the strategies supported by research and literature for promoting activity in children by design include: building connections between buildings; orienting buildings to views; locating functions to encourage bouts of walking throughout the day; provide ample space room in classrooms for children and teachers to move around; promoting breaks and even physical activity programs; classroom layouts that allow for multiple configurations; design furniture that is ergonomically appropriate for age; use adjustable, stand- biased desk with stools; use variety of equipment to promote choice, and change in postures for group work, free work and individual work; providing outdoor classroom spaces, with cover and shade, include gardens (Brittin, 2015).

THREE LESSONS IN CONTEMPORARY EDUCATIONAL ARCHITECTURE: KINDERGARTEN, SCHOOL, UNIVERSITY

The spatial articulation of schools closely resonates with architecture's rudimentary origin of being a form of care in itself (though this aspect has been diminished by its other cultural connotations and practices leading to its autonomy. Krasny, 2020). As the transformation of educational space, triggered by care for weak children, converged with the modernist architectural paradigm leaning on care for humanity, delivering healthy cities of the plan-libre disposition and light-flooded spaces of dwelling and work, so do contemporary theories of care for the planet prompt a questioning of how buildings for education embody a healthy environment, sustainable construction as well as a didactic message. Three chosen examples illustrate these levels being explicitly or implicitly addressed, delivering an educational frame reaching beyond its primary function, indoor-outdoor permeability or healthy construction. They simultaneously point toward the capacity of a school to trigger movement, teach about the elements, engage communities, design utilizing climate, thus pointing toward a broader rethinking of what we considered as a rational, safe, healthy, functional or didactic educational space.

Lesson #1: Fuji Kindergarten in Tokyo, Japan

As the pavilion classroom and curricular changes enabling time spent outdoors sprung from spatially articulating an antidote to the ailments of early-20th century city children, can a contemporary school provide an antidote to excessive

time spent indoors, a lack of live interaction being replaced by two-dimensional, digital, virtual worlds, lack of movement while sitting in front of screens? (Tezuka, Tezuka, 2008) Such are the implicit lessons of the Fuji kindergarten in Tokyo, articulated as an interactive, analogous machine of enhanced and intense physical action and contact of the body with natural elements and everyday devices which are turned into didactic machines. A preschool enclosing nature, permeated by trees, without walls, with movable furniture, augments the Montessori principle of teaching one to do it themselves to an extreme in which even switching on a light requires physical action. Instead of toys, the building itself becomes a learning instrument, and the moveable glazing, oval walkable roof and protruding Zelkova trees intensify the experience of natural elements, constantly provoking movement.

Figure 2: Takaharu and Yui Tezuka (Tezuka architects): Fuji Kindergarten in Tokyo, 2008 (Source: https://www.detail- online.com/, image: Tezuka architects).

Lesson #2: Pazdigrad School in Split, Croatia

The importance of open-air spaces belonging to a school can be observed as additional articulation of local public space, both as its supplement and as a trigger for outdoor gathering and physical activity. Such is the example of the recent elementary school in the quarter of Pazdigrad in Split, Croatia. Built in an unplanned, heterogeneous area of the city comprising a collage of shopping centres, dense exploitative housing, agricultural greenhouses and undefined dross, it compensates for a chronic lack of public infrastructure. The sloped terrain and various directions in the neighbourhood are connected through a network of squares, sports areas and resting points, intertwined with equally intricate segments of the school. These parallel systems of controlled and open communications enrich not only the encounters within the school and the neighbourhood, but also ask for constant movement and discovery. The total area of these spaces exceeds the starting size of the plot, providing an exemplary strategy for a neighbourhood-school symbiosis which benefits the health and social experience of both schoolchildren and the community by offering accessible places for encounters and sports.

Figure 3: Mirela Bošnjak, Mirko Buvinić, Maja Furlan Zimmerman (X3M): Elementary School Pazdigrad in Split, 2017 (provided by X3M, image: Bosnić + Dorotić).

Lesson #3: The School of Architecture in Nantes, France

An instructive example integrating sustainability, health standards and complicated demands of contemporary and future educational curriculum is the School of Architecture in Nantes by Lacaton & Vassal completed in 2009. They conceived a design that is open to changes in size, program and use, framework for educational programs of the future. Semi-open space enclosed in simple and economical industrial envelope and indoor space enclosed in standard glass façade are combined in an efficient and oversized industrial structure thus providing ample out-door space for educational uses for much of the year. Outdoor space provided functions also as a semi-public communication space and a reserve for future expansions. Moreover, that strategy allows for combining of both innovative methods of natural ventilation and standard mechanical solutions resulting in healthy conditions for users and lower energy costs. The design defies the standard accepted image of institutional architecture in a similar way modern architecture of Open-Air schools did more than a century and half ago.

Figure 4: Anne Lacaton, Jean-Philipe Vassal (Lacaton & Vassal): The School of Architecture in Nantes, 2009 (Source: http://lacatonvassal.com/, image: Lacaton & Vassal).

CONCLUSION

The didactic message of an educational space stems not only from its function, but its capacity to communicate a message in a formative phase of life. Therefore, the responsibility of the spatial articulation of a school is not only to provide a healthy learning environment, but teach a position in and toward the world, convey a value-system, and present this stance toward the environment, the neighbourhood, the community. The acute issue which needs immediate action is to assure we educate in healthy environments, but the overarching long-term issue of redefining the articulation of educational space is rethinking the message a school delivers by teaching about our relationship towards nature and our role in the cycle of sustainable life.

Looking into the origins of open-air education prompted by tuberculosis in rapidly growing cities of the early 1900's, the imprint on both the network of schools as well as their spatial expression was rapid. By the end of the 1930s, a large number of designs and new realizations of open-air schools can be found all over Europe and the United States, illustrating a new architectural model of school – the modernist pavilion school. The influence of their architectural vocabulary, born out of necessity, was consistent with the interwar tendencies in architecture in general. The need for a physical and psychological hygienization of the living environment, formulated at the interwar CIAM congresses, coincided with the requests stated at interwar conferences on open- air schools. The changes made in the curricular organization and the environment in which it took place deeply influenced both the educational process as well as school space.

Acuteness of external factors affecting pedagogy and curricula today, as well as corresponding school spatial frames, are comparable to the ones existing when the open-air education movement revolutionized school building practices. Those factors are broadly grouped around two interconnected crises: one of climate and one of health. Both are deeply challenging to accepted standards, require systematic change on different levels and are imminent. The lessons of over a century ago show the profound impact of the open-air education movement on the typologies of schools for decades to come. Modern and contemporary school spaces, viewed in light of historic and emergent health requirements, drawing from examples of good practice, trigger a renewed look into the necessity of an interdisciplinary articulation of educational space which will spatialize the needs of current education trends aiming to raise healthy citizens, which will in turn also determine our common environmental futures.

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Healthy Urban and Architectural Design

Overview

Healthy Urban and Architectural Design

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The second thematic area of the conference "Healthy Urban and Architectural Design" follows the principles presented in the conference's main introduction. The emphasis is on integrating health values into a socially stimulating environment, improving the distinctive and multiple cultural assets of cities in urban design, and on working to promote designs that meet the expectations of all citizens in terms of safety, accessibility, comfort, and active living.

Within this thematic area, we would like to emphasize the role of universal design and highlight the fragility of the ecosphere amid the ecological crisis and global health situation. References are made to the HURBE project, in which it is emphasized that the WHO is working actively to create initiatives and networks that tackle urgent common and interlinked challenges affecting our countries, cities and communities today. The WHO European Healthy Cities Network's actions encourage public administrations and institutions to develop commitment, partnership-based planning and capacity-building initiatives for inspiration and learning for European cities that contribute to equitable health and well-being. The EU Commission in "ERA-NET on Smart Urban Futures" underlines the importance of stimulating projects that can provide applicable tools and methods for sustainable, open, innovative and inclusive urban areas.

It is worth asking what a truly sustainable future looks like. Can we use our creative talents to rebuild our cities and make them more sustainable? What role can or should technology play in this? And what impact does art have on sustainability and vice versa?

There is no healthy urban environment without universal design, which we define as generally applicable design. In other words, it must be as accessible as possible for all people without any additional adaptations or need to use specialized design. In the process of working on the design, it is necessary to include other factors, such as cultural and gender differences, safeguarding the environment, technical and technological solutions, as well as all taking into consideration the economic aspects.

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The second framework of this thematic area is the WHO's determinants of health, which are strongly affected by the urban and architectural choices – in both the design to technological dimension: healthy lifestyle, social support networks, employment, accessibility, local food production, buildings and traffic safety, equality in belonging to the local community, air quality and aesthetics, sanitary water and drainage quality, soil and mineral quality, stable climate.

The scientific papers included in this section of the conference deal with the urban and architectural design of various scales and typologies. The urban and architectural design opens up topics from city scales to buildings, from urban design to neighbourhoods and interiors. In any case, an interdisciplinary approach is necessary, to reach a space of appropriate identity and aesthetics. Our space should not only be safe but also provide a sense of belonging and the possibility of social interactions. Being healthy does not only mean the absence of disease but a complete state of physical, mental and social well-being.[1]

It is no surprise that most of the papers at the conference consider housing when we know that we have been in a pandemic environment for the second year. Our living spaces have also become spaces of work, education, recreation, various social interactions in the virtual space, all done from one physical place - the apartment. We became even more aware of the necessity and need for direct social interactions, the importance of social connection. After the initial concern about

1 https://www.who.int/about/governance/constitution#:~:text=Health%20is%20a%20state%20of,belief%2C%20economic%20or%20social%20condition

physical health, we began to realize the values of mental health, our autonomy, but also the need to establish ties with fellow citizens. The concept of living space is in a constant process of change, in line with technological advances, but the pandemic shock highlighted the need for adaptability as well as further compounding and condensation of functions and multifunctional living space organizations.

A sudden change in the social environment leads to changes in thinking processes, where educational processes are a reflection of the current moment. Future professionals learn how to react to current social changes, how to be a part of those changes. Education is emerging as an essential component of our healthy future. The group of authors in their works emphasizes the need to include the concepts of health, sustainability, and improving the quality of life in a methodologically and technically correct way. The issue of adapting to the existing, built-up urban environment is something what we have been debating for a long time, especially today in the light of sustainable development In addition to the learning process, we also discuss learning spaces at the conference. The modernist legacy continues to teach us important lessons about health.

Topics of inclusion and general well-being were highlighted through this section of the conference. Therefore, some papers emphasize the need to achieve better social cohesion through smaller-scale interventions in public space. It emphasizes and calls for the design to be universal, for all age groups, especially those of the third age, to realize their needs and develop as a person and as a collective.

Open public spaces are places focused on the visitor experience as well as places of different interactions. The interrelation of space at the level of the human scale with the need to connect with infrastructural paths is one of the challenges of today. We are aware that urban spaces have a negative impact on personal and public health. It is necessary to introduce sustainable modes of transport in traditional/existing city patterns and to place certain 'occupied' zones at the service of citizens.

A higher quality of life in urban areas cannot be separated from proper urban and architectural design. Areas under urban areas as well as the number of their inhabitants are constantly growing, and the city is becoming a central place to address issues of general health and well-being of the human population. Architectural (and civil engineering) discipline occupies a significant place in building a physical and social environment for the benefit of the community, considering issues of safety, accessibility to all public services with special reference to disadvantaged users.

Architects and urban designers - from both academia and practice – play a significant role in enhancing the physical built environments' ability to adapt and seize opportunities; changing current approaches and systems of processes that lead to a ripple effect for an equitable, inclusive, and sustainable development on various scales. Active collaboration between scholars, actors of the built environment, local community members and decision-makers is key for the active transformation towards a city for all its citizens: inclusive, supportive, sensitive, and responsive to their diverse needs and expectations. In this section, authors transmit and disseminate innovative work by sharing both research, and accomplished projects to boost interdisciplinarity, creativity and dialogue for the development of urban and architectural approaches for healthy, resilient and inclusive cities.

Healthy and Inclusive Cities. Overcoming Architectural Barriers, in the Social, Safety, and Health Spheres of the URBAN-HUMAN Interaction Systems

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ABSTRACT

The essay assumes the concept of "health" not as an urban reality that has already reached a particular health status, but rather an active and participatory city that is committed to guaranteeing greater conditions of comfort and well-being to the citizens. In this context are introduced some theoretical and applied experiments on the territory of Friuli-Venezia Giulia - a region of the north-east of Italy - to prepare the PEBA, Plan for the Elimination of Architectural Barriers, to increase the accessibility and the use of public spaces in the cities. The focus is shifted from the quality of the public space towards the quality of the whole process that precedes the planning and programming phases. The experiments are at the basis of the international guidelines of universal design and planning, sanctioned by the United Nations Convention on the rights of persons with disabilities and in line with the objectives of the 2030 Agenda for Sustainable Development, following also the local provisions referred to the Friuli - Venezia Giulia Regional Law 10 / 2019, "Principi generali e disposizioni attuative in materia di accessibilità".

Keywords: *Healthiness, Urban Inclusion, Citizen wellness, Accessibility strategies, User's-oriented design.*

INTRODUCTION

Placed in the current and advanced cultural and social context and adopting the international guidelines of universal planning enshrined in the United Nations Convention on the rights of persons with *disabilities*[1], and in line with the objectives of the 2030 Agenda for Sustainable Development, the methodology and the research presented aim to guarantee and promote active participation in the social life of all users. Interacting and communicating are some of the criteria that, according to the United Nations Organization (WHO European Healthy Cities Network)[2], contribute to defining a "healthy" city. This is not an urban reality that has already reached a particular health status, but rather an active and participatory city that is committed to guaranteeing greater conditions of comfort and well-being to the citizens who live and enjoy it in everyday life/ activities.

Therefore, it is not just a matter of the number of public spaces, but it's about quality, to guarantee widespread accessibility in all urban areas. The urban "room" is therefore not a neutral scenario, but an operating system, within which the built environments and social spaces become key focal points (Angelucci, Cellucci; 2019). The interaction that is established between them and the community represents the element on which to act in order to guarantee to all people a full expression of their abilities and the achievement of the maximum possible autonomy.

On these bases, the in-depth analysis conducted by the research group of the *Laboratorio dalt of the University of Udine*[3], aims at translating people's needs into concrete actions improving health (physical, mental, and/or social).

A holistic and transdisciplinary approach has been adopted at the different scales of the project (from urban planning to the design of equipment and furnishings) inside of a synergic dialogue with local administrations and governance bodies. The contribution takes the opportunity to present some applied experiments carried out in the field of environmental accessibility on the territory of the Friuli-Venezia Giulia region (FVG) - a territory of north-eastern Italy with cross-border importance - with a specific focus on urban itineraries; this is an opportunity to study the social, collective, and urban well-being, through the use of tools and methodologies capable of shifting the focus from the quality of the space to the quality of the whole process, that presides over design and management.

EXPERIMENTS AND METHODOLOGIES

The subject of inclusive living (considered in its broadest sense of "dwelling") has been the subject of various studies, researches, and experiments conducted over the years within the UniUD Dalt and Space Lab[4] research units[5], assuming the

1 The Convention on the Rights of Persons with Disabilities was adopted on 13 December 2006 at the United Nations Headquarters in New York; it was authorized by Law March 3, 2009.

2 https://www.euro.who.int/en/health-topics/environment-and-health/urban-health/who-european-healthy-cities-network, WHO's website, World Health Organization, viewed on june, 2021.

3 The Laboratorio dalt (design for all, accessibility, thesis and research laboratory) is a structure afferent to the Polytechnic Department of Engineering and Architecture of the University of Udine, with Prof. Christina Conti as scientific supervisor.

4 Space Lab is a laboratory of the Polytechnic Department of Engineering and Architecture of the University of Udine. It deals with the architecture of new spaces, the reuse and enhancement of existing buildings, technological process and product innovation. Principal Investigators: prof. Christina Conti, prof. Giovanni La Varra.

5 Among the researches conducted (in addition to those covered by this essay), we note for further information "The inclusive city. Borgo Grazzano, Udine "(2018-2020); "Casa Zero Barriere" (2017); "Experimental City. Beyond the Borders of Living "(2016, with the participation of the Municipality of Udine); "L.E.B.A., Laboratory for the Elimination of Architectural Barriers, developed by the Municipality of Udine and, specifically, the focus" Survey and analysis of accessibility to commercial establishments in Via Mercatovecchio, Udine "(2016).); "Il Nastro verde", teaching and research initiatives of the University of Udine and of the University of Trieste in the field

concept of accessibility as defined by the United Nations Convention on the Rights of Persons with Disabilities[6]. These experiences have in common the objective of improving people's lives by implementing environmental accessibility as a macro requirement in response to the functional needs of use and space interaction. This is made possible through the elimination of physical and sensory-perceptual barriers within a structured and coordinated whole project, considering the single barrier as part of a larger urban environment.

In the textures and fabrics (streets, squares, buildings) of the city, people meet and socialize. The more they can choose independently how and where to move (Baratta, Conti, Tatano; 2019), the more the urban environment is fair. The design of urban spaces, therefore, must be defined following the holistic principles of Universal Design (UD), with particular reference to usability, considered as identical or equivalent accessibility for all. In addition, the simple and intuitive use of urban itineraries and the containment of physical effort, enhance the facilitation of the use of spaces.

There are numerous experiments applied, which implement these principles that can be looked at to understand the real elements that are an integral part of inclusive planning. Among them, we may mention an urban design experience based on the UD vision, located within the reference territorial context of Friuli-Venezia Giulia: the "Inclusive Urban Park of San Valentino", in Pordenone[7]. The overall project is composed of a sum of individual works and assumes a single key objective: to allow the user the maximum possible interaction with the environment regardless of individual characteristics. This guarantees widespread usability to all (children, adults, elderly). The common thread that permeates all the units of the project is the concept of safety, which can be found:

- in the number of accessible parking spaces for users with disabilities;
- in the reduction of the slopes naturally dictated by the natural orography; in the differentiation of cycle and pedestrian routes;
- in the design details (for example, the seats have a variable height that is also suitable for children);
- in the flooring materials used (for example, a terracotta-colored curb surrounds the entire path, acting as a natural guide for people with visual disabilities and as a safety element for children;
- in the interruption of the curb signals the presence of elements places of interest along the route).

Another example of the application of the UD principles in similar contexts can be identified in the planning experiences of the historic centers of Arezzo and Pisa. Both plans are grafted onto a building and infrastructural heritage similar in terms of typological-functional characteristics. The focus is The implementation of specific interventions that have made the pedestrian connectors (paths and crossings) accessible between the historic center area and the neighboring areas. In Arezzo, the main urban axes have undergone an increase in areas and cycle-pedestrian paths, solving at the same time most of the accessibility problems of the related commercial functions, while the municipal services have been transferred from a series of decentralized offices (substantially inaccessible) to a new multipurpose center obtained from the

of inclusive planning and Design for all (C. Conti, I. Garofolo; 2011/2012).

6 - that is, that set of measures adequate to guarantee access to the physical environment, transport, information, communication and, in general , to all equipment and services open or provided to the public

7 See Global Project Studio – Inclusive architecture https://www.architetturainclusiva.it/

recovery of the former barracks in a lot in the historic center. In Pisa, similarly, Piazza Dei Miracoli has been the subject of specific interventions, both in the external paths and in the monumental buildings.

In both cases, the priority of intervention was given to areas with functions open to the public (school, municipal, tourist buildings, etc.) and structures with socio-recreational functions[8].

As a result of these considerations, from an applicative point of view, there are two research experiences conducted by the dalt Lab that are functional to the definition and validation of the methodology adopted. Both experiences have been conducted on the real case study of the city of Udine[9]. The first one is Cantiere Città[10], a preparatory study to the development of participation activities and definition of the method with the stakeholders. The second one is Abitare Udine[11], an experiment conducted jointly with the Municipality of Udine, and CRIBA FVG[12] for the definition of the Peba - *Plan for the Elimination of Architectural Barriers*[13]- for the city of Udine, within the guidelines of the FVG Region[14] implementing the regional law 10/2018 "Principi generali e disposizioni attuative in materia di accessibilità".

The fundamental methodological aspect for the research presented is exemplified by the differentiation between "path" and "itinerary". The first is defined by the urban elements that decree its historical and volumetric development (void between the buildings). The second, leads back to a higher level, through the recognition of human interactions with the built environment. The itinerary is identified with the "actions" of the user in the space, as to reach, communicate, and meet, and it is, therefore, the set of possible interactions (needs, requirements, desires) that the user can activate inside of a self-determined space, not a priori, that is chosen in a subjective and personal way. This reflection aims to scientifically synthesize the user's possibilities (according to the technological design with a systemic approach of needs/performances) to use the space, interpolating the historical-cultural aspects of the routes and the subjective-demanding ones of the itineraries.

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8 Marzi, L. (2021). Esperienze nell'ambito della pianificazione dell'accessibilità in ambito urbano. I casi dei centri storici delle città di Arezzo e Pisa, inL'accessibilità nel patrimonio architettonico. Approcci ed esperienze tra tecnologia e restauro, atti del convegno a cura di Germanà, M. L., Prescia, R. Anteferma Edizioni. pp. 194-201

9 Udine is a medium-sized city in Friuli-Venezia Giulia, which today has about 99,736 inhabitants (data source: ISTAT, 2021).

10 The research Cantiere Città (University of Udine, Polytechnic Department of Engineering and Architecture, 2019-2020) analyses a part of the urban fabric of the city of Udine by involving users with multi-sensory subjective needs (A.A. 2019/2020; scientific supervisor: prof. Giovanni Tubaro with research fellow Dr. Mickeal Milocco Borlini).

11 The research project Abitare Udine involved the collaboration of the group of the Lab. dalt of the University of Udine (Laboratory of the Polytechnic Department of Engineering and Architecture, members of the research group: Christina Conti -scientific supervisor-, Silvia Cioci, Elena Frattolin, Mickeal Milocco Borlini, Ambra Pecile, Linda Roveredo, Teresa Sambrotta), of the Municipality of Udine with the coordination of arch. Eddi Dalla Betta and Raffaele Shaurli and of CRIBA (Regional Information Center on Architectural Barriers and Accessibility, technical service of the Regional Council of Associations of Disabled People and their Families CRAD, regional reference center by LR 10/2018). The project is part of the program regulated with agreement implementing the Collaboration Protocol between the University of Udine and Municipality of Udine, 2019.

12 The Regional Information Center on Architectural Barriers and Accessibility -CRIBA FVG- technical service of the Regional Council of the Association of Disabled Persons and their Families of the Friuli Venezia Giulia region -CRAD FVG and single regional reference center pursuant to law 10 of 2018, " General principles and implementing provisions on accessibility ".

13 The Peba - Plan for the Elimination of Architectural Barriers -introduced in Italy with the Financial Law n.41/1986, is a mandatory planning and monitoring tool that public bodies can use for the management of interventions aimed at the removal of architectural barriers and, consequently, the achievement of greater usability of urban routes, buildings and public spaces for all citizens (Fantini et al; 2019).

14 continuing collaboration with TRIAL_TRIeste (DIA, Univeristy of Triest) Accessibility Lab: Ilaria Garofolo, Elena Marchigiani, Barbara Chiarelli, Andrea Peraz.

Urban space, especially in Mediterranean culture, represents a real "extension" of the private domestic space and actively contributes to the definition of the quality of life of the people who inhabit and live it (Dorato, 2020).

Specifically, the study Cantiere Città, conducted between 2019 and 2020, focused on the choice of calibrating the Human-Centered strategies, normally applied to the Web and product design, at the urban scale, thus defining the possible interactions, needs, and performances between the person and the set of artifacts (objects) that define our cities. Through the analysis and study of the relevant scientific literature, the urban experiment combines direct participation with stakeholders, and urban mapping, towards the validation of the arguments, theoretically developed.

Briefly, during the participatory tests, users were asked to report the critical issues encountered (for example, vertical elements positioned on the path, excessive ramp slopes, etc.) assigning each of them a value on a scale from 1 to 5 (where 1 corresponds to high accessibility and 5 to total inaccessibility). All critical issues highlighted by users were then reported on ad hoc questionnaires and subsequently transferred to computer format (database).

The outcome is defined by an archive of forms that collect the criticalities encountered by each user, then interpolated by groups and returned as a set of graphic data that determine - depending on the color - the more or less accessible areas according to the experience of the users involved (fig. 1). Two maps were produced: the first shows the elements of the selected urban routes such as the built lots divided by type (commercial, public, residential/private), locating the pedestrian crossings (distinct for crossings with or without tactile-plantar elements, pedestrian crossings, ramps, and gradients) and parking spaces for disabled people; the second, on the other hand, highlights all the critical points acquired from the subjective experiences of users. Specifically, in this phase, two synthetic schemas have been provided for each set of users; one represents the sum of the criticalities and the other defines the most accessible continuous paths.

On the other hand, in Abitare Udine, thanks to the subjective experiences (personal requirements) with stakeholders, highlighted by Cantiere Città, the research focused on the analysis of the services, the topographical and historical stratigraphies of the urban agglomeration, to define their importance. This experiment aimed at satisfying - as much as possible - the agile reachability of primary services.

The methodological intervention process has decided to focus its attention on urban itineraries, identifying the priority ones based on the presence of "services to the citizen" and for their historical and cultural value.[15]

15 The development of the urban agglomeration is distinguished in two types of fabric: the central one, which develops close to the slopes of the Castle, with a dense character; and the one constituted by a discrete number of residential, productive and militar apparatuses (now decomissioned) that are disposed in a non-homogeneous way outside the traces of the old walls, on streets and paths that branch off from the inhabited center. These appendices, which historically have been identified as villages, with a commercial vocation, widen their areas of relevance through secondary streets (alleys) with the intention of recreating a more homogeneous network of communication routes for residential use. The creation of rail and road networks, in the nineteenth century, led to the redefinition of the "new" productive, manufacturing and industrial areas (textiles, transport, communications, clothing, mechanics and metals), in more external and peripheral areas, bringing Udine to become an important regional economic center. In the peri-urban and urban areas prevails a high presence of commercial activities (local micro-economies), banking and administrative activities, with an exponential development - in the last decades - of activities related to culture, primary and secondary education and university.

ACCESSIBLE PUBLIC SPACE

Proper planning and management of public spaces contribute to the quality standards of public life and, in this direction, the PEBA is a tool capable of shifting the focus from the quality of the space to the quality of the entire process that presides over it (design and management). Thus, the new proxemics dictated by the pandemic condition requires more and more attention to the spaces of the body. Urban spaces are no longer to be understood as places to be crossed, but rather as spaces to be re-inhabited (Dorato; 2020). For this to be possible, specific technical-scientific skills are required that know how to read and combine the needs of those who live in the city every day. Good planning is capable of systematizing processes and experiential knowledge that are the result of theoretical and applied research and analysis.

Within the complex structure of the "city system", the experimentations focused on the systemic analysis of public space as a fundamental component of the urban fabric. This can be defined as a place of public property or public use accessible and usable to all. Public spaces are key elements of social and individual well-being as places of the collective life of communities.[16] They are places of experimentation within which architectural intervention becomes the medium to favor a positive evolution of the physical and social state of the urban environment.

It is within the public space that interpersonal ties, social relations, collective rituals, and innovative ways of participating in community life are manifested. Therefore, the public space is an arena of flows and relationships that combine to define the city, and only through its controlled design is it possible to trigger and promote inclusion and social cohesion processes (Cervesato, Pecile, Roveredo; 2019).

Within the abundant network of public spaces, which cannot be defined as homogeneous[17], the experimentations focused on the connecting elements of the essential services that the city offers to citizens, guaranteeing an autonomous and independent life for as many users as possible. The path (or itinerary), is the first gesture with which man describes the organization of the territory on the ground[18]. In addition, the space dedicated to pedestrians is not to be understood only as an infrastructural node, but also as a relational space, which has played and still plays a fundamental role in defining people's quality of life.

Today, designing and planning urban mobility requires an integrated mixitè of criteria concerning safety, well-being, health, accessibility, and inclusion for all those who use public space (Savarese; 2017). It is clear that planning plays a fundamental role in the life of the community, and that all the operations of urban transformation can only start from the identity of the places, expressed by the "space of relationship" generated by the people who live in it[19]. Hence the importance of activating moments of participatory mapping; these opportunities do not replace the technical surveys but are completed by them, allowing the administration to raise awareness of the elements that hinder the full usability of the urban fabric, broadening the "urban needs" point of view, and consequently ensuring greater planning results.

16 See Public Space Charter (2013), INU, Biennial of Public Space.

17 Public space cannot be defined homogeneous. It includes open spaces such as streets, sidewalks, squares, gardens, parks, and covered spaces (such as, for example, libraries and museums). Source: Public Space Charter (2013), INU, Biennial of Public Space.

18 Brugellis P., Pezzulli F. (2006). Spazi comuni. Reiventare la città. Bevivino editore

19 Savarese N. (2017). Il ruolo dello spazio pubblico nel futuro delle città. AR Magazine 120, online edition.

Figure 2: Project section taken from the experimentation "The Inclusive City. Borgo Grazzano, Udine". Research fellow: The porous city. Urban redevelopment and regeneration in the existing city. Borgo Grazzano in Udine – Cantiere Friuli, 2018-2020. Principal Investigator: prof. Giovanni La Varra | Researcher: Linda Roveredo.

FOCUS: EXPERIENCES OF ANALYSIS AND APPLIED RESEARCH

The healthiness and well-being generated by a space are expressed through the satisfaction of the needs and requirements of the user. For these reasons every project that places human beings and their health at the center of its objectives must necessarily start from the definition of the required framework, considering the active participation of users, bodies, and associations. Consequently, defining the performance aspects and technological requirements allows translating user needs into specific architectural and technological indications (addresses).

Following the seven principles of Universal Design and declining Human-Centered Design (HCD) and User Experience theories,[20] experiential profiles (actions in space) are outlined, to be validated with simulation tests thanks to the active participation of a broad spectrum of users.

The small-scale application experiences of Cantiere Città and large-scale of Abitare Udine were accompanied by moments of theoretical study of National Good Practices. In detail, some PEBAs[21] were considered from a wide range of case studies and were selected by their process and method aspects. In this phase, the organized knowledge of national PEBAs and the specialized technical skills of their development strategies, have allowed the extrapolation of relevant elements useful to the improvement of the methodology for the PEBA of the Municipality of Udine. The key points of each plan and their contextualization within (if present) the broader regional and/or international guidelines (UN standard 2006) was fundamental.

Best Practices

Through a transversal reading of national case studies, it was possible to identify a series of recurring and specific elements which, within the specific territorial application contexts, were extrapolated and readapted within the methodology developed for the specific case of the city of Udine.

20 For further information on this subject, please refer to the specific bibliography.

21 PEBA of Schio, PEBA of Vincenza, PEBA of Valeggio sul Mincio, PEBA città di Paese.

It emerged that in the initial phase of the PEBAs analyzed there was the need to precede all planning choices with a territorial analysis that necessarily takes into account the historical and cultural vocation of the context and that defines a specific direction of planning and design choices. It is useful to systematize the urban and building environment of the city by bringing out a detailed analysis of the "connections", focusing one's choices on urban routes and public transport. In other cases, there was the desire to make touristic, cultural, and environmental interests as accessible as possible.

This initial phase must be followed by a careful urban analysis at different scales, that is functional to the definition of specific areas of interest. Thanks to the presence of exclusive polarities, it contributes to defining urban areas of intervention. These are divided into excerpts, to give order and implement the interventions, while being inserted within a network of actions that underline specific decision-making criteria.

The analysis of the urban areas is then followed by a detailed technical survey, (referring to the local legislation in force) that can provide an objective assessment of the critical issues that hinder the full usability of the selected urban areas. Each of these is associated with a "weight" (score), based on the specific strategies adopted upstream by each administration. Through questionnaires (citizen's forms) and population awareness activities, it is possible to define a strategy for the relief of critical issues. This provides a balance between the elements of the process that interact with financial resources, and with the intervention priorities on a time basis. An emblematic aspect of the plans is the condition of "minimum accessibility" attributed to the buildings and public spaces, which influences the temporal development and the priority of the interventions. In some cases the criticality survey has given priority to schools and municipal buildings, integrating their neighboring areas and reconnecting them to the urban cycle-pedestrian network. This operation makes it possible to create a multi-level system that takes into account any type of "slow" mobility, guaranteeing the use of particular city attractions and highlighting the tourist and commercial vocation of the cities.

From a technical and methodological point of view, the plans envisaged the development of criticality forms interpolated through specific scores to obtain numerical sums that can determine the areas of greatest interest and define temporal planning of the interventions. The participatory activities with the stakeholders have the ultimate aim of placing the user and his needs at the center of planning choices.

Another strong point is the use of georeferencing software (GIS) of various kinds. This choice is functional and strategic to the creation of an interactive and continuously updated database. Thanks to the algorithms that define it, the data entered is allowed to be interpolated based on specific needs defined by the designer and the competent administration.

The intersection of existing software - dynamic and updatable - allows querying the IT system through various discrimen (economic ones, for example) to highlight the intervention priorities while relating the needs and the financial resources of the administration itself.

This methodology is optimal to define planning choices to intervene with accessibility practices in a synergistic and improving manner, considering the entire urban context as a whole.

Abitare Udine, the PEBA to live the city

The research Abitare Udine has taken the entire urban area of the city of Udine as an arena of investigation, intending to prepare a PEBA that is configured as a moment of applied experimentation resulting from cooperation between public institutions and Universities, within a synergistic and virtuous dialogue between administrations and their territory.

In line with the provisions of the Law FVG March 19, 2018 n.10[22] and following the "Guidelines for the preparation of the Plan for the Elimination of Architectural Barriers of Friuli Venezia Giulia"[23], the UN Convention of 2006, the survey recognized in the access routes to services the key to identification of intervention priorities. The greater accessibility of personal services determines greater accessibility "between" the points of the urban system, increasing well-being and consequently improving urban health.[24]

Itineraries have been selected in the routes that cross longitudinally (one ridge) and transversely (several ribs) the urban fabric of the Friulian city (fig. 3).

The result is a geo-referenced and cataloged mapping of the criticalities of urban routes (identified also thanks to a participatory process with stakeholders) and guidelines to be made available to the municipal administration.

These operations are functional to the achievement of a higher quality of the public space and the implementation decision-making processes. The strong participation of government bodies and stakeholder associations has generated a virtuous circuit of validation of applied research, essential for designing guidelines for appointed professionals. The choice to produce georeferenced maps on computer systems wants to marry the qualitative focus from the result in itself (punctual work) to the entire process that presides over it. This evaluates the opportunity to systematize the services and programs offered by the Municipality with the ultimate goal of giving meaning and cohesion to the project of removal of architectural barriers punctually distributed throughout the municipal area.

An urban route to be defined as an itinerary must adopt a systemic methodology that considers each urban element with a vision of unity-totality, not attributable to the mere sum of its constituent parts.

CONCLUSIONS

The results achieved aim at their repeatability and application to other urban realities and therefore for the progressive improvement of the person / built environment interactions, generating flows, itineraries, and increasingly inclusive paths and within everyone's reach.[25]

The research experiences discussed above clarify that a higher quality of life for users who live in the city cannot be separated from correct management, planning, and design of urban spaces, especially considering that by 2050 almost 70% of the world population will reside in urban areas.

22 L.R. 10/2018, Principi generali e disposizioni attuative in materia di accessibilità.

23 Linee Guida PEBA FVG, Regione Friuli-Venezia Giulia, june 2020.

24 UNI EN 17161:2019, "Progettazione per tutti - Requisiti di accessibilità per prodotti, beni e servizi progettati secondo l'approccio "Design for all" - Ampliamento della gamma di utenti"

25 United Nations (2018). World Urbanization Prospects.

Therefore, the city becomes the central place of prevention: guaranteeing comfort, safety, accessibility, and usability of spaces. The city requires the redefinition of planning processes, methods, and project criteria, in close collaboration with the administrations, the associations, and all the community.

The common goal must be the design of healthy cities that continually create and improve physical and social environments and expand community resources, meeting the requirements of accessibility, usability, safety, well-being, and comfort, with particular reference to disadvantaged users, unable to access public and private services for economic and cultural reasons (Maspoli; 2018).

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Public Spaces in the Peripheral Danubian Cities. Pandemic Mode

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ABSTRACT

The "emergency epidemiological situation" has fundamentally changed the concept of free movement and the sense of security of the urban man. It is increasingly likely that such restrictions will be possible in the future in cases of epidemics. The public spaces of the Danube cities are among the most negatively affected due to the challenges of overcoming peripherality, population aging, depopulation, urban decline, collapse of tourism, transboundary pollution.

In this text I'm looking for answers to questions of an urban and architectural point of view, attracting attention more sharply than ever. These are issues common to the cities, but also with specifics for the declining Danube cities. Are there well-developed and attractive healthy public and green areas, evenly distributed throughout the cities and accessible on foot to the entire urban structure? Is the Danube River fully used as a spatial, aesthetic, cultural and ecological phenomenon in the riparian zones? Are the streets and boulevards comfortable and healthy for people and cars? Are the bike lanes safe? How home and living environment can be easily transformed into an "arena" not only for living, but also for work at home, for education, for contacts with relatives and friends? Alienation or empathy grows between people and how does this affect the urban space? What is the behaviour of the traveling person in the new reality? Is protecting of the European heritage an outstanding opportunity to improve the quality of public spaces?

This paper pointed out 5 principles of urban planning, that continue to meet the public interest and a concept of a healthy city: nobility and humanism; effective system of pedestrian spaces, public transport and bicycle access network; nature in the urban environment; economic aspects of the quality of life; unique sites and urban spaces with their own economy.

Keywords: *Urban, Design, Pandemic, Healthy, Danube.*

INTRODUCTION

As in many other Danube cities, in the history the Danube was a connecting rather

than a dividing river. Borders after World War II greatly enhance the process of separation. Remarkably developed, economically and culturally, connected directly with the Danube cities of the Middle Danube in the second half of the XIX and the first half of the XX century, today towns of Vidin, Lom, Svishtov, Rousse, Silistra ranks last in terms of GDP in the EU. They are among the fastest melting municipalities in the country. The reasons for this are complex - on the one hand, common problems for the whole country - aging population, depopulation of small settlements, low standard of living, lack of sufficient funds in municipalities to maintain public works, social policies, health, high unemployment, monocentric spatial development on the territory of the country with unbalanced development of the capital at the expense of other regions, on the other hand - peripheral border location, poor communication links - unfinished highways and transport corridors to allow fast connections with the capital and other larger settlements places, as well as cross-border connections, lack of significant investments in the economy or failed major infrastructure energy projects, transboundary pollution, insufficiently developed network of higher and special education.

LEGISLATION IN SPATIAL PLANNING DANUBE CITIES

According to the current legislation, general development plans have been finalized for all municipalities in Bulgaria in recent years. Integrated urban development plans 2021-2027 are in process of elaboration. They focus the efforts of cities to solve problems of public services, development of economic zones and areas with pronounced social challenges. But in the analyzes of the National Concept for Spatial Development - NCSD one can see the alarming trends for the melting of cities on the outskirts of the country, including the Danube cities. The demographic forecast for Bulgaria is negative. The assessment today is that the demographic potential of the villages has already been exhausted. Now migration processes are moving from small towns to larger and even larger ones, as a result of which the peripheries are becoming increasingly depopulated. Thus, the Danube cities with a remarkable cultural and natural heritage, with a developed spatial structure and a relatively well-developed cultural and social infrastructure are losing their population. And the forecast analyzes show that this lasting trend will continue (National Statistical Institute, 2020).

Table 1: Expected demographic statistics for Danube cities 2020-2080.

Demographic statistics	Years		
	2020	2050	2080
Region of Vidin	82 065	46 948	28 124
Region of Ruse	215 806	165 521	129 887
Region of Silistra	107 055	74 623	55 540

The National Concept for Spatial Development proposes a variant for the development of the so-called “highly developed polycentrism”, a moderately optimistic variant for spatial development as opposed to the clearly expressed monocentrism.

The perspective for Vidin and Silistra is to develop sustainably as cities of the 3rd, with a tendency to the 2nd hierarchical level, and Ruse to remain at level 2. In their agglomeration areas, which are in a state of contraction and disintegration, the functional connections between settlements and centers to begin to recover and intensify. The NCSD has specific goals and priorities - territorial cohesion through integration into the European space, polycentric territorial development,

preserved natural and cultural heritage; economic and social cohesion.

Transport and communication systems between the Danube Bulgarian and Romanian cities on both sides of the border to increase their capacity. Improving transport connectivity would have a tangible positive economic effect. The construction of three more bridges across the Danube (Svishtov-Zimnich, Silistra-Calarasi and Nikopol-Turnu Magurele), as well as a second bridge Ruse-Giurgiu, part of the main TEN-T network would be a solution to the problem of "narrow sections". Certainly, these connections would give a new breath of air to Svishtov, Nikopol and Belene, which is located between these two cities, and certainly to Silistra.

Against the background of spatial development, design within the urbanized area of Danube cities also has its major challenges. General development plans create the territorial basis for long-term sustainable urban development. There are unavoidable conditions – without harming the environment, further technical equipment of the living environment while preserving the uniqueness of the territories and full inclusion of natural and cultural heritage.

Specific guidelines for design of the Danube cities include: (a) Improving the quality of the environment through the reconstruction of public areas and communication spaces; (b) Increasing green areas; (c) Opening of the central urban areas to the Danube River; (d) Reconstruction of abandoned and unusable coastal industrial areas and their conversion into attractive mixed-use areas; (e) Completion and renewal of the technical infrastructure in the Danube region. Others important focuses are the areas for business development, education and social services, as well as the areas with mixed functions – living, work, service, sports, especially attractive with short communication links and key factors for retaining and attracting young people.

Overcoming the negative consequences of the failed major economic projects, such as the Belene example, remains an open challenge and will seek positive solutions in the near future.

However, the financial security for the implementation of the policies of the plans that are developed is uncertain, often minimal. Planning relies on optimal or optimistic scenarios, which are largely not implemented or are implemented very slowly. In addition to the mentioned project for a second nuclear power plant in the town of Belene, such infrastructure projects as "Modernization of the railway line Vidin - Sofia" and "Road E-79 Vidin - Montana" are delayed. (DARIK news, 2020), Hemus motorway, officially started in 1974, part of the European road network from the connection with Corridor IV to the west to Corridor IX near Veliko Tarnovo (NCSIP, 2020).

DEVELOPMENT OF THE INTERNAL POTENTIAL OF THE DANUBE CITIES

Against the background of the demographic picture illustrated above, the sustainable development of cities can be realized on the basis of the internal development of cities, their potential and the energy of the citizens. There are numerous examples of active actions of citizens who have the opportunity and join the process of creative planning. This localized community approach to urban renewal, established by Finnish architect Marco Casagrande (the father of urban acupuncture) (Puttkamer, 2021), allows for a lot of creativity and freedom of ideas. "In urban acupuncture, citizens have the opportunity and are encouraged to join the process of creative planning and through their participation to develop

their environment according to their preferences. Therefore, this concept is closely linked to the law of the city.”.

The COVID 19 pandemic has radically changed the sense of free movement and the sense of security of the urban man. The public spaces of the Danube cities are among the most negatively affected due to the challenges of overcoming peripherality, population aging, depopulation, urban decline, collapse of tourism, transboundary pollution. Public spaces were deserted, and citizen participation in urban planning became impossible.

We have the opportunity to observe very directly the course of the pandemic and its impact on the behavior of citizens and urban areas. After the second wave, there is a marked interest of people thirsty for social contacts in public spaces and a return to public outdoor events that give new life to urban spaces.

Thus, we return more and more argumentatively to the questions posed from an urban and architectural point of view, which attract attention more sharply than ever. These are issues common to cities, but also specific to the declining cities of the Danube.

ARE THERE WELL-DEVELOPED AND ATTRACTIVE HEALTHY PUBLIC SPACES AND GREEN AREAS?

Analyzing the current pandemic situation, some questions are relevant: Are there well-developed and attractive healthy public spaces and green areas, evenly distributed in cities and accessible on foot for the entire urban structure? Can these attractive healthy public spaces and green areas be a kind of stage of urban communication – between people, between people and arts – music, theater, plastic and fine arts, street arts, literature, etc.? Search for answers to these questions shows that there is still a great potential for the development and expansion of public spaces, as well as for improving their relations with citizens.

Figure 1: Vidin, view of the pedestrian zone (Source: MAIN RECONSTRUCTION OF THE CENTRAL PEDESTRIAN ZONE, VIDIN. 2020, buildingoftheyear.bg, 2021).

In the context of the pandemic, many of the arts have sought a way to go out into the open public spaces to meet their audiences in compliance with anti-

epidemic measures. Many retail spaces, restaurants and cafes have also looked for ways to go outdoors, which helps businesses in these industries to tolerate the restrictions of gathering people indoors more sparingly.

Precisely because of this, and because of policies to reduce carbon emissions, open and green spaces are becoming an even more important part of urban spaces and the urban economy. In Vidin the pedestrian zone was mainly reconstructed (2020), in Silistra, the central part of the city was renovated (2013) under the Project "Green and accessible urban environment - Silistra", implemented with the financial support of the Operational Program "Regional Development" 2007-2013, while in Kozloduy it is necessary to urgently replace the pavements and urban furniture.

Figure 2: Kozloduy (2018).
(Source: Kozloduy residents: "We have umbrellas, we do not have a pedestrian zone" kozloduy-bg, 2018).

Figure 3: Lom, Central part of town.
(Source: Problems in Photos.Website: SignaliLOM, 2017).

Figure 4: Silistra, central part of the city (Source: Project "Green and accessible urban environment - the city of Silistra", which is implemented with the financial support of the Operational Program Regional Development 2007-2013, co-financed by the European Union through the European Regional Development Fund.) (http://stroitelstvoimoti.com, 2019).

IS THE DANUBE RIVER USED ENTIRELY AS A SPATIAL, AESTHETIC, CULTURAL AND ECOLOGICAL PHENOMENON IN RIPARIAN ZONES?

This question that we ask ourselves in today's spatial design is very specific and the answer is different in different Danube cities. If we look at the general development plans, we will see that there is a different relationship between the river and the urban structure. Vidin with its coastal park, Kozloduy with the coastal memorial park "Botev" and the ship "Radetski" have unique connections with the river.

Figure 5: General development plan, Vidin. The central part of the city is open to the Danube River (Община Видин, 2021).

This is not the case with the answers in the analysis of the plan of the town of Belene, and also with the town of Svishtov. The central parts of both cities, saturated with public functions, have no direct contact with the river. Despite the location of the reception center of the Persina Nature Park in Belene and the conservation and restoration works that socialized the archaeological remains of the ancient Roman fortress - castle "Dimum", the city still does not use the potential of the river to create its unique urban spaces. citizens and guests and representing potential for the economic development of the city - in all aspects - recreation and leisure, cognitive and cultural tourism, sailing on the river, fishing. There is a great potential for arranging parks and saturation with more

attractions for visitors - entertainment, sports, cultural, educational, commercial and more.

Figure 6: General development plan, Svishtov. Authors: "VIDI ARCH" Ltd. (svishtov.bg, 2021).

Figure 7: Belene, Information Center of Persina Park, photo by P. Petrov (Petrov P. , 2007).

Figure 8: The bank of the Danube river, Belene. Photo by P. Petrov (Petrov P. , 2007).

ARE THE STREETS AND BOULEVARDS COMFORTABLE AND HEALTHY FOR PEOPLE AND CARS? ARE BIKE LANES SAFE?

Regarding the transport infrastructure, it can be said that it is relatively well developed and built. The bicycle network has not been built, which is due to both the insufficient attention to this problem and the lack of expressed interest of the citizens. The aspiration for the removal of heavy goods and transit traffic from the city is expressed in the general development plans. For example, the Lom Master Plan offers a ring road to transport the transit traffic on the national road network from the directions Vidin, Montana, Kozloduy and others (Municipality of Lom / Община Лом, 2018).

HOW CAN THE HOME AND THE LIVING ENVIRONMENT BE EASILY TRANSFORMED INTO AN "ARENA" NOT ONLY FOR LIVING, BUT ALSO FOR WORK AT HOME, FOR EDUCATION, FOR CONTACTS WITH RELATIVES AND FRIENDS?

The tendency to transform the dwelling into a workplace, for education or social contacts is possible in dwellings designed with sufficient area for the development of these functions. According to data from 2018, about 40% of Bulgarians live in overcrowded housing (DW, 2020), at the same time, according to the statistics (NSI, 2011), the total inhabited dwellings for the country are 1 913 496, and the uninhabited ones 653 105 (Манолова, 2017) or, for cities other than Sofia, the share of unoccupied dwellings is over 30%. Such a huge percentage of unused housing stock is typical for the Danube region. With the advent of Industrial Revolution 4.0, fewer and fewer activities are done by hand and more and more by high-tech autonomous robotic machines. The share of people employed in the field of software engineering is increasing and they are interacting with the environment in which we live. This technological revolution creates opportunities for skilled people to choose to live everywhere and to choose their home not by proximity to the workplace, but by the opportunities provided by each settlement. Thus, they have the opportunity to choose and live in homes with a larger area at the same or lower value and use the difference to raise their standard or to visit other settlements for rest or with an interesting historical or cultural life.

Figure 9: Leaving IT specialists from the capital in the first period of COVID-19 (DEV.BG, 2021).

In a study of DEV.BG (DEV.BG, 2021) for decentralization of the IT sector in Bulgaria there is an export of part or whole companies to the larger regional cities. This is a result not only of the constraints imposed by the Crown crisis, but also of the ever-increasing costs, both of renting offices and of renting or buying housing by employees. In fact, this crisis has accelerated the natural process for high-tech entities to enable their employees to work from anywhere in the world, a theory that seemed to be possible only for so-called freelancers. The cities on the Danube are an exceptional opportunity for modern technological nomads to find their choice of place to live.

As for the possibilities to turn the home into a center for training and education, the possibilities are more limited. Technology is not enough to make distance learning more successful than present, at least in some professional areas, as well as in primary and secondary education. There is an indisputable need for more space in the home in order to be able to provide all the current daily functions related to family life, work, daily activities with children and days outside working days and hours. The furniture, the flexible spatial organization, the multifunctional furniture are of key importance for the flexible and rational spatial organization of the home.

ALIENATION OR EMPATHY GROWS BETWEEN PEOPLE AND HOW DOES THIS AFFECT THE URBAN SPACE? WHAT IS THE BEHAVIOR OF THE TRAVELING PERSON IN THE NEW REALITY?

Surely, we can say that empathy between people increased after this great ordeal COVID 19. This is seen in the rapid return to normalcy, and the various forms of communication, and the many forms of creative and artistic performances in urban spaces. The examples are numerous.

CONCLUSIONS

Based on the analysis made, we can say that overcoming the great challenges facing the shrinking Danube cities, especially in the context of the COVID-19 pandemic, can be overcome mainly by unlocking the internal potential of cities, as well as through the skillful use of European policies and relations, namely:

- Turning Danube cities more towards the river and connections with cross-border cities.
- Creation of joint business projects for development of high technologies and industry;
- Development of river civil transport along the river and the transport infrastructure - bridges, ferries;
- Construction of cultural routes along the Danube, in order to develop tourism and in particular cultural tourism;
- Changing the requirements for the urban environment, the culture of living and maintaining property with state preferences.
- Adaptation of industrial areas to the possibilities for long-term temporary residence for tourism (recreational, cognitive, cultural or sports)
- Unlocking the potential of “my new job in 1-3-6 months” for working nomads;
- Continuous development of public places cities. The distance from the

office / workplace and its exclusion as a place for social contacts needs to be compensated. That is why it is necessary to transform public areas into more accessible for social contact or experience.

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Improve Walkability: Design Strategies for the Psycho-Physical and Social Well-Being

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ABSTRACT

In recent years, human healthiness and users' well-being are extremely important for the development of contemporary society and urban quality. Well-being is indirectly influenced by the morphological- typological features of the places we live in, thus negatively or positively affecting the health of the population and the adoption of proper lifestyles. Considering these direct relationships between psycho-physical well-being and urban space, physical activity is identified as a protective factor for many chronic diseases. The project of urban outdoor spaces constitutes an opportunity to design walkable areas and pathways that can produce positive direct effects on environmental health and indirect consequences on the 'lifestyles. This design vision can be implemented particularly inside small towns in which still exist important continuities and long-time relations between the human scale of public spaces and sense of place related to the historical/traditional infrastructural pathways.

This proposal synthesizes the results of BikeFlu interdisciplinary research on two case studies in Ortona/Italy, between the unused infrastructures of historical Sangritana railway and the new green line of the so-called Costa dei Trabocchi on the seacoast. The challenge is focused on the possible synergy between two design approaches for the outdoor space trough a convergence between user-centred vision and universal vision. The synergic use of these visions enables a dual and no-scalar design pathway in which the project of urban outdoor spaces results through a technological/environmental complex framework of interactions.

On one hand, these interactions can be physical, through the research of dimensional and sensorial relationships with which control consistency and appropriateness of the inputs emitted from the artefacts with the physiological structures of individuals. At the same time, the interactions are determined by the intangible relationships and material connections that can be established seeking the multiple degrees of correspondence and sensitivity to the context that the project can incorporate.

Keywords: *Urban Health, Users Centred Vision, Universal Vision, Walkable Cities, Unused Railway Lines.*

INTRODUCTION

The relationship historically established between people and the city, by walking through open spaces, continues to suffer the effects of a fracture generated by two recuring distortions in planning. The first regards the separation between walking and walkable space. The second is related to the consideration of mobility infrastructures strictly dedicated to highspeed movement.

Regarding the first distortion, the activity of walking in the city has been often deprived of its sensorial, preceptive and emotional implications and reduced to an action of moving from point A to point B. In other cases, it was reduced to a placebo for resolving the unsustainability of vehicular movement. The effects of these two recurrent aspects are the undifferentiated pedestrianisations, the densification of tourism activities, the subtractions of public space in favour of private uses (De Cauter, 2004; Sennett, 2018). Regarding the second distortion, deindustrialisation and the intensification of demand for ever-faster mobility networks has radically transformed, or even led to the total abandonment, of many infrastructures (rail and road). These processes produce a loss of walkable space and effects like: divisive interventions of urban space (doublings, expansions, connections); substitutions with spaces dedicated to the alternative mobility; transformation into new infrastructural developments that ignore the needs of moving on foot.

Faced with these criticalities, there is an urgency to use design to recompose walking and walkable infrastructural space, leveraging the strategic technological-environmental concept of walkability. This challenge must explore the multiple experiential potentialities which can be integrated in urban space to generate suitable conditions of environmental, psychic, physical and social well-being. This re-composition between walking, walkability and well-being can be achieved, above all, in small to medium-sized towns, boasting several recurring strengths: continuity among the historical, modern and contemporary city; still-active relations between open spaces and sense of place, the human scale of urban spaces and lasting ties with nature and the territory (EU/DGRP, 2011; EU, 2012; ECOVAST, 2013; Friedman, 2014; Colleoni, Caiello e Daconto, 2017)[1]. As elsewhere, in these minor settlements, deindustrialisation has led to the decommissioning of important transportation infrastructures which can become important occasions of intervention for actively/inclusively reorienting walking (in all its various definitions). Two design experiences conducted in the small town of Ortona/Italy[2] offered a chance for defining methodological and intervention criteria for rethinking some decommissioned railway lines through a synergic technological-environmental strategy involving (Angelucci & Cellucci, 2019):

- a user-centred vision, concentrated on local relations between users, technological systems and the built fabric and raising the level of physical, mental and social well-being;
- a universal vision, concerning global environmental connections between urban comfort, contextual forces, socio-technical systems and green infrastructures.

1 The research referred to the concept of European small/medium sized town, defined as intermediate density or small urban area in which the population (between 5.000 and 100.000 inhabitants) lives for less than 50% in high-density clusters and less than 50% in rural areas.

2 The experimentations were coordinated with the interdisciplinary works of research “BiKeFlu”, developed at the G. d’Annunzio University of Chieti-Pescara, Department of Architecture.

Considering a demographic scenario tendentially characterised by a prevalently elderly population, physically inactive and occupied in sedentary activities (WHO, 2019), walkability assumes the importance of a technological-environmental integrated requirement.

A project requirement that is strategic but simultaneously visionary and operative and fundamental to the design of small and medium-sized towns. Through free and full mobility, conditions of walkability assume a significant role in favouring the psychic-physical well-being of users in general and, particularly, of people affected by diverse forms of fragility and for whom physical activity is a determinant factor in life expectancy.

All the same, there is a necessity to improve studies on the walkability in small/medium-sized towns. Primarily, because processes for evaluating walkability in terms of the integrated quality of public space remain inadequate, while relative information continues to be fragmentary and/or incomplete. Similarly, because administrative procedures that tend to separate technological-constructive from environmental-relational dimensions do not contribute to favouring the satisfaction of the demand for walkability.

These two reasons can be particularly significant in small/medium-sized towns, which reiterate the opposition between trends that tend toward the rigorous restoration of the historicized image of public space and drifts centred on their aseptic modernisation (in favour of vehicular mobility) (Angelucci & Elfraites, 2020).

RETHINKING WALKABILITY BETWEEN A USER-CENTRED AND UNIVERSAL VISION

The synergic approach that combines a user-centred vision and a universal vision adopted by the research BikeFlu was tested to explore the theme of walkability in a small town considering two aspects: the relationship between walkability and the insertion of new networks for alternative mobility; connections between walkability and the recovery of abandoned railway infrastructures.

Even small towns have been affected by the so-called slow burn disorders (Pike et al., 2010) and effects such as: long-term processes of deindustrialisation, marginalisation and intensive exploitation of resources, abandonment of infrastructures and consumption of agricultural lands. Small cities are today in the middle of a transition from industrial models of settlement (Saraceno, 2003) to policies of welfare intent on guaranteeing work/services for the community rooted to the territory and greater competitivity for touristic villages (Pileri, 2015). These socioeconomic challenges are well suited to the metric relations between the urban dimension and the human scale. This new condition favours better relations of proximity between socio-environmental components, making small towns more suitable to rethinking spaces of walkability to establish material and immaterial connections among people, open space and the environment. Two interpretative keys were adopted to reinterpret walkability with respect to recent evolutions in settlement:

- overcoming the hyper-specialised excesses of a user-centred vision and the congestion of walkable open space with specific tools for increasingly more sectoral targets;
- reducing the generalist temptations of the universal vision and overlapping of decontextualised practices and solutions responding to minimum standard requirements.

The user-centred vision, in fact, concentrates on the role of the user/pedestrian as a generator of urbanity, confronting the difference between space objectivised by geography and the subjective space of the landscape (Straus, 2005). Walking is differentiated from other forms of travel (e.g. with mechanical means) by the bodily awareness of spatial translation based on the objective rules of geography; we move from place to place, through slow and personal perception. According to this vision, the propensity of a public space to favour walkability depends not only on usability and the dimensional relationship (accessible, inclusive space) but also on the capability of space to be an experiential reality (psycho-physical-metabolic relationship) and, finally, prosthetic space capable of stimulating activities determinant to human health. The comprehension of the human scale, intended as the compatibility among spaces and people's physical-sensorial-cognitive characteristics, thus becomes central to investigating the quality of walkable space through considerations on conditions of use by users.

Therefore, the experimental project conducted in Ortona did not stop at the design of specific solutions. Instead, the work defined different conditions of use that favour walkability, leveraging the relationship between people and space. They involved[3]:

- metric-dimensional conditions, centred on the accessibility and inclusivity of space;
- psycho-cognitive conditions, focused on the sensorial well-being of users;
- social conditions, centred on participatory processes and collective activities.

The universal approach to the design of urban space inherits modern and post-modern cultural elements. The holistic vision, of modernist inspiration, is aimed at overcoming physical, psychological/cultural barriers and affirming the right to public space, to well-being in the city, to the availability of resources, to social inclusion (Vescovo, 2006). This environmental/contextual vision, with its post-modern inheritance, recognises the objectivity of local values as generators of morphologies and amplified conditions of accessibility to the city as a common good. At the same time, it favours the autonomy and independence of people, with their diversities and specificities (Preiser, 2007; Lauria, 2017). The universal vision conceives the space of the city not as a container, but as a vector of well-being that leverages the presence of beneficial natural resources, but also people's capacity to transform and vitalise space. Space is thus interpreted as an interface between universal/environmental values and local capacities to ensure autonomy of movement and seek ties among territories, cities, natural resources and people.

Transferred into the reality of small town, this approach comported an attention toward aspects that influence walkability, also through:

- the historic-touristic attraction, in terms of alternative extra-urban territorial mobility;
- the quality of life in outdoor spaces, as the co-presence of/coexistence among different users;
- the re-composition of ties between inhabitants and visitors through the sharing of spaces.

3 We referred to the World Health Organization definition of technological systems, expressed in the ICF classification and included into the so-called environmental factors. Each technological system (also spaces, cities, and technical devices) is significant for the empowerment, improvement, supporting and enabling human activities, psycho-cognitive well-being and social participation.

This synergic process founded on the user/universal vision, tested in two case studies in Ortona, assumed a dual methodological character in relation to people, spaces and infrastructures concerning the theme of walkability.

From a technological point of view, we must consider aspects regarding metrics and quantitative descriptors of the material connections between people and walkable spaces. This first methodological character allows us to concentrate on the actions and activities of walking, considering two aspects: people and their diversities (physical structures/functions, individual factors); spaces of movement as generators of well-being (technical and contextual factors).

Walkability is therefore a function of the capacity of space to have psychic-physical and social impacts on walking, to function as an interface that increases inclusive processes, limits restrictions on use, and supports activities of rehabilitation (WHO, 2006).

From an environmental point of view, we can look at qualitative variables and descriptors about the immaterial relations among inhabitants, users and walkable spaces. This second character opens toward a combined interpretation of walking with other methods of movement, inside/toward the city. We can look at people's behaviour and practices (participation, social aspects) and spaces as condensers of vitality and healthiness (environmental factors).

Walkability becomes the capacity of space to induce conditions that favour moving on foot through the city, as an interface for enabling processes of sharing common goods, improving people's psychic-physical-relational abilities, reducing the functional impoverishment of urban resources (WHO-EU, 2017). The result is that the concept of walkability cannot be considered either strictly a technical or technological requirement, nor as a requirement regarding environmental aspects (fig. 1).

Figure 1: User/Universal Vision based synergic approach and its relations with the World Earth Organization vision. Walkability assumes the role of technological-environmental integrated requirement. Source: F. Angelucci, C. Cellucci.

Instead, it is necessary to re-orient a project for the walkability of urban space, extending it to define a framework of responses that embraces the broader question of the relationship among people and their state of well-being, the techniques of modifying space and the forces interacting between people and spaces. In the case studies considered, as in other small/medium-sized settlements, we can recognise interventions, even recent, that present a limited approach to walkability. In this direction, a synergic approach to design based on the user/universal vision investigated the concept of walkability from a technological-environmental standpoint, in all its experiential shades that permit people and communities to move through the spaces of the city, using various means, and not simply to move from one point to another.

TECHNOLOGICAL-ENVIRONMENTAL DEFINITIONS OF WALKABILITY

A synergic design approach to walkability was tested in two scenarios for the small town of Ortona as part of the research project BikeFlu. The opportunity to reimagine two abandoned railway lines to redefine pedestrian mobility inside the town, with various using levels, was applied for two different sites. The first is the result of characteristic situations generated by the rolling development of historic hillside settlements toward the seacoast, along the national Adriatic railway line between Ortona and Vasto (fig. 2a). After the closure of this railway section, the site was transformed into the so-called "Costa dei Trabocchi" Park. The second is near the historic city and related to the more recent expansion areas along the local Sangritana Railway line (fig. 2b and fig. 3).

Figure 2: Coastal level case study. Source: F. Angelucci, C. Cellucci.

Figure 3: Sangritana ex railway tracks case studies. Source: F. Angelucci, C. Cellucci.

The principal goals pursued by the study can be identified in the concept of integrated walkability as a generator of development, growth and transformation, focused on improving conditions of well-being for people and their ability to move in alternative and healthy ways.

In the first working phase, the design process included two different activities: investigations on local conditions and collective memories, built and infrastructural heritage along railway networks; analysis of contextual key-factors able to influence the attractiveness and liveability of the selected sites. The second phase is based on listening activities. A participatory process, in the form of questionnaires and interviews, helped reconstruct a framework about users' needs, projects in itinere, still being developing initiatives, criticalities and problems of policies for the reuse and reconversion of abandoned railway.

Walkability emerged as a recurring concept for orienting and integrating interventions, drawing attention to the requalification of historical-environmental heritage through the rediscovery of paths and areas of inclusion and socialisation. All the former railway lines considered have the potential to form a network of walkability that restores a "sense of scale, narrative and discovery" (Pavia, 2015), to the city, which returns to being generators of social interaction, identity and well-being. The urban tissue is thus connected and innervated by leveraging an integrated infrastructural-environmental network supporting walkability and including:

- public space with its different levels of pedestrianisation;
- technological devices for monitoring/interacting with the environment;
- bio-psycho-sensory, ergonomic and social modulators used to perceive the context (Cellucci, 2018).

Figure 4: Hypothesis for coastal level on the unused Adriatic railway line, along the new "Costa dei Trabocchi" Park. Two project alternatives for integrated walkability. Source: P. Barnabei – The city as an "open-air gym" for health. A path for psycho-physical well-being along the "Costa dei Trabocchi" (Supervisors M. Di Sivo, C. Cellucci).

The proposed network of walkability assumes a trans-scalar organization that ranges from public spaces in neighbourhoods to large bicycle/pedestrian connections crossing the territory. Specifically, the two case study sites were configured in accordance with two levels of technological-environmental interaction, in which it is possible to re-establish diverse degrees of relationships among users, technology, society and nature. The first section becomes an infrastructure supporting physical activity, directly connected with the coastal environment. The second becomes a network supporting the social vitalities and dynamics that emerged from among built and historical/architectural heritage. Both systems promote the centrality of the experience of moving on foot through contact with natural elements and local landscapes (countryside, urban parks, forest, beach, sea).

The idea of integrated walkability thus becomes strategic not only for reconnecting minor urban situations with territorial networks, but also for supporting policies to restore and improve ecological-landscape networks. The walkability system hypothesised at the coastal level intends to guarantee new walkable spaces (and not only cyclable) immersed in direct contact with the ecological-environmental resources of the coast (the sea, beaches, protected natural sites of the "Costa dei Trabocchi") (fig. 4).

Figure 5: Hypothesis for hillside level on the unused Sangritana railway line. Two cross-sections in which integrated walkability requirements suggest "hot to do" the project toward a multi-sensorial use of walkable space. Source: S. D'Alessandro – Green infrastructure for physical activity and health. Strategies, requirements and solutions for the unused Sangritana railway line in the centre of Ortona (Supervisors F. Angelucci, C. Cellucci).

These resources form a capital to be preserved, a globally recognised heritage of fundamental value to the vitality of local economies. The concept of walkability is

interpreted as a vector for triggering conditions that promote physical movement by people, to offer varied, flexible and well-connected walkable spaces, open to use/participation by all users. Visions for intervention include the expansion of the bicycle-pedestrian path and the configuration of a sequence of spaces for different uses: passive (rest), active (pedestrian activities, cycling, fitness, rehabilitation, etc.) and participated (spaces managed by citizens) (Edwards & Tsouros, 2008).

The system for hillside walkability laps at the margins of the historical city and rural landscape. The copresence of historical (medieval and twentieth century expansion areas) and collective (working-class quarters) spaces, alongside the abandoned railway, becomes an opportunity for rethinking walkability in terms of the reconnection of relations among diverse environmental, historical and economic-social components of the city (Hatzelhofer, 2012). (fig. 5).

Integrated with the ecological-environmental qualities of the local context, walkability supports the multi-sensorial use (visual, olfactory, tactile, acoustic) of the various landscapes crossed in different times and different using methods. The visions of intervention look at the recovery, promotion and reconsideration of various typologies of open space, configuring an infrastructural architecture in which the well-being of people is positively conditioned by the synchronic use of built heritage, territorial ecological networks and alternative lines of green mobility (Edwards & Tsouros, 2008).

A DIFFERENT APPROACH TO DESIGN IN FAVOUR OF WALKABILITY

The evidence that emerged from the case studies in Ortona can be tied back to an idea of urban, but also territorial quality, founded on the walkability of space and not solely on its pedestrianisation. Walkability becomes a strategic element for promoting the liveability of the city and the landscape offering conditions of both spatial and temporal well-being. This supports the maintenance and restoration of enjoyable urban/landscape environmental units in which walking makes it possible: to live, work and play; to favour social interaction; to foster various forms of sustainable mobility; to move through open spaces in which to practise physical activities. Elements of originality in design policies and approaches in the field of mobility innovation and the reuse of abandoned railways, involve three levels of the creative-propositive process.

At the level of strategic scenarios (fig. 6):

- an annulment of scenarios centred on mono-functional proposals for the recovery and reuse of decommissioned railway lines. This avoids interventions that tend to dismantle rail tracks and substitute them with specialised pedestrian, bicycle, tram-trails in favour of integrated systems for walkability;
- an expansion of the design process to consider more than just the corridor of rail lines and rethink them as a thematic ribbon for new mobility. On the contrary, his brings into play amplified technological-environmental sections of open space that consider multiple interactions between internal and external, material and immaterial contextual variables.

At the level of design forecasts (fig. 7):

abandoned railway infrastructures are reimagined as a technological-environmental interface between different forms of walking (strolling, running, jumping, etc.) and multiple interactions with the landscapes crossed. Walking

between the city, countryside, and beach can become a multi-sensorial opportunity for enjoying diverse states of well-being; spaces of pause and infrastructural setbacks become open rooms for walkability. These environmental units accompany alternative mobility solutions (bicycle paths, tram lines, etc.) with systems of variably structured spaces that favour expanded interaction between people's physical diversities and the physicality of context.

Figure 6: Strategic scenario level. Example of extended technological-environmental sections in case studies. Source: F. Angelucci, C. Cellucci.

At the level of identifying criteria of intervention (fig. 8):

- definition of a multi-criteria approach to models of intervention. Projects do not propose fixed solutions but act through variable connective patterns. Areas belonging to decommissioned railway lines become adaptable thematic "stations" in which to activate people in relation to different levels of enabling and rehabilitative activities;
- this multi-criteria approach brings information-based content to the project. Users' needs and the analysis of the contextual factors that influence them are followed by relational criteria that "in-form" design. What follows are not definitive responses (what to do), but informational criteria about requirements that suggest ways to respond (how to do).

Walkability is thus re-read as a direct function involving the user, space and the environment. In the latter, in fact, the growing interest in "liveable and healthy cities for all" has guided processes of urban regeneration, associating the concept of walkability with such megatrends as: physical activity, well-being, multi-sensorial and interactive experience.

Figure 7: Forecast level. Degrees of interaction and urban rooms in 01) coastal level case study, 02) sangritana ex railway track case study. Source: F. Angelucci, C. Cellucci.

Figure 8: Exemplification of informational criteria that in-form the design process and suggest "hot to do" (i.d., specifical walkability requirements about the connectivity needs). Source: F. Angelucci, C. Cellucci.

This approach, widespread in the field of studies and design of spaces and infrastructures for mobility, risks generating an overexposure of users and excess sensorial stimuli, when not filtered through local social, economic and environmental specificities.

The physical environment and contextual factors instead play a determinant role in guiding the direction of views (Lynch, 1960), fields of observation, the capacity to orient oneself (Weisman, 1981), the choice of spaces for recreational activities. In a final analysis, they are fundamental to defining the quality of walking inside the city.

The synergic use of user/universal visions at different levels of designing process enables a dual and no-scalar design pathway in which the project of urban outdoor spaces for walkability results through a complex framework of interactions. In the study of Ortona, the centrality of contextual qualities and local human/social capital, related to the megatrends investigated, make it possible to confront and evaluate the social, environmental and economic impacts of design interventions in public space and, consequentially, to guide future dynamics transforming the city.

This approach modifies visions for the design of spaces and infrastructures for walkability that must, in any case, comport:

- a competitive-based vision that considers walkability a condition for raising environmental comfort, public health and the inclusion of fragile users and to mitigate inequalities and social frictions in order to render cities competitive and attractive for new investments;
- a community-based vision characterised by design solutions for walkability adapted to the material and socio-cultural environment in which they are inserted virtuous processes of participation (co-design, civic awareness, co-management of places).

CONCLUSIONS

Walkability, as a technological-environmental integrated requirement of public space, must refer to both quantitative goals and measurable characteristics (presence of landscaped spaces, heat islands, the use of the ground, etc.), as well as qualitative characteristics (subjective sense of safety, aesthetic sensibility) interpretable in more descriptive terms. In this sense, the experiences implemented with the case study in Ortona reveal potential future scenarios of research that regard:

- tools for the collection of data set including subjective perceptions and emotions experienced by people while crossing, resting and using the built environment and nature. In this field, the integrated vision of walkability can contribute to the qualitative/quantitative interpretation of urban open spaces with significant effects on general mobility behaviours with respect to the users' individual needs and characteristics;
- experiments with integrated systems of permanent sensors, mobile sensors and wearable biosensors. In this second research sector, walkability can improve planning processes and design decision-making toward continuous monitoring networked activities through the comprehension of people's behaviour, the record of localised environmental data, the capture of human perceptions/emotions via biophysiological parameters;

- holistic design methodologies for the re-conceptualization of walking behaviours and walkable spaces in a co-evolutionary development process. In this third field of research, the integrated requirement of walkability can support the quantitative analyses of local environmental factors/ agents and the qualitative evaluation of individual users' aspects toward a better balance between performative and enabling project capabilities.

The question of walkability interpreted in its technological-environmental consistency has wide ranging impacts. It regards the reinterpretation of urban space and its components as devices with the ability to enable diverse and new levels of interaction among people, communities, nature and technologies. We must overcome the discrepancy between walking as movement and walking as a social, recreational and healthy activity.

In this sense, the use of tools for monitoring and managing multiple user-related aspects (safety, health, participation, social interaction) and modifications related to the aspects that involve spaces and communities (mobility, energy, information, management, education, tourism) assumes a fundamental role. Orienting all infrastructural developments toward walkability means recognising walking as a complex experience involving the body, mind, sensations, emotions and, at the same time, adapting actions and measures, choices and configurations to rethink and regenerate life in the city and imagine its evolution over time.

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Placemaking as an Instrument for Psychological Wellbeing and Urban Health

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ABSTRACT

In today's society, mental health issues become more and more prevalent. Cities and the way they are planned and envisioned, can play a major role in the mental health state of urban dwellers. By investigating place-making processes and a particular case study from Bulgaria, the research paper attempts to trace the relationship between place-making initiatives and their impact on psychological wellbeing of urban users. There is research evidence that quite modest interventions can have a significant impact on people's mental health and wellbeing (Kuo, 2001). Place-making initiatives and interventions are hereby projected in their capacity to enhance the wellbeing of urban dwellers. The paper argues that the placemaking process can improve cases of depression and other health disorders and investigates how through minor urban interventions and transformations, a better psychological state of urban dwellers can be achieved, encouraging better lifestyles for urban dwellers of all backgrounds and abilities, stimulating collaboration among local residents, institutions, and businesses, and establishing social relationships, hence affecting positively urban health and providing support in times of need.

Keywords: *Placemaking, Mental health, Urban wellbeing, Psychology.*

INTRODUCTION

According to the United Nations (The United Nations, 2018), 68% of the world population is projected to live in urban areas by 2050. The urban population of the world has been growing rapidly which creates multi-faceted problems in cities. The configuration of the urban fabric can be seen as a major cause for chronic illnesses, simultaneously offering potential solutions for the improvement of urban health.

Nowadays, mental health issues become more and more prevalent. Cities and the way they are planned and envisioned, can play a major role in the mental health state of urban dwellers. By investigating place-making strategies and particular case study from Plovdiv, Bulgaria- "The Neighbourhood Chat", the research paper attempts to trace the relationship between place-making initiatives and their impact on psychological wellbeing of urban users. There is research evidence that quite modest interventions can have a significant impact on people's mental health and wellbeing (Kuo, 2001). Place-making initiatives and interventions are hereby researched in their potentials to enhance the wellbeing of urban dwellers. The paper argues that place-making projects can improve cases of depression and other health disorders and investigates how through minor urban interventions and transformations, a better psychological state of urban dwellers can be achieved.

The Case for Healthy Places (PPS, 2016) points out that place-making initiatives, such as resident-led pavement painting or community garden projects can create opportunities for gathering, socialization, and volunteerism, thus reducing psychological distress and depression. Furthermore, place-making initiatives "engage people in creating quality public spaces that include a variety of activities and amenities to facilitate play and active recreation" (PPS, 2016, p. 121). Regular physical activity is critical for health, helping people live longer lives, improving cognitive function, and decreasing the risk of chronic illnesses such as heart disease and type 2 diabetes (p. 121). 'Place' can be perceived both as a social construct and a physical reality- a person's 'place in the world' can feature their socioeconomic status, perceptions of opportunity and sense of belonging (Frumpkin, 2003). Thus, it can be argued that place-making initiatives offer miscellaneous opportunities to encourage better lifestyles for urban dwellers of all backgrounds and abilities, stimulating collaboration among local residents, institutions, and businesses, and establishing social relationships, hence affecting positively urban health and providing support in times of need.

In terms of research framework and methodology, the current paper relies on theoretical investigations to establish the relationship between the process of placemaking and psychological wellbeing. It then focuses on a specific case study from the Bulgarian context- "The Neighbourhood Chat" in Plovdiv Bulgaria, executed in 2016. The author has conducted in person interviews with some of the initiative's participants and organisers, and on-site investigations and short interviews were carried out in June, 2021 in order to address the question on how this certain type of placemaking initiatives, involving residents in the process of planning, has resulted on their wellbeing. The short time frame in which this research has been conducted (April to June 2021) has been perceived as the major research limitation.

Theoretical Investigations: The Relationship between Placemaking and Psychological Wellbeing

Placemaking is a multi-faceted approach to the planning, design and management of public spaces. It capitalizes on a local community›s assets, inspiration, and potential, with the intention of creating public spaces that promote people›s health, happiness, and well-being.

Implementing principles of healthy placemaking into practice is critical – and will become even more so in a post Covid-19 context. According to Alan Penn (Penn, as cited by Reynolds, 2016), dean of the Bartlett Faculty of the built environment at University College London, architects and policymakers are not sufficiently dealing with mental health problems and their relationship with the urban realm because "understanding of these issues is not yet mainstream in the architectural community" (Penn, as cited by Reynolds, 2016). Furthermore, in their meta-analysis, Peen, Schoevers, Beekman and Dekker (2010) state that people residing in cities are more likely to experience an anxiety or mood disorders with considerable percentages, ranging from 21% to 39%. All these statements point towards the urgent need of architects, urban planners and policymakers to start conceiving, designing and shaping healthier and more resilient urban environments by taking people's mental health into consideration. The director of the Centre for Urban Design and Mental Health in London – Layla McCay points out that these debates are complex and dependent on a number of factors (McCay, as cited by Reynolds, 2016). According to McCay (2016), factors such as the access to nature or green spaces, public spaces that promote physical activity and facilitate social interaction as well as residing in spaces that feel safe, are crucial factors impacting mental wellbeing of those living in cities. Good mental health can ameliorate people's enjoyment of life, relationships, educational achievement and contribute towards building better social capital and helping people to reside together in positive way- inevitably, these aspects benefit everyone (Reynolds, 2016). Therefore, it can be claimed that placemaking is a potential instrument in urban design for improving people's health and wellbeing in cities because research shows that it contributes to all the aforementioned factors (PPS, 2016).

Nowadays, a small portion of organisations have been established to research the ways in which urban spaces influence mental health. These are significant for influencing architects and urban designers' ability to consider mental health issues into their designs and conceptions. By involving citizens through placemaking initiatives in the redesign of the urban environment these issues are naturally addressed as people themselves have the capability to shape the realm in ways they perceive amicable, therefore leading to more positive perception of their surrounding environment. As Sarkar points out (2021) places are perceived by receiving information from the environment by our sensory system and in this way we establish relationships with the places. Places have the ability to introduce the sense of attachment by residents and thus to contribute to the long-term aim to make our cities more resilient (Sarkar, 2021). Thus, the process of placemaking, involving local residents in the activity of transforming the environment leads to creating intangible relationship with those places and, hence, to potentially positive psychological wellbeing (2021). Moreover, research has found that people who reside in more "scenic environments" report better health (Seresinhe, 2016). Additionally, it has been investigated (Peen, Schoevers, Beekman, Dekker, 2010) that the brains of people who live in cities have different operational mechanisms when compared to those living in rural areas. In particular, the scientists have uncovered that particular brain regions that are involved in the regulation of emotion and anxiety (2011), become overactive

in urban dwellers in time of stressful situations. Arguably, it can be stated that this might be one of the reasons for the prevailing higher rates of mental health problems in urban areas (2011). Therefore, the task of architects and urban designers is to attempt to make cities better places to live in and, potentially, the tool of placemaking might be holding the key to addressing this problem. Up to this moment, there is a relative scarcity of resources that can be utilized by urban planners, architects and policymakers, informing them what would be good and bad from mental health point of view (Jha, 2011).

Furthermore, it has been documented (Hes, Hernandez-Santin, Beer, Huang, 2020) that placemaking fosters place attachment in increasing diverse communities characterizing the increasingly globalized world and, thus, holding potentials to bring improved health, community participation as well as perceptions of safety. Placemaking aims to instigate an emotional attachment between place, the community, the natural environment and the self (Hes et al., 2020). Implementing principles of healthy placemaking is crucial, especially in post Covid-19 context in order to address health challenges and ameliorate inequalities (RTPI, 2020). Therefore, engaging communities in planning decisions and processes fosters social capital, a sense of belonging and individual well-being. Working towards these aims will be critical in post Covid-19 cities (Royal Town Planning Institute, 2020) to ensure the recovery of our cities and planners, architects, urban designers and policymakers need to bear in mind an important lesson that the pandemic situation taught us: "healthy environments mean healthy people, however, economic progress cannot happen without this underpinning principle" (RTPI, 2020).

Psychological Wellbeing - Carol Ryff's Six Factor Model

Hereby, it is worthy to mention the Six-factor Model of psychological well-being (PSB) – a theory developed by the psychologist Carol Ryff (Seifert, 2005) that dissects Eudaimonic wellbeing into six key types of PWB. It is worthy to relate it to the process of placemaking as it seems the two have a lot in common. Ryff's model is a theoretically grounded instrument that specifically focuses on measuring psychological well-being through six major factors - self-acceptance, the establishment of quality ties to others, a sense of autonomy in thought and action, the ability to manage complex environments to suit personal needs and values, the pursuit of meaningful goals as well as a sense of purpose in life and continued growth and development as a person. (Seifert, 2005) The model depicted on figure 1 illustrates the model to assess the psychological components of well-being.

Ryff's Six Factor model could be a potential instrument that can be used for the assessment of the level of well-being of urban dwellers (Seifert, 2005). Despite the fact that the instrument does not measure all dimensions of well-being (2005), the accumulated knowledge can aid institutions, planners and architects towards understanding and developing programs to enhance the well-being dimension of urban population and implementing the results in their projects. When the process of placemaking is related to the framework of Ryff's model, it becomes apparent that it possesses promising potentials to increase well-being dimensions of citizens. Becoming aware of their contribution to the process, people could develop an elevated sense of appreciation for their surroundings. Moreover, by increasing the sense of place – genius loci of a specific place, placemaking can have certain psychological benefits to urban well-being. The placemaking process contributes to the factor of self-acceptance, giving participants the opportunity to reflect on their perception and usage of places which develops a sense of

appreciation. In this way people become more involved in the maintenance and redevelopment of those places. When the factor of environmental mastery is taken into consideration, the process enables a number of stakeholders to work together and recognize urban issues, finding potential solutions to them and as a result they develop a sense of competence (Siefert, 2005) to manage their external surroundings. Developing positive relations with others is also a factor that can be observed in the placemaking process - participants acquire the skills to make decisions collectively towards solving urban issues in specific places, especially through various discussions and workshops of LQC (Ligher, Quicker, Cheaper) initiatives which could lead to elevated sense of belonging and connectedness with other members of the same community (Siefert, 2005). Inevitably, this works toward alleviating segregation in the contemporary city.

Figure 1: Ryff's Six Factor Model for Psychological Well-being. Redrawn by Author (Sarkar, 2021).

In terms of personal growth, participants can develop a multiplicity of tangible and intangible skills as they work towards achieving a common goal, becoming more aware of their surroundings, broadening their horizons, becoming active citizens. Moreover, the process could contribute to the elderly to feel more socially connected, leading to psychological strength. When we speak about purpose of life- another part of Ryff's model for assessing psychological well-being- oftentimes, as the process of placemaking develops gradually, over time, participant are given the opportunity to experience the progress (2005), creating a momentum that encourage people to work towards improving their places and neighborhood. Therefore, it can be claimed that the goal-orientation created by the placemaking process contributes to the feeling of life purpose as demonstrated by the investigated case study- "The Neighbourhood Chat" in Plovdiv, Bulgaria. Last but not least, the process enables participants to become more autonomous as they learn how to act independently in order to balance common with individual expectations. As Canter points out, the link between place and activities, and the expectation of finding certain people in certain places, all indicate how a particular physical location can have its psychological power from a 'location' to a 'place'. (Canter, 1977, p.123). Therefore, the process of placemaking can be a powerful tool to improve psychological well-being of urban dwellers while simultaneously contributing towards creating more resilient urban environments (Siefert, 2005). Moreover, in post-pandemic cities it is crucial to develop and utilise such tools in order to engage the public participation and alleviate the effects of social distancing whilst achieving healthier communities and cities.

THE URBAN CONTEXT- TRAKIYA NEIGHBOURHOOD, CITY OF PLOVDIV, BULGARIA

"Trakiya" is a specific residential area in Plovdiv, composed of residential blocks, representative of the mass housing developments-"panelki" typical for the Soviet Countries and Eastern Europe. The neighborhood was developed in the 1980s. Its planning structure is akin to the rigid principles of the Modern Movement. What is interesting is the sporadic unregulated appropriation of in-between public spaces that occurs between residential blocks. Thus, one can notice the fascinating contrast between the rigid nature of the modernist planning structure and the soft principles of appropriation that happen sporadically. The neighborhood usually provokes two reactions in people. The first is the oppressive perception of "gray, horrible, inhuman architecture." The other is a bewilderment of the changes made by residents, provoking reactions such as "there are regulations against this in other countries." (Toleva, 2016). Undoubtedly, the process of cooperation, which is an integral part of placemaking, has led to the current appearance of the neighborhood. Hence, one can think of the urban initiative "Neighbourhood Chat", as a reflection of residents' desire to have more freedom and control of their environment and to participate in the processes of urban place-shaping.

THE CASE OF "NEIGHBOURHOOD CHAT" – A PLACEMAKING INITIATIVE IN PLOVDIV, BULGARIA

Background

The urban intervention "Neighbourhood chat" was executed in the City of Plovdiv, in the neighbourhood of Trakiya. (fig. 2) The project was conducted as part of the initiative "One Architecture Week" 2016. The goal of the initiative was to engage with the local residents and to involve them in the process of public space co-creation. The urban installation was executed in between 1st of June and 15th of August 2016 by the collective |In|formal – a Bulgarian team practising in the field of urban design through acknowledging the role that people play in the creation of the urban environment. The 2016 edition of the festival focused on citizens' participation in the creation of public space (One Architecture Week, |In|Formal, 2016). The following case study is pertinent for analysis and reflection since it offers potentials to trace the relationship between the placemaking process and its effect on mental health of residents. In investigating this case study, the author partially relies on Ryff's definition of psychological wellbeing in order to trace the potentials of the placemaking process to improve mental health of a particular group of urban dwellers.

The focus of the "Neighbourhood Chat" was the area bounded by the residential blocks 1,2 & 3 in the vast neighbourhood of Trakiya. (fig. 2) The site is typical for the neighbourhood. It featured elements such as large green spaces, absence of motorised traffic and a number of bottom-up initiatives initiated by local residents. Due to its amicable human scale proportions and the absence of motorised traffic, the site posseses a high sociability factor. A spatial analysis of the territory of interest was conducted by the project team. In addition, an interactive map, including explanatory graphics and short descriptions, concerning the area of interest, was developed.

The urban initiative consisted of numerous meetings with local residents that took place within a temporary structure. A major part of the initiative – The "Urban Activator" (fig. 3) – was a structure that was specifically designed and employed, for a number of discussions to take place, and where the feeling of collaboration

and mutual trust was established between the festival's team and local residents. The aim of the structure was to act as a visual attractor, stimulating curiosity and, thus, inviting local residents and accumulating their views and opinions. For a period of 12 days the structure was assembled on various spots within the area bounded by the three residential blocks. According to a report by the organisation's team a total number of 230 people got involved. The collected information was translated into a design brief envisioning the redevelopment of the area. On the basis of this brief the architectural teams developed their proposals involving residents' feedback. (One Architecture Week, |In|Formal, 2016).

Figure 2: The scope of the project. (Google Maps, 2021).

Figure 3: The temporary structure of the "Urban Activator". (One Architecture Week, |In|Formal, 2016).

Few key characteristics were identified as crucial with respect to the design of the structure of the Urban Activator (fig. 4) – the necessity to be mobile, so it can be easily transported and disassembled at various locations; the requirement to

be secure and to be constructed from natural materials, the necessity to provide comfortable environment for community events such as weather protection and comfortable seating, especially in the hot summer days and the necessity to be constructed from repetitive elements in order to facilitate the ease of repetitive assembly and disassembly. An interesting feature is that two of the surfaces were adapted for writing where brainstorming took place. One of the surfaces was an actual "window" where participants could draw on, so that they can directly reimagine the present landscape. All these little elements were crucial because they allowed stakeholders, initiators and locals to work together, to foster the spirit of community and thus build trust amongst each other which is significant for the success of the placemaking process and simultaneously for the improvement of mental health of residents. Furthermore, the boards were easily detachable, allowing for a variety of options for hanging and orientation which allowed freedom of work. All these little details have contributed for the establishment of quality ties, for developing sense of autonomy in thought and action, the ability to manage complex environments to suit personal needs and values, the pursuit of meaningful goals and a sense of purpose in life – some of the major factors characterising Ryff's model for psychological wellbeing.

The idea of the Urban Activator was precisely to create such gathering point for public meetings, discussions and workshops with locals which proved to be psychologically very effective for engaging the locals. According to the authors, the overall approach of "The Neighbourhood chat" was precisely aiming at citizens empowerment by actively involving them in the project development process - from the initial research phase throughout agreeing upon a shared communal vision to designing of experimental interventions, their actual construction, utilisation and further adaptation.

Figure 4: Final Design of the Urban Activator.
Text by Author (One Architecture Week, |In|Formal, 2016, p.27).

The placemaking process

The urban action consisted of eight major stages, based on the concept of placemaking, incorporating various research methods and stakeholder which contributed to the incremental development of the initiative and the feeling of shared purpose in life- arguably one of the factors contributing to psychological wellbeing of residents. During the period of acquiring the necessary materials, few initial meetings with local residents were implemented (2016). The approach was gradual incorporation of the local community through several

phases (2016). According to |In|Formal (2016) this was psychologically a crucial moment for building mutual trust with the inhabitants as well as involving them in the placemaking process because during these initial stages the locals shared intriguing moments related to the site, that would have otherwise been impossible to acquire (2016). Typically for the Bulgarian context, initially the locals were reacting with reservation, however, many of them have gradually participated in the meetings by witnessing their neighbours taking part and giving concrete ideas for the development of the site. Clearly, the process has contributed to the establishment of a common goal which creates closer ties within the community.

One of the most significant factors in involving local citizens in the placemaking process was the Urban Activator's assembly on various locations within the site. The collective |In|Formal states that it aimed at establishing contact with a maximum amount of residents, listen to their needs and suggestions with regards to the surrounding space and convince them to participate in all of the project's phases – from planning to actual construction of the main interventions. It is believed that in this way the locals would be able to recognise the new physical interventions as their own and take greater care of them in the future which is a prerequisite for some of Ryff's factors for psychological wellbeing - the pursuit of meaningful goals and a sense of purpose in life as well as continued growth and development.

As a result of the numerous meetings with local residents in 2016, a design brief has been developed. Its purpose was to specify the concrete physical interventions of the proposals as well as their locations. Furthermore, this step aimed at including locals in the actual design process which additionally contributed to establishing closer ties with community, the environment and a shared sense of common goals- all factors contributing to psychological wellbeing according to Ryff's model.

The placemaking outcomes and their impact – 5 years later

The site was visited on two consecutive days 13th of June 2021 and 14th in June 2021 – almost five years after the execution of the placemaking project (fig. 5). Interviews and small talks were conducted by the author with some of the local residents in order to find out how the initiatives have impacted the locals. From observation it was found out that children continue to actively engage with the interventions bringing their parents together. Clearly this feeling of togetherness and mutual care for the environment are prerequisites for an improved mental health.

1 2 3 4

Figure 5: Placemaking elements developed from the initiative on site in 2021;
1- The structure for children play; 2-the alcove; 3-the urban garden; 4-the seating space.
(Author's personal archive).

CONCLUSION

Implementing principles of healthy placemaking into practice is critical – and will become even more so in a post Covid-19 context. As the paper has demonstrated, by focusing on effective implementation rather than on normative principles is now key to addressing place-based health challenges. People thrive in places that fulfill their needs and which they have helped to shape. Engaging communities in planning decisions is crucial to foster social capital, a sense of community and individual well-being. Achieving these outcomes through public participation will be even more crucial in the design of post-Covid-19 cities to ensure the long-term success of these new, resilient and sustainable urban environments. However, when designing post-pandemic cities and their associated spaces, policy-makers, planners, architects and public health professionals alike will have to bear in mind the simplest yet most important lesson that the pandemic has taught us: Healthy environments make healthy people and healthy people underpin economic vitality (RTPI, 2020).

The present paper has also depicted public spaces in mass housing developments in Bulgaria as places of communication where locals define themselves as a community. What is more, the process of place-making illustrates the potential of this type of planning to be an effective tool to bring communities together and to elevate the mutual spirit of working towards a certain aim, thus improving psychological wellbeing and reducing mental health problems. Furthermore, this experiment shows that working with locals is significant for achieving healthy and more resilient urban environments.

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Towards a Healthy City: Urban and Architectural Strategies for Age-friendly Design

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ABSTRACT

The main challenges that today's metropolises have to face, in addition to an often-unregulated urban growth, concern the progressive aging of the world's population.

This article proposes an evaluation and support tool for age-friendly design based on integrating the certification system, combined with a predictive approach that characterizes Digital Twins.

The goal is to transform a city segment from a Smart to Healthy City, where technology will continuously improve the physical and social environments.

A model structured in this way and highlighting its physical discontinuities at the urban level allows simulating interventions to make them safer and respond on time to the deficiencies in the preventive assessment phase.

A virtual functionalized urban sector will be obtained, offering safe roadways and green spaces and adequate services to avoid the concentration of specific activities in the same areas (commerce, education, health services).

The innovative aspect of the research is the multidimensional approach, which allows you to combine the potential of digital models made in Building Information Modeling (BIM) environment with the Geographic Information System (GIS), further integrated with the Age-friendly system of evaluation and certification, which are an articulate and valid tool to support decision-making processes to design places on a human scale. This tool can also be helpful in the context of the health emergency we are experiencing due to the pandemic, which has placed an urgent need to rethink urban spaces to promote a greater sense of tranquillity, safety, and liveability. The purpose is to manage the flow of entry and exit from places of aggregation, imagining structures that can transform themselves when necessary and act as strategic support to health facilities. As a case study for the evaluation of the peculiarities of living spaces and social contexts, it was chosen the Balduina district, an urban area of Rome.

Keywords: *Healthy City, Age-friendly Built Environment, Building Information Modeling, Geographic Information System, Urban Digital Twins.*

INTRODUCTION

In the era of increasing ageing population, climate changes, urbanization, globalization, digitalization, new diseases, the public health challenges are quickly evolving, and strategic actions are necessary to create a healthy city (Azzopardi-Muscat et al, 2020). Each of these phenomena has important implications on the well-being and health of the population of each country and require that people be placed at the centre of any policy for sustainable development.

The First International Conference on Health Promotion, meeting in Ottawa on 21 November 1986, formulated the Ottawa Charter for Action on Health for All. The Ottawa Charter stated that "Health is created and lived by people within the settings of their everyday life; where they learn, work, play, and love." (WHO, 2021)

In 1988 the WHO Regional Office's for Europe's created the Healthy Cities project to bring Health for All (HFA) to the local level. The World Health Organisation (WHO) claimed that "*a Healthy City is not one that has achieved a particular health status. Rather, a Healthy City is conscious of health and striving to improve it. It continually creates and improves its physical and social environments and expands community resources that enable people to mutually support each other in performing all the functions of life and developing to their maximum potential*". (Tsouros, 2017) It means that health is an individual and collective condition, strongly influenced by the environmental context and the strategies implemented by local governments.

The 17 Sustainable Development Goals (SDGs) of the 2030 Agenda for Sustainable Development, signed in 2015 by the governments of the 193 member countries of the United Nations, re- emphasized the importance of a health cities approach; in particular SDG 3 "ensure healthy lives and promote well-being for all at all ages", and SDG 11 "make cities and human settlements inclusive, safe, resilient and sustainable" (United Nations, 2015).

The current cities are defined by Capolongo et al "pivotal for the public health paradox" because on the one hand, they should offer services to promote health and well-being; but on the other hand they produce many risk factors such as pollution, heat island that affect the health status of inhabitants, especially the more fragile population such as the elderly (Capolongo et al, 2018). In fact, according to the Organisation for Economic Co-operation and Development (OECD) (OECD Publishing, 2015), cities are home to 43.2% of the elderly population.

Urban contexts are therefore the ideal place to address the issue of population ageing and Health for All in an integrated and interdisciplinary way. In particular, collaboration between public health and urban planning is essential to create healthier neighbourhoods, towns and cities (WHO, 1999).

The key role of designers and urban planners in making cities healthier for their inhabitants, from the building scale to the urban scale, is evident.

This paper proposes an evaluation and support tool for age-friendly planning, based on the integration of the age-friendly certification system, which coming from the bilateral Italy-Sweden project "PRACTICE" (Planning Rethinked Ageing Cities Through Innovative Cellular Environments), integrated with the methodologies of predictive approach that characterize the Digital Twins.

The ultimate goal is to provide a multidimensional approach to the design of cities to define more appropriate solutions for the accessibility and usability of

spaces allowing greater autonomy to the population with particular regard to the most fragile segments of the people, such as the elderly.

AGE-FRIENGLY CERTIFICATION FOR THE BUILT ENVIRONMENT

In 2007, the WHO drew up a guide, Global Age-friendly Cities: A Guide, based on a survey of 33 cities in all WHO regions. The WHO administered questionnaires to the over-65s in order to ascertain the advantages and difficulties they experience in the eight key areas of city life: housing, transportation, social participation, respect and social inclusion, civic participation and employment, communication and information, community support and health services, outdoor spaces and buildings (WHO, 2007).

Based on the WHO guidance, a multi-criteria analysis system was developed to assess the actual adequacy level of buildings, considering even its urban context. The proposed age-friendly certification is structured according to three hierarchical levels:

1. area, macro-themes relevant to the evaluation;
2. categories, particular aspects of the areas;
3. criteria, certification evaluation items given a score of -1 to 5.

In addition to the assessment area, category and criterion, each sheet also includes the following items:

- requirement, expresses the quality objective to be pursued;
- unit of measurement, referring to the quantitative performance indicator;
- normative references;
- performance scale to be used in the indicator normalisation phase in the range from -1 to +5;
- method and verification tools, to be used to characterise the indicator value;
- criterion weight, the degree of importance that is assigned to the criterion, compared to the whole assessment tool.

Each area, category and criterion was given a weight representing its relative importance to the entire certification. This weight was deduced from the analysis of the answers to the questionnaire administered to different experts categories, such as doctors, architects, engineers, psychologists and nurses.

All other scores are calculated using the weighting system:

- criteria scores contribute to category scores;
- category scores contribute to area scores;
- the sum of each area scores combines to form the overall score, classifying each building performance level: Bronze, Silver, Gold.

The age-friendly building certification is composed of 5 areas, 15 categories and 35 different criteria (fig. 1).

Age-friendly home should be able to satisfy the occupants needs that change during their live. The homes must include some key features that make them safer and more usable for people with chronic or temporary disabilities and the elderly.

The proposed certification applies to executive projects to allow verification of all evaluation criteria and to existing buildings. The age-friendly urban environment certification is composed of 4 areas, 12 categories and 24 different criteria (fig. 2). The quality in an urban context is rather important for all citizen, especially for older people.

The neighbourhood represents for the elderly citizen the reference territorial scale and therefore, proximity to public services, especially transport systems and health services, shops and other services, green areas, within a radius of 500 metres or 15 minutes on foot (the World Health Organisation considers these to be the optimal distances for the elderly person to be able to move around easily) becomes fundamental. The proposed certification assesses these aspects and the safety and comfort level.

Villa	Flat	AGE-FRIENDLY BUILDING CERTIFICATION	WEIGHT
		1. Access	**0,35**
		1.1 Building access	*0,5*
x	x	1.1.1 Horizontal pathway	0,35
x	x	1.1.2 Parking area	0,3
		1.1.3 Entrance door	0,35
		1.2 Ingresso dell'abitazione	*0,5*
x	x	1.2.1 Entrance door	0,3
		1.2.2 Stairs	0,15
x	x	1.2.3 Door threshold dimension	0,15
		1.2.4 Elevator	0,4
		2. Manoeuvring space	**0,25**
		2.1 Internal horizontal pathway	*0,2*
x	x	2.1.1 Corridors	0,3
x	x	2.1.2 Internal doors	0,4
x	x	2.1.3 Spaces in front of and behind doors	0,3
		2.2 Internal vertical pathway	*0,15*
x		2.2.1 Internal stairs	1
		2.3 Toilets	*0,2*
x	x	2.3.1 Dimensional and functional specifications	1
		2.4 Living area	*0,25*
x	x	2.4.1 Kitchen	0,4
x	x	2.4.2 Dining room	0,3
x	x	2.4.3 Living	0,3
		2.5 Sleeping area	*0,1*
x	x	2.5.1 Bedroom	1
		2.6 External spaces	*0,1*
x	x	2.6.1 Balconies and terraces	1
		3. Interior fittings	**0,2**
		3.1 Finishes	*0,5*
x	x	3.1.1 Taps	0,2
x	x	3.1.2 Floorings (kitche, bathroom)	0,2
x	x	3.1.3 Floorings	0,2
x	x	3.1.4 Handles	0,2
x	x	3.1.5 Windows	0,2
		3.2 System terminals	*0,45*
x	x	3.2.1 Cytophone/videophone	0,15
x	x	3.2.2 Bell	0,15
x	x	3.2.3 Switches	0,35
x	x	3.2.4 Plugs	0,35
		3.3 Fixed fornitures	*0,05*
x	x	3.3.1 Mailbox	1
		4. Installations	**0,1**
		4.1 HVAC system	*0,7*
x	x	4.1.1 Heating	0,7
x	x	4.1.2 Cooling	0,3
		4.2 Renewable energy	*0,3*
x	x	4.2.1 Photovoltaics	0,4
x	x	4.2.2 Solar collector	0,6
		5. Ambient assisted living	**0,1**
		5.1 Safety and security	*0,8*
x	x	5.1.1 Security, control and implementation systems	0,4
x	x	5.1.2 Alarm systems	0,4
x	x	5.1.3 Air quality	0,2
		5.2 Smart metering	*0,2*
x	x	5.2.1 Smart metering electricity/gas	1

Figure 1: Index of age-friendly building certification assessment sheets.

AGE-FRIENDLY URBAN ENVIRONMENT CERTIFICATION	WEIGHT
1. Green and open-air spaces	**0,30**
1.1 Pavements	***0,20***
1.1.1 Road pavements	0,55
1.1.2 Parking area	0,45
1.2 Pedestrian areas	***0,30***
1.2.1 Pedestrian crossings	*0,35*
1.2.2 Sidewalk	0,55
1.2.3 Bike paths	0,10
1.3 Outdoor facilities	***0,50***
1.3.1 Public toilet	0,25
1.3.2 Benches and urban furniture	0,60
1.3.3 Urban decorum	0,15
2. Transports	**0,20**
2.1 Public transport	***0,70***
2.1.1 Transport accessibility	0,35
2.1.2 Location of public transportation stops	0,35
2.1.3 Quality of public transportation stops	0,10
2.1.4 Frequency	0,20
2.2 Private transport	***0,30***
2.2.1 Parking area	1,00
3. Safety and comfort	**0,15**
3.1 Outdoor pollution	***0,30***
3.1.1 Noise pollution	0,30
3.1.2 Atmospheric pollution	0,70
3.2 Urban safety	***0,30***
3.2.1 Safety system	1,00
3.3 Public lighting	***0,40***
3.3.1 Urban lighting	1,00
4. Services	**0,35**
4.1 Health services	***0,40***
4.1.1 Hospitals/first aid	0,45
4.1.2 Clinics	0,55
4.2 Cult places	***0,10***
4.2.1 Churches	1,00
4.3 Basic needs shop	***0,20***
4.3.1 Pharmacies	0,60
4.3.2 Supermarkets	0,40
4.4 Leisure and recreation	***0,30***
4.4.1 Parks and/or public gardens	0,50
4.4.2 Recreational clubs	0,50

Figure 2: Index of age-friendly urban environment certification assessment sheets.

DIGITAL TWIN – A NEW STRATEGY FOR HEALTHY CITY BUILDING

The urban context can have positive or negative effects on people's health and this highlights the need to enable research methodologies and monitoring of accurate data that today allow urban planners and architects a role as mediators and facilitators (Giofrè et al., 2017).

That is why the efficient and appropriate management of cities is very important given their rapid development in terms of size, population and consumption of resources.

With increasing urbanisation, it is crucial to focus on how technological innovation can help safeguard people's health and provide a sustainable future.

In this context, Digital Twin (DT) can be considered a new strategy for today's healthy city construction.

The Digital Twin is the virtual copy of a real physical object/system, through which studies, cost- benefit analyses of alternative solutions and various simulations can be carried out (Jones et al., 2020). Developed by NASA engineers as part of space programmes in the 1960s, DT thanks to the availability of numerous new Information Communication Technologies - ICT including Big Data, Cloud, Internet of Things, sensors, is now considered one of the main strategic technological trends of the coming years (Deren et al., 2021).

The following table gives some examples of Digital Twin potential applications in various sectors.

Table 1: Examples of Digital Twin possible and potential applications. (Source: Tao et al. 2019).

Domains	Possible/potential applications
Aerospace	Assembly line monitoring (Yin et al.,2019)
Agriculture and breeding	Animals health monitoring (Neethirajan et al, 2021)
Automotive	Car performance test in different conditions (Rajesh et al, 2019)
City management	Heating, ventilation and air conditioning system monitoring Intervention design selection support Real-time mobility monitoring Simulation traffic to optimize (Rudskoy et al., 2020)
Construction	Real time progress monitoring (Sacks et al., 2020) Safety workers monitoring Resource allocation and waste tracking optimization
Electric power generation	Carry out energy consumption scenarios and simulations with great precision and to adapt the electricity supply to them (Agostinelli et al, 2021) Help improve operations and maintenance over the useful life of physical installation Power grid planning optimization
Environmental protection	Resources management optimization Environmental health monitoring
Healthcare	Diagnosis and treatment decision support Patient realtime monitoring Personalized medicine Simulate the patient health status (Braun, 2020) Staff scheduling
Security and emergency	Catastrophic event prevention (Ford et al. 2020) Disaster management

Through advances in geospatial technologies, the Digital Twin is applicable to three-dimensional digital modelling at both building and urban scales.

The integration of the digital model with the Geographic Information System - GIS and ICT allows the data collection and their integration in real time, the processing of advanced analysis and the automation of future predictions (Zhu et al., 2018).

Data-driven urbanism, urban planning based on data collected more or less automatically, can enable more efficient city management.

An urban Digital Twin is the most accurate and complex possible reproduction of an urban environment, a part of a city or all of it (Castelli et al., 2019).

The aim is to collect and systematise as much data about the city as possible in order to have as complete a view as possible of the urban organism functioning at a given time.

Although study on the urban Digital Twin is still in its infancy, the potential applications are innumerable.

For exemple, the prototype of an urban Digital Twin for the 30,000-people town of Herrenberg in Germany has been developed to urban mobility and wind simulation, to support urban planners, urban designers and the general stakeholder (Dembsk et al., 2020).

The Digital Twin of the City of Zurich has been developed to support the city administration and to visualize construction projects and make them available to a selected group of people (Schrotter et al., 2020).

The open DT of the Docklands area in Dublin (Ireland) has been developed for urban planning of green space and skylines, allowing users to interact and report feedback on planned changes (White et al., 2021).

Ahn et al. use Digital Twin City (DTC) model to evaluate objects/areas potentially having a negative impact on older people mobility, to simulate possible solutions and to identify less-demanding paths (Ahn et al., 2020).

As the aim of planning is to improve the quality of life and urban space, the Digital Twin also aims to foreshadow possible scenarios as a result of the choices made and projects implemented. The idea is developed in the field of urban intelligence, adding the urban component to the smart city computerised approach, defined by the Massachusetts Institute of Technology the Senseable city (MIT). The word "Sense-able" includes the human component and has a double meaning: sensitive city and city capable of feeling.

In senseable cities, technology is not the ultimate goal but the tool to building highly computerised cities while at the same time questioning the human side of the city, going beyond the predominantly technological approach of the smart city (Belingardi, 2020).

METHODOLOGY: FROM 3D MODEL TO DIGITAL TWIN

The first methodological approach for the realization of the assessment tool is based on 3D modeling created through the use of BIM software such as Allplan Architecture, Autodesk Revit, Bentley Systems AECOsim Building, Designer Graphisoft ArchiCAD. The second step is the integration of age-friendly certification to evaluate the built environment through a graphical programming interface, such as Autodesk Dynamo, allowing customisation of the building information workflow.

The third methodological step is the integration BIM model with GIS technology, to perform simulations of real situations and then to simulate possible new scenarios, visualizing in real time their impact, for example, for the improvement of mobility to reduce pollution.

The fourth methodological step is to create an Urban Digital Twin through the installation of the IoT sensors, to monitor the actual behaviour of the entire built environment.

The following is a case study for a better understanding of the proposed methodological approach.

CASE STUDY: BALDUINA DISTRICT IN ROME, ITALY

The methodology described has been applied and verified in a quiet residential neighbourhood in the northwest of Rome, in the XIV Municipio (Fig. 3). The Municipio of our interest has increased between 2011 and 2019 by 5,563 units. The composition by age classes of the population, referring respectively to 2010, 2016, 2019, shows a particular evolution. Citizens aged between 35 and 44 years, those most present in the municipal territory, record a significant decrease from 17% to 14.7%. Instead, there is an increase of the 45-54 age group. There has been an increase even in over 75s in the municipal area in nine years, from 10.6% in 2010 to 11.7% in 2019 (Municipio Roma XIV, 2018).

Figure 3: Satellite view of the neighbourhood area examined (red) and the building examined (orange).

STEP 1 – 3D MODELING OF THE BUILDING

The building and the individual flats were reproduced out with Autodesk Revit 2020 software (fig. 4) to design the improvements and insert them into the GIS platform.

The modeling was based on an on-site visit that allowed us to obtain information about the building's geometry and the location of the assets. Specific information on the stratigraphy and materials used was decided to model walls, floors, ceilings, and generic roofs with the sole purpose of delimiting the rooms. The modeling of doors, windows, and furniture was also carried out to create a representatively coherent model. In this case, model information, separated into environment components (walls, floors, roofs) and model components (stairs, windows, doors, furniture), are at different levels of detail (LOD).

While the building blocks are of LOD 300, the elements are represented with the correct size, position, and orientation and interface correctly with the other elements of the model; the model components are of a higher level of detail than their predecessor, as they include manufacturing, assembly and installation information (LOD 400).

Figure 4: BIM model view of the case study building and architectural plan.

This diversification of the LOD is due to the proper application of age-friendly certification, which requires specific information such as door height, handle type, and faucet type. Once the building model was completed, the space of the flat under consideration was defined. The definition of the spaces is fundamental as it has allowed us to know the position of the various components.

STEP 2 – AGE-FRIENDLY CERTIFICATION FOR THE BUILT ENVIRONMENT

The building and urban scale certification described above has been integrated within the parametric BIM software to allow designers and planners to obtain an automatic evaluation of the criteria. This integration was achieved through the Dynamo tool; this is an open-source visual programming environment that allows automation procedures to be created by manipulating and linking graphic entities (nodes) to achieve the desired result.

The figure 5 shows a age-friendly certification sheet of the building scale that has been inserted in the environment BIM through Dynamo. This formula queries the model through criteria and evaluation elements of the certification to which is assigned a score from -1 to 5 (negative, sufficient, good, excellent), finally obtaining an sheet evaluation. This procedure, applied to each category, allows obtaining an overall assessment of the building.

This tool makes it possible to create algorithms to automatically identify critical points at the building and urban scale by reading the parameters contained in both the BIM model and the GIS. While BIM focuses on the building itself,often disconnected from its context, GIS specializes in the geospatial information that defines its exterior. The integrated use of these technologies can bring benefits in both fields. Data from a GIS can facilitate BIM applications such as site selection and material layout. At the same time, BIM models can help generate detailed models in a GIS and lead to more effective project management.

Age-friendly building certification

	Intended use	Criteria for	
CRITERION 1.1.3	Residenziale	/	Apartment

Access door

AREA OF EVALUATION	CATEGORY
Access	Building access

NEED

The presence of common access with characteristics such as facilitating autonomous accessibility by people with reduced or impaired motor skills

REGULATORY REFERENCES	UNIT OF MEASUREMENT
Decree of the Minister of Public Works no. 236 of 14 June 1989	cm

PERFORMANCE SCALE

		OPTIONS
NEGATIVE	**a.0)** Presence of revolving doors, non-delayed automatic return doors, or glazed doors if not provided with safety devices **b.0)** Presence of doors with minimum span <100 cm	☐
SUFFICIENT	**a.1)** Presence of doors with a minimum clear span of 100 cm	☐
GOOD	**a.2)** Presence of doors with a minimum clear span of 110 cm **b.1)** The door must have a maximum thickness of 5 cm	☐
EXCELLENT	**a.3)** The clear span must be at least 120 cm **b.2)** The door must have a maximum thickness of 5 cm	☐

METHOD AND VERIFICATION TOOLS

SCORE	
WEIGHTED SCORE	

Figure 5: Example of the algorithm for criterion 1.1.3 of age-friendly building certification with reference sheet.

STEP 3 –BIM-GIS INTEGRATION

Once the building has been created in a larger context, it can be imported into an InfraWorks model for analise, planning and managing roads and other infrastructure in the surrounding area. Revit geometry is positioned geographically and imported into the InfraWorks model.

In InfraWorks, after loading the REVIT file in the “Create New Layer” section, the geo-localized project can be accessed directly and displayed in the list of building data sources.

Infraworks has therefore made it possible to locate the objects in space, linked to specific alphanumeric attributes saved in the relational database (Archive), and to manage them as “information layers” that identify their spatial relations. The models, visually realistic and complete in every detail, are built using all available GIS data: environmental and anthropogenic data, orthophotos, terrain models and survey data (fig. 6).

Therefore, the model obtained implemented within a GIS system, placed side by side with other models of adjacent buildings or in any case of the study area, allowed further analysis and documentation of the assets and the surrounding environment as a whole.

Figure 6: Axonometric view of the volumetric model generated with Autodesk Infraworks 2021.

STEP 4 – DIGITAL TWIN CREATION THROUGH IOT BUILDING SENSORS CONNECTION

The home is the privileged place where, more than in any other, it is possible to measure the criticalities, demands and developmental aspirations of active ageing. Technology can support ageing in place especially for older people living alone. The installation of IoT devices inside the building allows to improve the quality of life, psycho-physical health and autonomy of the elderly tenant at the same time it generates Big Data. The Digital Twin continuously updates itself with the data collected and shows in real time the areas in which it is important to improve safety, autonomy and user comfort. The installation of sensors and cameras at urban scale makes it possible to collect Big Data (fig. 7). The DT collects real data from installed IoT devices, which can be processed using analytical techniques and simulations based on algorithms.

Figure 7: Smart home Digital Twin and IoT sensors.

RESULTS AND CONCLUSIONS

Aging population, climate change, particular diseases engender new challenges for the city and to face those complex issues an integrated and multidisciplinary approach is required.

The first and the second step of the case study analysis, after a detailed and careful analysis applied directly to a typical apartment of the building, assessed that it is certified with a Bronze level with a score of 0.70 on 5; this certification tool highlighted the difficulties regarding especially to accessibility and usability of interior spaces. The third step evaluating the building in the urban environment, such as urban design, road safety, noise pollution, and services offered, lead to a certification score of 0.63 on 5 - Bronze. This result is mainly due to the inadequacy of urban facilities and the almost total absence of cycle and pedestrian routes.

The case study essentially evaluates the effectiveness of the algorithm that automatically

generates the certification results by extracting the data to fill in the sheets directly from the digital model. Therefore, the results produced were compared to those coming from the direct compilation made by the technicians who performed the inspections.

The fourth step makes it possible, through the installation of special sensors, to make certification dynamic. This makes it possible, for example, to update the building's energy consumption assessments and, at the same time, to record any changes in the building and urban scale through the installed cameras.

The same sensors are essential in creating a Digital Twin, that requires the construction of a comprehensive spatial information infrastructure to simulate urban and architectural strategies for age-friendly design and, not only that.

To optimize the potential of the Urban Digital Twin, research efforts should focus on improving data processing efficiency and the inclusion of the city's socio-economic components.

In conclusion, the integrated use of technologies with a certification already proposed by the PRACTICE project but developed directly within a digital information system, ensuring a complete and dynamic view of the entire project and in turn combined with the digital twin strategy, can be an objective tool, thus promoting a building and planning more attentive to the needs of all types of users.

The tool proposed in this paper is a starting point for an open discussion with all stakeholders involved in this topic. This tool could significantly improve the design, visualization, and simulation workflow in developing cities oriented to all citizens' expectations in terms of safety, accessibility, comfort, and active life.

The city modeling makes it possible to improve visualizations of the urban environment and appropriately manage priorities for interventions to build healthy cities.

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Reconstruction of the Urban Pattern: Transforming the Meaning of Architectural Space Through Individuality and Belonging

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ABSTRACT

The city of Prishtina currently faces a significant identity fade. It is well-known that attributes of a space in relation to continuity, coherence and distinctiveness, allow people to identify a place. This study aims to interpret architecture and urban space of the city of Prishtina-Kosovo through public art. The concept of this study uses public art as a tool of development strategy and with an important role in healthy urban design. The inhabitants of the city are used to the daily routine of the urban life in which they are located. The purpose of public art is to question the practice of this unhealthy daily life outside the physical framework, such as walls, buildings or streets. Its use serves to give meaning to these spaces that build the urban pattern. That is to say, it challenges the way cities are experienced, shaped and lived. In order to achieve this goal, there are present three possible scenarios, where, public art interfere to address the complex architectural issues that we face today in the city of Prishtina.

Keywords: *Urban pattern, Public space, Public art, Urban regeneration, Sustainability.*

INTRODUCTION

Cities are a vibrant system and we are constantly faced with an unprecedented political, social, economic changes, when detachments and imbalances are numerous and above all, at a time that requires far-reaching transformations. By using space and place in an innovative way, they can provide inspiration and impetus for the formulation of new concepts in public space.

The main purpose of this paper is to critically research the current state of the various neighbourhoods of Prishtina and the opportunities offered in them for re-establishment and regeneration. In particular, opportunities for the re-socialization of public spaces and abandoned spaces through public art will be discussed, as important values for the re-inclusion, awareness and well-being of a society.

Our impressions of a city are formed mainly by the quality of public spaces. They fill urban gaps with life, are directly related to the construction of what we call the city, and affect the relationships that are created within them. So when we refer to the streets and other public spaces of a city, we are actually talking about the identity of the city itself. Public art, being used as a "tool" of intervention testifies to the diversity of use of public spaces, the impact on the quality of the urban environment and the definition of our daily experience in cities. Moreover, public art in the examples of international design experiences, has highlighted its impact in particular on environments increasingly limited by their use. The variety of uses of public art to create a greater urban vitality that encourages people to live together, strongly argues the selection of the case studies under this research.

Research questions:

- Which public places are the most vital and suitable for public art location?
- How can neglected spaces in Prishtina be reformed in order to achieve intertwined multiple social, cultural, and environmental benefits for its users?
- How can art in public space promote the sense of community, belonging and well-being in neighbourhoods of Prishtina?

The aim of this study is to achieve the creation of creative space, defined as space that enables its users to apply their imagination to generating ideas, questions, thinking about alternatives and to evaluate their own and their city officials' ideas, final products and processes; to achieve the creation of a sense of belonging and individuality for the community and to encourage their active participation.

RESEARCH METHOD AND PROCEDURE

In this study, data collection was based on a mixed methods approach using simultaneous procedures. According to (Creswell 2003), these procedures are a strategy in which the researcher combines quantitative and qualitative data in order to provide a comprehensive analysis of the research problem. In this method, the researcher collects quantitative and qualitative data at the same time during the study and then integrates the information into the interpretation of the overall results. Although the study was conducted in stages until the completion of the general research, the whole process of data analysis had a repetitive and cyclical character, rather than sequential.

Data and analysis of the current situation were obtained from national and international institutions. During the literature review, were analysed in detail: different scientific sources for theoretical concepts for architectural space and public art; Urban development plan of Prishtina from the perspective of public space; Projects of international organizations for public spaces and development of urban sustainability in cooperation with the Municipality of Prishtina.

The questionnaire was conducted to gather the opinion of individuals about the problem and to understand their level of awareness and information on this topic. Whereas, through interviews, professional and in-depth opinions of people from the artistic community were collected, who directly or indirectly deal with this problem. Respondents were contacted via email and were expected to provide their individual perceptions.

In the observation phase, since the study focuses on public spaces, there was no need for permission to observe and analyse their functioning. Initially, all public spaces of the city of Prishtina were visited, including all typologies such as squares, city and neighbourhood parks, municipal markets, playgrounds, plateaus, landmarks and streets. Field visits facilitated on the collection of data's and on the analysis of the existing condition for the selected locations – aimed at the use of space, the identification of all pedestrian and motor accesses and the difficulties encountered in them.

Data extraction and synthesis, all the read material, field data, taken photographs, documents and maps were analysed and categorized into a group that were directly linked with the topic of public art. Some of the contents seemed unnecessary for the research project, thus, the data were reduced intensively, in order to form the text into useful categories.

ANALYSIS IN THE THEORETICAL CONTEXT

Public art is a part of our public history, part of our evolving culture and our collective memory. It reflects and reveals our society and adds meaning to our cities (Bach 1992). Reflecting the way, we see the world is the artist's response to our time and place combined with our sense of who we are (Gorichanaz 2020). Public art is not an "art form" (Gorichanaz 2020) and what distinguishes it is the unique way it is done (Davies 2005), where it is and what it means. Set in public space, this art is there for everyone, as a form of collective community expression (Januchta-Szostak 2010). But, in a diverse society, all art cannot attract all people, nor should it be expected to do so. The purpose of public art is not to be liked by everyone, but to attract everyone's attention. With this, it can express community values, improve our environment, transform a landscape, raise our awareness, or question our assumptions.

Over different periods the spatial view of what includes public spaces and what's the purpose of it, has changed (Mandeli 2019) (Siláči and Vitkova 2017). Depending on how society has perceived space at one time, its design features are based. From a historical point of view, art in most cultures has had a much more visible and accessible space of action (Kwon 2002). The contemporary period through marginalization has limited the use of space by dividing it into interior and exterior, while art has made it more intimate by concentrating its location in galleries and museums. The gradual departure from the idea that the gallery or museum should offer the main arena of contemporary art has led to the expansion of the concept of location definition and back to the genesis (Januchta-Szostak 2010). Art, in fact, must be open and offer a space of interaction to a wider audience. In this way, public art is put into a new public space that unites many

people around a common desire, idea or project. At the same time, to serve for a good identification of the urban space of the city, the symbolism of which should be a basic and determining component of social welfare (Molina and Guinard 2017) (Januchta-Szostak 2010). Today many artists are working in a wider range of contexts to give their imaginations and ideas more space. According to Ray Smith, this has coincided with the rise of new types of art practice in which artists have been quick to respond to the potential of innovative technology. The massive increase in access and potential of computer, video or laser, has resulted in the development and expansion of traditional art practice.

With the changes of social conditions and opportunities in public life, the concept of public art has evolved and extended its forms and functions, both in the fields it performs and in the possible settings. In the relationship between art and people, in the end, it is the people that have the final say in the story, giving the work and the artist their place in history. The education of taste by artists conveys the desire to create a habit of new habits, since, art is functional in providing certain kinds of tools for self-reflection, critical thinking and social change (Rendell 2006) according to Emile Zola, what pleases people is always what is most common, what they are accustomed to seeing every year.

To continue the above argument, according to Miles (1997), public art claims a necessary connection to what surrounds it, from architecture to urban modelling, from society to the needs of residents, and aims to adapt to the human environment with the utopian ideal of improving human and environmental conditions.

LOCALIZATION OF THE MATTER - BEING IN THE PLACE AS PRISHTINA

Prishtina, as the capital of Kosovo, is its administrative and educational centre. The concentration of central institutions and major international organizations, as well as the largest public university, make Prishtina the main point at the national level. For this, it has the largest number of inhabitants and the largest influx of movements. As a result, despite the fact that the census has around 200 000 inhabitants, on weekdays its number may triple. Pristina, like most of Kosovo, is characterized by a predominantly young demographic, which is both a potential to look to the future with hope and optimism (KAS 2018).

The urban landscape of Prishtina is a reflection of various cultural and political influences. Services are concentrated in the city centre, within the inner ring of Prishtina, while the surroundings are mostly residential. However, there are three distinct urban patterns (MoP 2013) that characterize the city:

Historic area of Prishtina - One of the remaining features of the old part of the city is the urban fabric of narrow streets and small districts composed of irregular plots of different sizes. The remaining cultural heritage consists of a number of monuments such as residential units, sacred buildings and other public buildings. These monuments are concentrated in the centre of the historic centre, which are constantly being replaced by new structures, losing the historical character and identity of this area. Also, the minimal interaction with today's city centre makes this area remain very isolated.

Modern area - It represents the main urban area, including the centre and southern part of Prishtina, which developed from the mid-50s to the late 90s. The area consists of planned structures of functions such as administrative services, sports and recreation, residential neighbourhoods and public service infrastructure.

Informal postmodern area - The post-war period of 1999 was accompanied by large informal constructions within the urban area as well as an uncontrolled spread of the city in all directions, contributing to the degradation of suburban agricultural land. It consists of mainly combined structures of residential character with economic destinations, initiated by the private sector. The variability of the architecture of the buildings, the lack of the necessary infrastructure, including the technical, public and social infrastructure, as well as the public space, limit the technical and financial capacities for a proper development (MoP 2013).

Public Spaces - The public space, the segment for which the city of Prishtina is treated in this research indicates free spaces, but insufficient for the large number of users. Apart from two City Park and some green areas, including small parks in collective housing neighbourhoods, squares in front of some public buildings, and main boulevard, other potential spaces are partially developed. The continuous construction of business buildings, residential buildings and temporary premises, have caused the free areas to be degraded.

There are also many plateaus and 'landmarks', which are spread throughout the main urban area with a great potential for future development. Serving as important landmarks, some of these locations have used or continue to attract visitors because of the cultural and social activities they promote throughout year. While others serve as transit areas or places for casual social gatherings.

Kosovo Art - Despite a growing and diverse art scene, Kosovar artists also face old-fashioned practises. There are very few spaces in Kosovo for independent and alternative art to flourish as well as there is a lack of cultural infrastructure (Parameswaran and Gaedtke 2014). Kosovo's art scene has slowly emerged since the war and it took time to prove the liberation of the artist under the Yugoslav regime at that time. Individual artists from Kosovo contributed to the breaking down of local definitions, which simultaneously reflect the influences from the events and trends of the contemporary world which were influenced from many different schools but also prominently impacted art and culture in Kosovo (Muharremi 2019). From understanding precisely what historical and critical narratives have emerged and are emerging in the Kosovo context its important to know how a new nation-state fits into not only global but also regional histories of contemporary art. Unfortunately, lack of prevailing understandings about post-war (socialist-era) modernism in Kosovo, and minimally covered Kosovo's modernist art history in studies of contemporary art from (former) Eastern Europe, leaves artists from Kosovo in particular, still often framed in terms of trauma, cultural liminality, and the country's perceived poverty (Schendl 2018). Even though the flourishing independent scene would still have to wait for the national institutions to embrace the national contemporary art scene as alternative art remained largely alien to the institution during these years. There is no clear concept or cultural strategy, the real task would always be to make something interesting and exciting — not only good enough locally, but also something that could play an interesting role in a larger arts and design discourse. In other words, to build an international institution in an otherwise provincial city (Cristina 2015), and this only do a disservice to Kosovo's artistic context by suggesting that political, artistic, and institutional issues really boil down to two opposing sides (Schendl 2018).

Meanwhile, what makes art attractive and motivating are not the ways of creating it, but the concepts and ideas they carry, they accelerate the power of art. That is, to demand that artists remain isolated from the world in which they operate, from their social, economic and cultural situation that has always influenced art, remaining within the old and traditional frameworks. On the other hand,

nothing better explains the institutional Kosovar art context in the world today than the overproduction and multiplication of images and monuments of our reality, such Kosovo monuments and statues that remind us of the last war and its victims, monuments were also erected historical heroes. The characteristic of most of these new monuments is lack of quality same as its artistic value. (Maliqi 2012). There have been some sporadic initiatives on placing the adequate art on the adequate space from individual artist, but the overall analysis of the current urban conditions showcases a little or no significant incorporation of public art in a public space, let alone address attributes that make a place with a character, which is designed and created in ways that are consistent with the surrounding area, and take on a symbolic role in creating the identity and readability of the city.

CONCEPTION OF THE PROPOSAL

Analyses of the existing situation have provided the data on which the concept of this study is developed, and revealed that:

1. Recent projects by the Municipality, where special importance has been given to the creation of new public spaces, as well as the revitalization of existing ones, have contributed to increasing the quality of public life of residents. Interventions such as the greening of main roads, the removal of fences around public buildings, the creation of sports fields, have brought a positive result and hope to users that the city is “refreshing”. This provides an impetus to work more in this direction.
2. In the urban structure of Prishtina, we constantly have layers of identities, replacements and disappearance of collective memory, where, as soon as a new identity is acquired, to be overturned by another “new”. Therefore, the reconstruction of the urban pattern must be done right here - by touching on these identifying points - not to forget the spaces that were once the symbols of the city, and above all, preserving the image we have created over the years for to.
3. As a result, it is proposed that at the crossroads between urban art and everyday life, the viewer evolves from a passive participant to an asset in the contemporary composition of urban cities. Thus, we try to form our sense of place. By awakening new meanings and raising awareness, environmentally engaged urban art provokes a re-engagement of people with the environment, acting as a catalyst for transformative social change.
4. In this regard, it is important to try an approach to returning ourselves to the urban pattern, so that we no longer act solely on the basis of current needs without asking anyone. So it is not a matter of rebuilding what has been removed, but rather of the process of rehabilitating and restoring a lasting sense of public space.
5. The general data on the development of the urban structure over the years has revealed the three distinctive urban structures of Prishtina, which do experience identity crisis together with specific concerns related to their typology, consequently this study has chosen three possible locations for art intervention.

Placing a work of art seems to be just as important as the content. For this reason, in order to connect the content with the location, the selection was made based on the division of three urban areas: the historic area, the modern area and the informal area. For each of these, depending on the context, a proposal for

intervention is given.

Since contemporary architecture benefits immensely from artistic content, in all three proposals the way public art is approached comes in different forms. The urban structure of the city of Prishtina went through phases of restructuring, influenced by various historical, political, cultural, social and economic actions. In connection with this, public art became an intermediary for addressing the complex architectural issues we face today in the city of Prishtina.

The three proposals are based on the three basic elements of architecture. The first element is the shelter, which is considered the genesis of the formation of architecture. The second element is the stairs, as an essential element for the interconnection of two spaces at different levels. The third element is the cube that symbolizes the space that is experienced since our first movement, which in the basic perception is defined as the elementary, existential experience of man, as a thinking being. Taking possession of space is the first gesture of the living being; the occupation of space is the first evidence of existence.

The concept, in addition to connecting the three urban areas through the shape of the geometric structure, in the aesthetic aspect they are also connected through colour. The three proposals are presented through the three primary colours - yellow, red, green - as long as all three lie under the open blue sky.

Figure 1: The three proposals are presented through the three primary colours.

From a philosophical point of view, we consider the position of man in relation to the three propositions. At the shelter, the person takes the observation position, which moves from point A to B. This aims that through his movement to the chosen site, he experiences the feeling of place that can offer a historical area, at the same time to see the situation in which is located. At the watchtower the man assumes the observation position which stands in a static position at a high point. From this he looks at the 360 ° angle at the surrounding area. From this is expected the assessment for the current, i.e. the green spaces between the surrounding buildings. Unlike the first two propositions, the third detaches man from reality through the optical illusion offered by the images displayed on the sides of the cube. Here man is placed in the imaginary position from which reflection is expected when facing the urban space around the cube and realizes that green space remains only a “virtual reality”.

Figure 2: Observation positions of the three proposals:
a) movement, b) static, c) imaginary.

Through the process of reflection, the urban elements and public art come together within the everyday, to form not new but discovered forgotten relationships between man and nature, occurring against the alien experience of the urban landscape. Therefore, the symbolic act of the three proposals, are: 1 - call for intervention, 2 - call for evaluation, 3 - awakening call.

Therefore, the treatment of the three urban areas tend to give different perspectives on how to apply public art in an urban space.

The first location lies in the historic area. The area contains old structures that are gradually being replaced by new structures, however, the old road fabric is still preserved. Therefore, the proposal is the treatment of streets “Iljaz Agushi” and “Henrik Baric”, in order to express the historical character of the area.

The second location lies in the modern area - The area contains complex urbanized social structures (residential, public and economic). For the proposal was taken the public space “Memorial Park” located in the neighbourhood “Muhaxhirët”.

The third location lies in the informal formalized area - The area contains combined residential-economic structures. The proposal is located in the neighbourhood “Block B”, located in the public space between the entrances.

Figure 3: Locations selected for the three urban structures (author: K. Osmani).

First Proposal – Historic Zone

One of the predominant buildings in the historic zone is Ethnological Museum, which is out of the central part of the area where the cultural heritage is concentrated, the intention is that through public art an attempt is made to restore a sense of belonging and inclusion. Realization is done through temporary coverage of two roads with one shelter. The coverage of the shelter includes the treatment of the street where the “Emin Gjiku” Ethnological Museum is located and connects it with historic zone. The narrow streets around the blocks of the old city centre, declare the intimacy of family groups that were traditionally known as “mahalla” - neighbourhoods. However, we must emphasize the changes of the main roads that lead to the monuments and other valuable objects of the area. Although initiatives have been taken to repair the road network, most of those that have been “restored” have lost their authentic “cobblestone” layer and have been replaced with asphalt. In this context, the shelter is intended to show what is slowly disappearing before our eyes and to express our sense of security.

Figure 4: First intervention – historical zone within the city and photos of the surrounding area (author: K. Osmani).

Figure 5: The first intervention a) plan of the street; b) the structure of the covering, c) and d) 3D views (author: K. Osmani).

By moving from one place to another, we gain a sense of direction. Slowly moving under the shelter tends to give a sense of meaning to the road, at the same time of the surrounding space. By placing meaning and recalling set values shelter cultivates a sense of place and becomes a symbol of the well-being we seek.

SECOND PROPOSAL – MODERN ZONE

In the "collective memory" of the citizens of the former Yugoslavia, the seventies of the twentieth century are remembered as the "golden age" before crises and wars. This is especially true for the architecture of Kosovo at that time. According to Gjinolli and Kabashi, in the seventies Kosovo has managed to maximize modernization, political and cultural autonomy and social freedom. The growth of towns and villages, the development of industry and tourism was so visible that the reflections of that time still dominate the landscape and free space of Kosovar cities. Until 1981, Kosovar architecture could be compared to the larger and more developed republics and provinces of Yugoslavia. However, with the dissolution of the federal system, the possibilities of its development were limited. This disabled the demand for symbiosis between inherited and contemporary architecture, which we continue to seek today (Gjinolli and Kabashi 2015).

Figure 7: Second intervention – modern zone within the city and photos of the surrounding area (author: K. Osmani).

For the second proposal the chosen location leads to the area of the memorial park, which has a net area of 4.4 ha, where its cultural-historical destination, the cemetery of martyrs and the grave of President Ibrahim Rugova will be preserved. The second proposal, the watchtower is planned to be placed at the top of the park slope, in order to have general view of the park. Citizens can use the watchtower in addition to using the park located on the left side of the watchtower. But, the position of the watchtower aims to go beyond providing a beautiful view, where people will climb and take beautiful pictures of the landscape they observe, from this point the current situation of Prishtina and the view itself tends to increase the load of awareness. When the citizens move down the city, in a narrow and

twisted streets, it can unconsciously become part of their daily life, wandering along it without thinking about the difficulties they encounter. In contrast, looking at buildings from above comes as a “bite” from the reality they are used to and gradually accept as such. Therefore, the citizen needs to face this view directly, which in this case probably does not offer the most beautiful view of the city but may be the most suitable location for reflection. Perhaps when they look at the park choked with the surrounding buildings, they realize that public spaces are centres of value.

Figure 8: Third proposal – modern zone a) frontal view b) floorplan c) section d) 3D views (author: K. Osmani).

THIRD PROPOSAL – INFORMAL FORMALIZED ZONE

The 1999 war brought great economic damage. Many residents of other cities in Kosovo, in search of a better life, migrated to the capital. This caused Prishtina to experience a significant increase in population, which along with it increased the demand for houses and commercial buildings. The rampant urban expansion of settlements mostly affected the outskirts of the city. The magnitude of this

problem is indicative of multi-layered problems. Some of these problems are: limited opportunities for future city development; strengthening the operation of the technical infrastructure system; non-implementation of the law during the design and implementation of projects; damage to the natural environment; lack of public spaces; lack of civic awareness. The unplanned increase of settlements continues to have a negative impact on the urban structure of Prishtina. In the context of this research, based on information on the development of the twentieth century, show that the area of "Mat" in the first half of this century was mainly agricultural land. At that time, the urban area of Prishtina was not limited to "Mati", however, in the course of developments it expanded in a south-eastern direction and this area became part of its periphery. The first houses were built in the 1990s, to become hundreds at the end of the decade. These were located in the south-western part of the "Mat" area and there was no urban plan that allowed and regulated this development (Municipality of Prishtina 2013).

Figure 10: 3D views – open cube, AR&VR environment (author: K. Osmani).

Since 1999, the dynamics of development is increasing, with many houses built in the south-east, north and northwest of the "Mat" area. Despite the fact that all these houses have been built without proper roads and proper technical infrastructure, i.e. sewerage or water, in the last decade many investors bought these lands from residents, to build multi-apartment and local buildings. By not respecting professional ethics and using the land to the maximum for construction, free green areas remained bypassed by projects.

The third proposal of the cube placed between the space of the buildings of this area, is the symbol of the lost space which is experienced only within our imagination. The concept is to confront people with the idea of immediately changing the space in which they live, from an environment laden with buildings to an imaginary green and forested environment. To achieve this, the proposal is based on a relatively easily disassembled steel frame structure, in which reflective glass panels are placed to make the three-dimensional experience possible. Space is related to our sense of space that the cube symbolizes.

What is associated with those feelings? A sense of space, according to Tuan, is related to feelings of freedom, while immobility is related to feelings of closure and construction. Human beings always require space and place (Tuan 1979).

Therefore, the cube becomes the symbol of the desires and absences we feel and the result of our imagination. So something we are constantly looking for. The concept is that this structure needs to be relocated. It will temporarily appear in a new place of informal character, inviting people to actively seek an explanation.

CONCLUSIONS

Regeneration and expansion of functional capacities, based on the application of public art in the environment, is considered a successful solution for preserving and increasing the value of public spaces. Emphasizing these values through public art would have a positive impact on the revitalization of public spaces, in which case they would contribute to the attractiveness of the area, not only for the residents of the neighbourhood but also beyond. However, for the project to succeed and the public spaces in general, the mutual cooperation of the community and the relevant institutions is needed. Only in this form is it possible to reinforce the identity of common spaces that are necessary for all. In order to show how wide, the scope of public art can be in different contexts, especially in creating healthy urban environment it was important to elaborate it in different perspectives, in the setting of Prishtina, by referring to the same principles as Remesar has highlighted: the value of inclusion, where there is no more zoning and concentration in central areas; the value of diversity, preservation of existing spaces and their improvement with regeneration; the value of innovation, promotion of new materials and new ways to use the old ones; the value of art in the environment, to support creative expression and the idea of creation of works in public art; the value of social satisfaction, work and active participation of the community; the economic value of art, the benefits in economic and cultural terms (Remesar 2016).

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Learning from COVID-19 - Analysis of Housing and Urban Design Influence on Users

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ABSTRACT

COVID-19 pandemic, in addition to putting severe pressure on the health and economic systems, has caused considerable changes in people's lives. The influence of the environment on the psycho-social and physical state of people is an established fact in scientific research and literature but the pandemic, with its related, necessary restrictions, brought to the fore some topics that are already well-known in areas such as environmental psychology and sociology.

The paper aims to analyse researches that have shown a correlation between the lived environment, private or public, well-being and mental health, with particular reference to the domestic environment.

The uncertainty and the feeling of not having control over one's own life and actions can be sharpened or mitigated by the environment in which one carries out their daily activities. There is evidence that the environment is an important determinant of health and, in particular at a time of strong emotional and psychological stress such as a lockdown, significant correlations have been found between the environment and states of stress.

Design strategies can therefore positively influence the relationship between man and environment. The pandemic period has led to "borderline scenarios" not only in hospitals but also, for example, in public spaces or at home, which has become a place where numerous activities are carried out, sometimes simultaneously: sleeping, eating, working, socializing, doing sports, etc. Parks, gardens, tree-lined streets have become the favourite spaces to have a short break from the house routine. It has been demonstrated that nature, in this period, is an essential factor from a restorative point of view and for the mental balance.

This extreme situation must be used to develop design strategies that best meet the new needs of everyday life. Such needs, even when the infectious risk is over, will definitely be changed compared to before.

Keywords: *Healthy living spaces, Healthy city, COVID-19, Environmental Psychology, Healing nature.*

INTRODUCTION

On 11 March 2020, the World Health Organization (WHO) issued a statement that has since radically changed our daily lives: "We have therefore made the assessment that COVID-19 can be characterized as a pandemic" (WHO, 2020). The health emergency has led to major changes in the way communities and people live, work, interact (Amerio et al., 2020) and it has emerged that some spaces in our cities and homes are not designed to be modified and adapted to situations other than those expected when they were conceived while at the same time maintaining a good quality of life for people who go there or live there.

National authorities, in order to contain the contagion, have imposed restrictive confinement measures that have led us to live the houses as places where we carry out all our daily activities, from work to cooking and eating, from sports to socialization (Rubin et al., 2020).

In the last decades, even before the pandemic, housing problems had become a real emergency. The last year has therefore amplified and brought to the limit a crisis that had already begun a long time ago and that now more than ever must lead to a constructive debate on the housing issue. The house is a place where most daily activities normally take place and also a space for representing one's individual and social identity (Trivelli, 2011).

Housing policy must therefore aim at a new concept of living the house and the city, focused on health and well-being, both in outdoor and indoor spaces, as these have a strong influence on the mental and physical state of users. In particular, it should be taken into account the fact that, now that the majority of the world's population lives in urban settings, it is necessary to plan them in such a way that there is a low environmental impact and an optimal response to continuous functional, social, economic transformations happening in cities, for individual and collective well-being (D'Alessandro et al., 2020).

1. NEW NEEDS FOR HEALTHY HOUSES AND CITIES

Before the COVID-19 pandemic, in Europe like in most western countries, people used to spend from 60% to 90% of their time in indoor spaces (Kelly & Fussell, 2019). The health emergency has increased this percentage as the restrictions imposed by the governments of all nations, in order to contrast the virus, have made us stay at home 24 hours a day for a few months (Lau et al., 2020).

The already present housing distress has therefore got worse, especially with regard to "fragile" people, namely people with economic, social and health difficulties.

In this kind of contexts and during the health emergency, the living space played a fundamental role. The fact that, often, such space did not conform to the physical, mental, social characteristics of the users and their needs, has been a negative factor if not, in some cases, a source of danger (WHO, 2010).

An important part of the debate on housing, even before the pandemic, is indeed the fact that often, in the design of housing, we do not pay enough attention to the social context, which has changed significantly in recent decades. The users base is increasingly characterized by a strong heterogeneity especially in lifestyles and, consequently, in the needs to be addressed through housing. Residential demand has changed considerably, for example due to the economic crisis, social fragility, increased life expectancy and self-sufficiency, climate change, immigration phenomena (D'Alessandro & Raffo, 2011).

An important factor in the real estate sector is the fact that it is now clear that appropriate and flexible living spaces are needed to meet dynamic quantitative and qualitative requirements for very different households. The demand for housing is in fact less and less characterized by requests for houses for large families, contrary to what people still tend to think, in Italy as well as in many developed countries (Indagine Makno & consulting per ANCE, 2004). In this context, the new main global classes of users are: the elderly, with social, accessibility, safety and support needs; single-parent households; city users, workers or students, often non-resident; immigrants with very diverse cultures and lifestyles. The housing design must therefore first of all investigate what are the new needs of users, for example new family compositions, and develop spaces that can be easily adapted to continuous changes in the activities that take place inside the house, which may require specific equipment and furnishings (Delera, 2009).

An example that applies particularly to the pandemic period, not only to lockdown, is the use of houses for teleworking purposes: despite teleworking already existed before the health emergency, it had not yet entered the ordinary management of work. Teleworking has allowed many workers not to lose their jobs, but it has also forced people to find suitable spaces in the house for this activity, in environments that had not been designed to be used in this way. The most relevant problems from this point of view are related both to the small size of apartments and to the difficulty of defining and distinguishing times and spaces for work and leisure (Amerio et al., 2020).

Therefore, only some of the requirements that these spaces will have to meet are known at the time of the development of the housing project. Housing must respond to these evolving needs in order to have high quality standards and ensure the well-being and health of users, but it must also target low levels of environmental impact to protect the planet and the community (Trivelli, 2011).

We must consider the home, the activities that take place in it and the users who live there, as dynamic, and never static, realities, by imagining future scenarios, by foreseeing what changes may be necessary in order to allow the spaces to follow and comply with the continuous evolutions of the inhabitants' needs. Some contemporary needs are not always addressed in homes. For example, the protection of the individual in the family context, a fundamental theme in the lockdown period, can be implemented with the creation of specific spaces for the individual, customizable and combinable to others depending on the need. Indeed, the balance between the individual and the community, both inside and outside the home and in the context where the accommodation is placed, is a topical issue that can be managed through strategies of separation and aggregation of spaces. People can have very different needs, even in the same household, and it is necessary for housing to encourage cohabitation and coexistence of activities that in some cases may conflict with each other, if poorly managed also because of inadequate spaces. The house, according to the principles of flexibility and adaptation, must therefore ensure the permanence of the household, of the inhabitants by adjusting to their needs, and this is a fundamental requirement to be considered in the design phase ("dynamic housing") (Turchini & Grecchi, 2006).

2. NEW CONCEPT OF LIVING SPACES

The housing issue cannot be separated from the debates about the typological models that characterize architecture, both at building and housing level, and urbanism. Housing and urban design, especially today, are very fragmented and very different models can be found. Currently, there is often a contrast between two extreme thoughts, belonging respectively to supporters of the design of large, compact and dense housing conglomerates, especially with regard to social housing, and to advocates of the low-density "sprawl city" (Delera, 2009).

It is certainly important to find meeting points between these approaches, in order to obtain a style and a quality of life that is characterized by the possibility of customization and green spaces, as often happens in the "sprawl" typology, but that at the same time takes into account respect and reduction of soil consumption, prerogative of the dense and compact model. Indeed, the new building complexes will have to respond to the new individual and collective needs of the inhabitants, especially of the increasingly numerous urban ones, but with respect for the environment, so as to ensure an adequate quality of life for present and future generations (Trivelli, 2011).

The creation of living models, concrete or abstract, which continuously modify the concept of "home", is inevitable and is a mechanism that characterizes architecture in general but especially the residential one. In an era characterized by continuous changes and innovations, perhaps it would be appropriate to consider all the possibilities and the flexible, adaptive, evolutionary solutions that the design and technologies allow today, rather than relying on schematizations or lists of new needs of users, which often lead to "rigid" housing models (Turchini & Grecchi, 2006).

The environment around us has a significant effect on our lives, therefore it is not possible to rely on a methodical application of fixed rules that inevitably will not generate optimal housing solutions for all people indistinctly. There are now numerous studies that prove a close relationship between the built environment, both internal and external, and the physical and mental health of people (Maas et al., 2009).

People constantly relate to spaces that have properties and characteristics that can favour or hinder their mental or physical activities. The environmental stress can be caused precisely by spaces conditions that are unfavourable to the functions that must be performed, and that can impact the physical, psychological and social well-being of the users. The "stressors" are the properties of the environment that generate a state of discomfort, illness or disturbance and they can be for example temperature, noise, lighting, building materials (Ulrich et al., 1991).

The dwelling, in particular, is the space with which we relate more frequently and therefore it can greatly affect the quality of life of the inhabitants. It is precisely in these spaces that the individual, collective and social problems, which will change according to the inhabitants and the cultural, social and economic context, are most evident and manifest.

An interdisciplinary approach should be used to understand how the built environment can affect people and their health. In the design teams for interior or exterior, private or public projects, architects should collaborate with experts in fields such as urban planning, psychology, sociology, but also health professionals and epidemiologists, the latter especially in the context of the pandemic that we are still living in (WHO, 2020).

The housing design in this century must therefore be based on integration with the context in which the houses are located, on concepts such as the recognizability of one's own home compared to others and its internal and external customization, on the adaptability of spaces according to one's needs thanks to a certain degree of flexibility and adaptability, on the possibility of having both moments of privacy, for one's individuality, and moments for the community (Delera, 2009).

Accommodations, as found by numerous researches carried out especially during the lockdown, should have wider spaces than those in which we are accustomed to live, and they should possibly overlook green areas, be they terraces or gardens, balconies or public parks. The interdisciplinary approach can be useful precisely to take into account all aspects of a complex reality such as living spaces, and it can guide housing and welfare policies to focus on the psycho-physical well-being and health of people (Amerio et al., 2020).

In recent decades, to respond to this new vision of housing design, there have been mainly two types of housing, the "consumption" and the "flexible" one.

The concept of "consumption" accommodation is based on the fact that a house can be designed according to the type of user who will live there, substantially modifying the "optional features" of the dwelling according to the needs that are usually shared by people belonging to that category.

The design of "flexible" accommodation is based on a structure that can be modified over time depending on the changes and evolutions of both the inhabitants and their needs, for example a house that can be extended, or in which it is possible to obtain different configurations of environments and furnishings (Ascher, 1988).

The underlying principles of the accommodation design will be decisive factors for the mental and physical health of the people in those spaces. The elements that can significantly affect the health and the well-being of the inhabitants are several, but this contribution will explore in particular the presence of visible and accessible green elements and environments, as well as the flexibility and adaptability of living spaces (D'Alessandro et al., 2020). The availability of green spaces and the flexibility of housing are only two of the many features of these environments that can have significant effects on the people's quality of life. However, these two specific features have stood up among other ones in the period of pandemic emergency, as our homes were probably not prepared to respond to these conditions.

3. FLEXIBILITY

The flexibility of residential buildings is one the main topics of the architectural research. In this paper we will focus on the new perspectives coming from the COVID 19 pandemic. Housing flexibility can be considered, in general terms, as the "variation of space over time based on varying experiences". The accommodation, to allow a good quality of life in it, must indeed meet the needs of users through the space performance, using configurations that guarantee the possibility of having a strong dynamism, by changing the geometric properties over time. The project, and in particular the housing one, must always maintain a strong link with the place, the society and the time of which it is part of (Trivelli, 2011).

Housing models that respond to the real needs of the inhabitants can change considerably, for instance on the base of geographical region, cultural customs, social level. For instance, the kitchen can be designed differently depending on the culture and habits of the inhabitants: it can be habitable, a kitchenette in an open space or simply a room separated from the rest of the living area. This logic

is central to all the spaces of the house and also to its general configuration. In Europe, for example, two main distribution models of houses are used: the first is characterized by a specific articulation and division of the spaces according to their function, the second by the undifferentiation of the rooms, according to a typically American "loft" model (Delera, 2009). Each housing model and typology can be characterized by a certain degree of flexibility, especially if the strategies for this purpose are defined at design phase.

An accommodation that can be defined as flexible is not characterized by free surfaces but by environments in which a certain "degree of flexibility" is programmed since the design phase, so that it will be possible to implement more or less substantial changes, in a more or less demanding and onerous way. Flexible spaces should not be considered as indeterminate or indefinite, they are areas characterized by the ability to change depending on what the specific users need at that time and in that place, so as to eliminate or reduce the rigidity that is often found in contemporary living spaces. The house needs to follow the evolution, growth and changes of each inhabitant over time (Till & Schneider, 2005).

The design strategies underlying the construction of housing must be based on solutions that guarantee the flexibility and adaptability of spaces, in the short and long term, through the configuration and distribution of spaces and furniture (CABE, 2009) to respond adequately to changing needs.

What users looking for accommodation mainly need from the contemporary real estate market is a single house in a multi-storey building, in order to have public spaces, relating with the city, semi-public spaces within the building, and private ones in their own accommodation. The demand is also based on the need to have, in the private accommodation, new and malleable spaces that can be partly customized in their configuration according to the specific needs of the inhabitants, especially privacy-related needs. Finally, the accommodation is currently required to undergo a "metamorphosis" according to the evolution of the family and precisely following the flexibility and adaptability logics of indoor and outdoor spaces (Turchini & Grecchi, 2006).

A building or a dwelling can be designed following the principles of flexibility and adaptability to obtain solutions that guarantee a certain level of neutrality of space, size and distribution, neutrality which allows for example to switch the functions of two areas according to specific needs. Another solution that favours flexibility of spaces foresees the study of distributive elements such as staircases, elevators, balconies, corridors, so that they are external to the building. This strategy allows to obtain additional accesses, to add building volumes and combine other housing units. Finally, for an accommodation to be assigned a good degree of flexibility, it could offer the possibility to expand the single housing unit. In the design phase, to implement the latter strategy, it is possible to create additional spaces such as terraces and gardens characterized by walls that are equipped for future systems, necessary for the transformation of these outdoor areas into indoor spaces (Leone, 1999).

As for the dwellings in particular, and its individual spaces, other design strategies can be chosen to facilitate in a simple and organic way the responses of the environments to the dynamic housing reality. The geometry and regularity of the walls, for example, favour the positioning of the furniture that can be modified at any time and, even if there is the need to replace a part of the furniture or to change its configuration, these strategies allow to do so with simplicity and without too many restrictions. From this point of view, an issue that cannot be

neglected is that of the systems (e.g. the electrical one), which must be positioned or studied in order to be efficient and accessible with any type of furniture configuration. The possibility of changing the configuration of the furniture in a housing space can also be favoured by a good ratio between the dimensions of the walls: if, for example, the sides of a bedroom have very different sizes, it will not be possible or it will be very complicated to change the position of the furniture in an easy way and according to the users' needs. In the design phase, it is also important to pay particular attention to the positioning of doors and windows, as they may constitute an obstacle to the internal or external organisation of the environment in question, especially as regards the equipping of walls. Finally, in addition to assessing the position of windows in relation to the spaces, it is also essential to make sure that the external openings allow levels of lighting that are suitable for different solutions, for example for the positioning of work surfaces, desks, reading and study areas (Turchini & Grecchi, 2006).

4. GREEN SPACES

Green spaces, as well as having an important role in mitigating the impacts of the built environment on the climate and in improving the ecological-climate urban conditions, can foster processes that improve the physical and mental health of people who come into visual or physical contact with them (White et al., 2019).

Green areas are in fact a fundamental part of the urban context, as they allow people to relate both to each other and with nature, and this also applies to people who do not have the opportunity to own a green space associated with their house. Urban spaces are often used for interaction and the creation of a sense of community, as well as for sports and recreational activities; this has often happened in the period of lockdown and domestic confinement during which, in Italy, this type of activities were still allowed as long as they were carried out in open places and individually.

Moreover, because of the confinement measures, also domestic green spaces, gardens, terraces, balconies have become increasingly important: they have provided the opportunity both to have direct contact with nature and to perform physical activity, acting as a relief valve in a period that has put a strain on the mental and physical health of people, in particular of the most "fragile" categories as the elderly (Corley et al., 2021).

The study of the relationship between natural environments and people is of considerable interest and a great deal of research has been carried out on this vast and articulated subject. In particular, something that is often investigated is the psychological effects of natural spaces, which can potentially mitigate emotional states such as anxiety, anger, sadness, depression, also thanks to the fact that they promote physical activity and social exchanges (Cohen-Cline et al., 2015).

Recent studies have also highlighted that the mere fact of being able to observe natural environments can reduce stress, bring benefits to the well-being and health of users, improve attention and arouse positive emotions (Jo et al., 2019).

People spend, as already mentioned, much of the day in closed spaces, at home, in the office, in the gym. Therefore, studies on the possible benefits of the observation of landscapes or spaces with natural elements, by reducing stress, are very interesting not only in view of the current emergency situation, but also in ordinary situations (Kaplan, 1995).

CONCLUSIONS

In recent decades the concept of living spaces has changed profoundly and there is a tendency to seek increasingly hybrid and multifunctional configurations, both in regards to housing and to the context in which they are located. The health emergency (COVID-19) certainly helped to change the perception of these spaces and especially the housing priorities of millions of people around the world, but the process of changing these spaces had already begun way before 2020.

As early as 2010, the WHO (World Health Organization) argued that living space must ensure accessibility, adequate levels of privacy for the inhabitants and, above all, it must adapt to all possible users, all age groups, lifestyles and different needs (WHO, 2010). For the well-being and health of people it is essential not only that housing is designed in such a way as to make users feel at ease in all situations that may occur in these spaces, but also that the context provides all the necessary services to ensure an adequate standard of living even outside the home, from healthcare spaces such as surgeries to recreational facilities such as parks, from school and cultural services to commercial ones (D'Alessandro et al., 2020).

The question to address so that the design of housing and urban spaces can promote the well-being and health of people, should be based primarily on understanding the changes in society, how people have changed, which are their priorities and how to respond to these new scenarios while maintaining a strong focus on the environment. In a post-pandemic perspective, architecture will have to work on rethinking living spaces to meet the possible needs and trends of the future, which inevitably will be deeply marked by this emergency event.

The prospect of healthy living space should guide future housing policies and architectural and urban interventions.

The pandemic emergency, however dramatic, has finally made us acquire a strong awareness of the importance that spaces quality can have for life and for the health of people. It is important not to forget this and to always remember and use this lesson in the design of our living spaces.

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Social Housing: How Covid-19 Has Affected/ Infected and What Care/Design Strategy is Needed

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ABSTRACT

For over a year, Covid-19 has rapidly imposed many changes not only in daily habits, but also in the adaptive capacity of the domestic space, imposing a functional reinterpretation to make it more flexible for multiple uses, such as home, office, gym, etc. Sensitive data on the indirect effects of the lockdown and on the house-inhabitant relationship show how new spatial needs have conditioned our physical and mental health as well as having produced cultural and socio-economic implications. Thus, the need to review home comfort and improve the quality of the indoor environment has become urgent, as well as to enhance contact with nature to live happier. This becomes more relevant in Social Housing, where moments and spaces for sharing represent the most characterizing aspect of the life of low and middle-income residents. The sector literature has dealt with this issue several times, especially in more recent times, but the results of the interrelation between Covid-19 and Social Housing are still poorly investigated and deserve further investigation. This paper aims to investigate the specific housing typology and to propose appropriate treatments as design strategies, to ensure healthier conditions of urban life. Through practical experimentation on an Italian case study, an emblematic example of economic and public housing in the urban history of Rome, the study will provide design solutions, graphic results and best practices that demonstrate the necessary updating of the architectural discipline in the light of a global pandemic, within the limits of a preliminary investigation which will suggest new ideas for the current debate on the subject.

Keywords: *Social Housing, Covid-19, Care/Design strategy, Healthy Home Environment.*

INTRODUCTION

For over a year, Covid-19 has rapidly imposed many changes not only in daily habits, but also in the adaptive capacity of the domestic space, requiring a functional reinterpretation to make it more flexible for multiple uses, such as home, office, gym, etc. Sensitive data on the indirect effects of the lockdown and on the house-inhabitant relationship show how new spatial needs have conditioned our physical and mental health as well as having produced cultural and socio-economic implications. In Europe, one in three families have had at least one serious housing problem related to overcrowding and coexistence within small or poor quality spaces (Tinson & Clair, 2020). Violence and family crimes have increased by up to 45%, of which 61% are femicides (Teodori, 2021). In Italy, the economic and employment crisis has exacerbated the housing deprivation of 1.5 million families living in the uncertainty of acquiring an owned housing solution, postponing the timing of mortgage repayments and rents (ERP, 2020). Furthermore, the health implications of housing (high density, unhealthy) have favored a more rapid spread of COVID-19. The shock caused by a global pandemic has imposed new forms of resilience on humans and the built environment. The physical limit made up of rooms and static morphologies, already overtaken by the fluid continuity of the open space, has become intangible together with the concept of privacy. The individual environment has been undermined in its formal and functional dimension to the detriment of personal interaction even between members of the same family unit. Thus, the need to review home comfort and above all improve the quality of the indoor environment has become urgent, as well as the need to enhance contact with nature to live happier. This becomes more relevant in Social Housing, where moments and spaces for sharing represent the most characterizing aspect of the life of low and middle-income residents. The sector literature has dealt with this issue several times, but the interrelation between Covid-19 and Social Housing is still poorly investigated and deserves further study. While the media were busy providing data on the spread of the virus globally and locally, the academic community also became polarized on the multi-sectoral implications of Covid-19. The state of emergency and the general emotional involvement have produced a multiplicity of reflections on the evolution of ways of living during the pandemic, which, however, appear to be partial and limited by a time interval that reveals only short and medium-term effects. Covid-19 has accelerated a process by focusing attention on the contemporary characteristics of flexibility, resilience and sustainability that are inevitably reflected in domestic spaces. In particular, the new paradigms of living demand new interpretations of the relationship between space / time and the individual / community.

This paper aims to investigate the housing typology of Social Housing and to propose appropriate treatments as design strategies, to ensure healthier conditions of urban life. After a brief historical digression on Co-living with reference to the typology of Social Housing, the research offers an in-depth study on the impact of the recent lockdown on the domestic environment. The methodological approach moves from the theoretical to the applied level through practical experimentation on an Italian case study of economic and social housing in the urban history of Rome, the 'Laurentino 38' district. In conclusion, the study will provide design solutions, graphic results and best practices that demonstrate the necessary updating of the architectural discipline in the light of a global pandemic, within the limits of a preliminary investigation that will suggest new ideas for the current debate on the subject.

SOCIAL HOUSING: EVOLUTION OF LIVING SPACE

The domestic space has been the subject of many works of research and important innovations which constitute the cardinal principles underlying many design processes. The main stages of research on domestic living as a space for sharing and freedom are presented below.

1. The Existenzminimum – Alexander Klein's studies on minimum housing are based on the research of human biology and human needs in order to dimension and derive the ideal organization of an environment through relationships between reduced volume and performance optimization. The goal then was to guarantee everyone a home, even with a minimum surface area but adequate for habitability.
2. The Plan In Space - With Adolf Loos' Raumplan, the project becomes a space project, the plan and the section regain absolute mutual interdependency. For Loos it becomes necessary to conceive the space in three dimensions, emphasizing the interior of the houses: the plan is divided into different heights with spatial solutions not perceptible from the outside.
3. The Free Plan - Le Corbusier's architecture has as its starting point the modular unit "DOM-INO", a single cell to be repeated in different ways to create increasingly complex environments. After meeting with Perret, he began to experiment with the reinforced concrete structure that allows the internal space to be articulated in an arbitrary way without structural constraints.
4. The Fluid Space - Mies Van Der Rohe's interest in space arises from attention to materials that influence the perception of space. Starting from the concept of a free plan, he makes the internal space fluid and free from the external envelope. The resulting void is a material space of the project and the elevation a filter for the landscape.
5. Modifying the Functionality - Herman Hertzberger states that the connective space is a place of aggregation. The goal is to respond to man's material needs and his psychological needs: he does not study the building itself but its anthropological and behavioral intertwining. Hertzberger elaborates the idea of the building as a small city, a space on a human scale where its interrelations becoming a distribution system of streets, a flow that creates areas of relationship.

Today, more than ever, it becomes necessary to rethink the design of a house that not only revises its main transformations but also responds to new demands for a more complete and conscious architectural change.

COVID-19 IMPACT: HOW TO LIVE AND WORK IN A PANDEMIC ERA

Human history has been affected by many pandemics and the consequences on architectural and urban development have been varied. The plague of 1300 favored the transition from the medieval city to the Renaissance city, renewing the typically informal urban layout with regular geometries. Hygienic-sanitary reasons have become the principles of modern urban planning (19th century) and have resulted in the redesign of the great European capitals with wide avenues and green boulevards, according to the theories of Haussmann (Paris), Ditter von Förster (Vienna), Cerdà (Barcelona). At the end of the First World War, the Spanish influence favored the extensive expansion of the city towards the suburbs in order to decrease the density rate present in the consolidated historical

fabrics. More recently, the challenges of the twentieth century, including the risks of overcrowding, have led architects and planners to take action in slum upgrading, to review Social Housing and manage infrastructure and municipal waste (Tokazhanov et al., 2020).

COVID-19 has attracted the attention of many researchers in different disciplinary fields: economics and sustainable development; culture and society; architecture and urban planning. The global economic crisis caused by the current pandemic is unprecedented and superior to the 2008 recession, since Covid-19 has influenced the times and ways of the market, imposing a sudden step towards the digitization of business as well as of all daily activities (Aitharaju , 2020; Nicola et al., 2020). Healthiness and distancing permeate new social and cultural behaviors, relationships exclude physical contact, psycho-physical health is tested by forced isolation and restrictive measures of uncertain duration. The experience of the COVID-19 pandemic will slow urbanization and densification. Most of the services will be decentralized and digitized, infrastructures enhanced in favor of pedestrian and cycling solutions, more individual but beneficial for both the environment and the health of citizens (Zhou, 2019). A progressive change is expected in the design of buildings, living spaces and construction methods. Modular, prefabricated, flexible, modular constructions in various configurations will be preferred because they are able to adapt to changing needs over time. Construction shapes and materials will also be conditioned by greater needs for hygiene and sanitation (Constable, 2020; Lubell, 2020). The pandemic leads to a reconsideration of existing buildings that need to become more resilient and sustainable.

THE KEY ROLE OF HOUSING AND CO-LIVING IN LOCKDOWN

The urgency to counter the spread of the pandemic has imposed difficult political choices translated into restrictive measures (Bonari, 2020). The general lockdown required sacrifices and profound changes in the personal (psychological, emotional, behavioral), work and economic, social and cultural spheres. While the rules of everyday life change, the built space adapts to them with difficulty. Accommodation has played a key role in dealing with Covid-19, assuming different prerogatives and forms according to needs: a home, a hospital for sick or infected people, a workplace for smart working, a school, a gym, a comfortable cloister, a digital social space. But housing was also the safest and most secure place to avoid Covid-19 in quarantine (Hang, 2020; Rogers & Power, 2020). Limiting people in the house in this way has created many problems in family dynamics and in the approach to others, in the rhythms and in the multiple uses of the house. For the homeless, housing was simply not an option, increasing the risk of contagion on the one hand, and our ability to be supportive during or after the pandemic on the other: thus, our balconies were converted into boxes for private singing and music performances (Quarshie, 2020). In even more extreme situations, such as in informal settlements where irregularly built houses lacking basic services house over 1 billion of the world's population, social distancing and quarantine could not be respected (Sanderson, 2020). Among building typologies, Social Housing is the one that has undergone the most changes since it requires the use of common spaces to be adapted to the new guidelines for the health and safety of residents, such as social distancing. For many family units this period has highlighted the limits of the widespread open space. It usually presupposes a 'phased' occupation model, whereby different family members occupy the house at different times of the day: during the day, it is used in an alternative way (mostly as a parent's workspace); in the evening, it is the place

where the whole family gathers to dine and carry out activities together (watch TV, listen to music, chat, play, etc.). This is very different from the occupation pattern during the lockdown. When everyone is at home at the same time, it can be difficult to find an individual space to carry out different activities throughout the day, while respecting the needs of the other members of the family (Rogers & Power, 2020). The problems that emerged were of different types: the lack of suitable spaces for smart working or distance learning, the lack of open spaces, the need to practice physical activity and the difficulty of finding the necessary space for intimacy and individual privacy. The living space also had to guarantee the possibility of frequent personal sanitation. To accommodate everyone's needs including privacy, the open space was the first of the domestic environments to undergo significant transformations, divided into smaller areas and converted into a co-working and co-learning spaces. In the same way, new spaces have been created for particular uses, such as those intended for the quarantine of objects and clothing that enter the house. Despite the difficulties in living together in limited areas and in the management of common spaces, Co-living has also offered some advantages over other residential types: common spaces are useful for offering support to residents, to facilitate home deliveries; the presence of several families constitutes a restricted community for support and virtual socialization against loneliness and isolation during the lockdown; the spaces dedicated to co-working, already integrated into the Co-living, offer superior facilities for working from home: this will help the transition already underway from traditional work to more flexible methods.

Figure 1: Most used housing spaces during lockdown (image by Lo Pinto).

In 1927 in "Being and Time", Martin Heidegger associated space with the concept of being, identifying a place in the world and developing a range of action and relationship around one's existence: proximity. In architectural and strictly spatial terms, the thought is translated by stating that when man defines his own space of existence, he possesses that particular space: he contaminates it with his personality and adapts it to his own needs and requirements. This is what our home represents for each of us. During the lockdown, it was easy to find himself in a situation where the space previously owned became a space that he owns. A result that derives from the direct confrontation we have with ourselves in a closed and known space is a form of self-analysis and a feeling of loneliness among the negatives. This is because our existence is used to expanding more and more. We always add new "regions" to live our existence, based on our needs and the activities we carry out daily.

All these changes in the living and working habits of residents also lead to a fundamental change in their housing demands, defining new housing performances, such as privacy, flexibility, healthiness, thermal comfort and energy efficiency. The most recent research and housing policies are advancing in this direction, in particular this work intends to highlight how these new priorities can combine Co-living and safeguarding people's health and well-being.

CASE STUDY: LAURENTINO 38

The 'Laurentino 38' district represents one of the most important Social-Housing interventions carried out in Rome between the 1960s and 1980s, based on a project by the architect. Pietro Barucci, to cope with an exponentially growing housing demand due to frequent migratory flows. Located in the south-western outskirts of Rome, the 'Laurentino 38' takes its name from the Zone Plan no. 38 implementing law no. 167 for the construction of economic and social housing settlements. Symbols of a grand-scale design that blends architecture and urban planning, they echo the modernist thought that favors the anthropic mark imprinted on the natural landscape, 'the skilful, rigorous and magnificent play of pure volumes under the light' and a minimal domestic life in spaces and in lifestyle (existenzminimum) (Cerri & Nicolin, 1986). Built between 1976 and 1984, it is inspired by the great European architectural experiments of the second postwar period, from the English New Towns to the three-dimensional urban planning of Le Corbusier, up to the Pampus plan for Amsterdam by Bakema and van den Broek. The idea was to create a new centrality or a satellite city, autonomous and self-sufficient, capable of accommodating a plurality of users (32,000 people) of different backgrounds and origins. The district covers an area of about 165 ha and its system is based on a module, the insula, made up of 7 buildings: 5 linear multi-storey buildings, a 15-storey tower and an L-shaped bridge building including shops, offices and car-parks on two floors.

Figure 2: 'Laurentino 38' District, Arch. P. Barucci (1976-84).

The settlement includes 11 multifunctional islands and 11 bridges that overlook the matrix path (Viale Ignazio Silone), separating the vehicular and pedestrian roads on different levels. The only variant is represented by the center of the neighborhood where a large square was planned to cover the underground parking lots, comprising a cinema, a theatre and other public services never built. Access to the buildings, located about 4 meters above the road axis, can be reached by pedestrian ramps and paths on pilotis. The residential typologies are high-density and contain apartments from 4 to 7 rooms (Rossi, 2012). The common spaces arranged on several levels can be recognized above all in the bridge buildings, where the district services were to be allocated. Over the years the bridges have remained unfinished; today the spaces where economic and recreational activities should have taken place are abandoned and degraded.

Although aimed at the lower-middle class, the project has not been able to meet the human dimension, needs and habits of its inhabitants, lacking both the attempt to overcome the limits of the 'dormitory area' and to raise the quality of life of the people less well-off, in housing and public spaces (Lenci, 2011). In reality, the eventual bankruptcy is the result of mismanagement and failure to deliver services. In recent years there have been numerous urban and social redevelopment initiatives in the area: in 2006 some bridges were demolished and new roads were built to give the district greater permeability, safety and more effective integration with the rest of the city (Lenci 2011).

DESIGN STRATEGY FOR NECESSARY CARE AND SPATIAL METAMORPHOSIS

The spatial innovations that have marked the evolution of living over time, the result of long research with collective roots, have been reworked as a prerequisite to be applied to experimentation on the 'Laurentino 38' case study. Starting from a consolidated historical housing model such as Social Housing, housing can be reformulated into a new model, a malleable housing experience adapted to current needs. This is what is constantly required by our style of living and is what the pandemic period has just experienced. By adapting Klein's approach to current needs, we arrive at a new existenzminimum. According to the principles of Raumplan, spaces can be assimilated to those who live in them: thus, a 3D house establishes an empathic relationship with its inhabitants. Le Corbusier's free plan and Mies' fluid space remain the key principle: the final configuration must include flexible environments that are not forced within an imposed but self-prescribed geometry, a constant and direct relationship with the outside, a block of services as such the only design constraint. In the Social Housing complex, therefore, living spaces and services are reinterpreted with sap paths on a human scale: a model of an ideal small autonomous city open to the outside world, according to Hertzberger's ideal vision.

On the application level, the housing units of the 'Laurentino 38' have minimal environments defined by a rigid distribution structure. To overcome the current spatial limits and to favor greater sociality and multifunctionality, it is proposed to free the internal space by breaking down the (non-load-bearing) dividing walls. The shared open space is reinterpreted through technology: home automation dominates tangible and intangible structures, remains invisible to the human eye but becomes perceptible when integrated with dynamic modular furniture, solar and thermohygrometric control systems, natural and automated ventilation. The accommodation remains a single environment that can be adapted to different configurations thanks to rails placed on the floor or ceiling that allow panels and objects to move or aggregate, while the service blocks (kitchen, bathroom) remain fixed.

In summary, a Covid-proof accommodation that meets the quality and safety requirements will have to be rethought according to the following design strategies:

1. **Rethink space according to use**
   The free plan allows spaces without structural constraints and with the adoption of a few but dynamic walls, the space adapts to a different use when necessary. These elastic characteristics are allowed by home automation which can resize the unitary space in even minimal but multi-functional parts to satisfy various needs. The spatial configurations can vary from a short time (day) to medium or long time (months, seasons).

2. **Define spaces for sociability**
   Connecting the living spaces, through to common paths, services and areas allows you to configure a building as a small self-sufficient city. This stimulates sociability even in a historical period in which interpersonal distancing and isolation prevail: thus, architecture helps to translate man's primary needs into spaces to inhabit.

3. **Provide every home with an outdoor space**
   During the lockdown, most people lacked open space, a possible escape to the outside or a direct relationship with nature. Paraphrasing the title of Rina Frank's book, "Every house needs a balcony", to ensure a fluid relationship with the external environment it becomes necessary to equip the house with loggias or green areas, where one can regenerate the body and mind and through which the house can naturally sanitize the air. In the time of Covid, the filter function of internal and external buffer zones, for aeration and passive ventilation, plays a fundamental role.

Tools for housing health

While the distance between physical space and digital space, as well as between private space and shared space, is imperceptibly reduced, digital can optimize time and space. With home automation, we can improve the comfort and efficiency of the home through new features: remotely controlling walls, furniture or service volumes allows you to immediately change the home environment, conforming it to our wishes. Technology not only guarantees an uninterrupted connection with the outside world, but also allows us to rethink the house of the future on the basis of new fluid spaces whose functions are potentially infinite, and as yet to be determined.

Figure 3: Spatial Metamorphosis, re-setting housing space (image by Lo Pinto).

The quality and condition of housing directly affect the health of its inhabitants, as well as their performance. In addition to the risks associated with Covid, the health of people and the home becomes a prerogative of home design. For this,

quality accommodation must include active and passive systems that provide adequate heating and cooling, natural ventilation, dry walls and environments, systems in accordance with and calibrated for energy saving, visual and acoustic comfort. In this too, home automation plays a fundamental role, as it ensures automated, controlled and efficient management of resources (air, water, waste, energy, IAQ, CO2 emissions).

Figure 4: Design Strategies (image by Lo Pinto).

CONCLUSIONS

The Covid emergency has raised problems and related considerations on co-living, on the limits of housing and forced sharing. It initiated semantic interpretations and definitions of the domestic space never previously performed, sensitive diagnoses of one's way of living. At the same time, the perception of the space of those who live there has changed.

The potential long-term changes triggered by Covid-19 can be incorporated into the next generation of construction projects. What future for post-Covid Social Housing? The limits of living together in consolidated structures can be overcome by a design that is more responsive to the care and well-being of man, flexible in both the use and the shape of the interior space. The new Social Housing project makes it possible to rediscover a denied sociality and to satisfy that human desire for transformation that tends towards the ideals of well-being, community, resilience and sustainability.

All images are drawn from the Master Degree thesis by Francesca Lo Pinto (2021), supervised by R. Belibani.

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The Project of an Urban Interior in a Modern Neighborhood of Rome: Primavalle

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ABSTRACT

Communicate, understand, raise awareness.

This paper shows the case study of two educational experiments which resulted in a design in an urban interior, of a modern neighborhood Primavalle in Rome located in the North West of the city.

The two teaching experiments tried to bring out the concept that it is possible to induce regeneration also with a small project, and a punctual intervention, in an area of a modern neighborhood like Primavalle in Rome, thinking of expressing this concept to the subjects involved in the future transformation of the neighborhood, starting with the inhabitants as well as the authorities in charge.

The students' projects aim to improve the social life of the inhabitants of the neighborhood through a punctual intervention in a part of the neighborhood, which has become a microcosm of residence only, in which the population is destined at an incessant mobility in the metropolitan context for work, association and recreational purposes.

In the neighborhoods the social cohesion is often achieved through systems that guarantee continuous communication between the subjects involved in the transformation and the residents themselves, with the aim of raising awareness, resolving conflicts, entrusting responsibilities (Sen, 1997).

Communication and awareness have often turned out to be winning regeneration strategies.

They produce a change of mentality and behavior, single and collective, which can make us reflect on the sense of the "public" thing, on neighborhood ties, on a different management of critical issues.

They allow an improvement in the life of residents and users of the neighborhoods, not only in terms of performance but also relational.

Keywords: *Open public spaces, Urban interior, Modern neighborhood.*

INTRODUCTION

I had the opportunity to lead two teaching experiments at different levels and with students of different ages and different backgrounds:

- the first didactic experience took place in 2016; it was attended by students from the middle school Istituto Comprensivo Federico Borromeo in Primavalle who took part in it through a workshop on the knowledge of the territory of their neighborhood as part of the project The school at the center. National Plan for school drop outs in the suburbs;
- the second one took place in the academic year of 2017/2018; it was attended by foreign university students through a project research study within the Urban Morphology module in the Master's Degree Course in Architecture Restoration of the Faculty of Architecture Sapienza University of Rome.

Both teaching experiments aimed to explore the possibility to stimulate the students' interest and passion for possible future architectural projects.

The experiments started from analyzing the neighborhood and the landscape of a specific part of Rome understanding its history, its development and the transformation within the past and the future, focusing on the importance of the public open space in the contemporary social housing.

The intentions were to:

- stimulate the development of projects for places in the city, understanding their past and current meaning and future role;
- try to give a contribution through the "modification" of a small area, to the set of the previous studies and redevelopment projects, programs and actions, competed or in progress, which have been affecting the neighborhood from many years, both in the university environment, either by the ATER or the municipal administration or by associations.

One of the aims of the educational experience with the middle school students was to open up the school to the local area, to make them aware, as neighborhood inhabitants, of the value of the place where they live. The outcomes of the workshop on knowledge of the territory were proposals for a garden in one of the public open spaces between the houses.

One of the objectives of the teaching experience with the students in the Urban Morphology module was to investigate the role of Primavalle in the contemporary city of Rome, starting with the study of the neighborhood and the elements that make up its urban layout. Study, as knowledge, of the elements of the urban landscape of the modern neighborhood: complex multi-layered and multi-level reading of the transformations of this part of the city. An investigation was carried out to identify strategies for the design of the future landscape of Primavalle.

The results of the university students' research were possible projects for the transformation of the same open space in the neighborhood in which the students of the Istituto Comprensivo Federico Borromeo in Primavalle had experimented with in the territory knowledge workshop the previous year. These are projects that try to give new meaning to a part of the neighborhood, hypotheses of enhancement to create socially favorable environments.

The level of planning, of deepening in the two educational experiences, was different but in both results emerged the will to propose solutions to the problems of the neighborhood in order to improve its living conditions.

1. LIVING IN PRIMAVALLE: BEING AWARE OF THE VALUE OF THE PLACE YOU LIVE IN

The school open to the territory through the Laboratory of knowledge of the neighborhood: the didactic experience with the students of the middle school of the Institute Comprehensive Federico Borromeo in Primavalle.

The school is:

- the place where you have to learn the importance and value of cultural heritage and sustainable development;
- a meeting place for knowledge and cultural diversity, a heritage of humanity;
- an educational community, endowed with a spatial and social capital, an integral part of the urban context in which it is inserted.

The Institute Comprehensive Federico Borromeo of Primavalle was transformed in 2016, into a place open to the neighborhood and of reference for the community, assuming the role of urban centrality, through a laboratory with the title: "Elements of reading the landscape of Rome in the XIV Town Hall. The public city: Rome, architectural and urban research in the Primavalle district " with the "Open doors" project as part of The school at the center. National Plan for early school drop outs in the suburbs (D.M. 273 del 27/04/2016).

The school was kept open during the summer to encourage inclusion and socializing, enriching the students' knowledge of Rome and their neighborhood, but also leading them towards an informed reading of the relationship between open spaces and the built environment.

The subjects involved, in addition to middle school students, were:

- the Institute Comprehensive Federico Borromeo of Primavalle with Alessandro Guarnacci who is the Didactic Director of the project;
- Center of modern studies, association which promotes the knowledge and enhancement of modern and contemporary architecture with Angela Bruni and Antonella Bonavita, who were the authors of the teaching laboratory and the teachers.

The main objective was to make the students aware of the value of the place where they live, also involving disadvantaged students, to whom the school curriculum does not always provide adequate opportunities, in a context of integration and socialization, including between different ages.

Promoting cultural education in which education about heritage and its conservation and protection is a qualifying element in the construction of young people's identity, by encouraging a constructive confrontation between school reality and the teaching of architecture, get students used to knowing and recognizing.

To educate in planning ability: approach and methodology in the neighborhood knowledge study

In the neighborhood knowledge study, the carried out activities were lectures, guided tours, drawings, models and first hypotheses of a possible project in a courtyard / garden between the houses.

They attempted to develop analytical skills in the urban environment in students,

educating “the gaze” to identify the transformations in the territory, from the moment of construction to today and the issues still to be resolved.

Students learned to recognize the main elements of the morphological structure of Rome and its neighborhood.

“(..) In an era of globalization it seems necessary to approach paths of active knowledge from the context of life in which it is placed; landscape reading can constitute a very rich formative experience to education in sustainability and the construction of an active and responsible citizenship (..) “ (Castiglioni, 2010).

Figure 1/2: I.C.F.Borromeo, students of laboratory: C.Aliaga, K.Klimek, A.Pietrarelli, M.Spagnoli, I.Russo.

2. UNIVERSITY PROJECT RESEARCH: THE PUBLIC CITY AND THE OPEN SPACES SYSTEM

Design hypothesis for one of the public spaces between the houses: the teaching experience with university students of the Urban Morphology module in the Faculty of Architecture of Sapienza in Rome

The University project research took place in the academic year 2017/2018. Students of Urban Morphology studied social housing complex in Primavalle. They chose an area between the houses for a small project. They researched project hypothesis for one of the public spaces of the houses, which are in the historical core of the neighborhood of Primavalle, to transform it in a pole of attraction also for the other near areas.

It was considered important to redefine the value of the empty spaces that are part of a modern neighborhood and to redefine their role in the contemporary city.

In the period that goes from the forties to the sixties of the last century, the modern Roman neighborhoods were the fullness in the void of the territory, actually they are emptiness in fullness of the city: there were an inversion of spatial relationships in the built environment.

For many years, the city has been the subject of many debates and the restoration of the modern is among the themes of these debates. To understand how “an idea of a city happens to another” is a current theme.

It is necessary to study the urban systems of the modern neighborhoods in the cities again to understand what is the new role of these parts of the cities in the urban contexts, that were transformed compared to those of the construction.

Spaces have changed and also relationships with the surroundings and with the other buildings have changed.

The number of houses has increased and all the empty parts of the city have been occupied.

Social cohesion and the sense of belonging to the place

The aim of this university research project was to improve the quality of one of the public urban open spaces for social relations.

The keywords were: reconnection, attraction pole, transitory space, flexibility, aggregation, community of solidarity, equity, inclusiveness.

One of the main characteristics, and at the same time criticality, of the public residential building districts consists in their non-attractiveness: these portions of the city are often “dormitory” districts in which

open space is a neutral space, which today requires an effort to arrange public spaces into a hierarchy so as to become vital.

The social cohesion and the sense of belonging to the place can be stimulated, creating or emphasizing the centrality of a neighborhood and constituting a distinctive meeting place through an open space.

In many cases the definition or redesign of a center of local public life, where some activities are also located, has been an effective strategy to increase the recognition of a neighborhood: a main place, punctual or linear, within the more complex system of open spaces, which therefore also performs a symbolic function of identification and belonging (Gehl, 1987).

In Life between buildings, Jan Gehl conducted a careful study of public space in relation to man and society. The book is important for the current design. Human life that flows between buildings is an aspect to be taken into consideration in the analysis and design of public space. His research has been applied several times in contemporary projects.

The theme of social housing

For some time now, university has been producing useful contributions to the theme of social housing in its many aspects. Today, a series of design attitudes typical of European best practices are recognizable and consolidated..

In the last decades the regeneration of residential areas, created by public initiative in post-war urban expansions, is a strategic issue in national and European urban policies.

The current guidelines at the community level highlight the need to make projects on the large degraded parts of the cities, rather than continuing to expand them by occupying new land, underlining different themes and approaches to be followed.

There are no valid solutions for all public housing districts that can be adopted

in the regeneration processes. There is the possibility of identifying a number of possible ways. The numerous experiences carried out in different countries highlight the common need to determine integrated intervention processes. The strategies and the policies for the inclusion of inhabitants are aimed at making them promoters and actors of transformations. In the 1980s, the experiences of the Berlin IBA and urban regeneration in Barcelona anticipate that attention to the reconstruction of the tradition of European urban living, in which the design of public space is affirmed as the basis of community policies of urban regeneration. Open spaces are urban binders (Caudo, 2007). In recent years many project proposals have worked on urban horizontal density. For example In the last twenty years a city redevelopment program has been conducted in Lyon focusing on its public spaces.

How to recover Primavalle? Approach and methodology in the university teaching experience

The theme was addressed through a direct approach, it is able to lead students to take an interest in problems with design. The research phases were knowledge, data processing and results processing.

Students asked "how does one respond to a social problem through architectural composition?"

A combination of the new and the old was sought, working on horizontality and the level close to the ground. They asked themselves how to recover a modern neighborhood, how to give a new meaning to a part of Rome through the project.

They studied how to redesign one of the public spaces between the houses to encourage social gathering, sharing, and improving the living conditions of the inhabitants.

In the contemporary metropolis they have tried to redefine the role of the modern district of Primavalle.

Among the possible ways are those of:

- preserving the architectural unity, thinking instead of transforming the margins;
- expressing a critical judgment on the quality and role of the area in relation to urban changes in order to understand its complexities and stratifications.

Stratification is the value of places; it is what enriches the places and the architecture. Returning, to re-inhabited places, involves changes. The transformation project concerns the tampered areas, those parts where there is no longer a relationship with the city. Where, how much do I transform it and why? There is a gradation of transformation. Physical and cultural relations with Rome were studied.

The students wondered how Primavalle looks at Rome and how Rome looks at Primavalle.

In public districts built in very marginal positions with respect to the urban center, connections with the center are a key element. Connections as possible relationships between the "parts of the city", bi-directional and non-dependent links on the urban center. The urban regeneration of the suburbs passes through a trans-scalar approach.

Knowledge of the elements of Rome's landscape and the construction of its outskirts

The method was to start from the knowledge of the elements of the landscape of Rome and the theme of the house and the construction of its outskirts.

For fifty years Rome has been a privileged laboratory of design experimentation for the architects of the Roman school in the construction of the suburbs. The students reflected on how in Rome, from the early decades to the 1960s, through the construction of houses by public bodies, it was possible to structure a public city on a human scale with a high quality of housing. In 1961 Aldo Rossi wrote in The city and the suburbs on "Casabella Continuity": "The face of the contemporary city is largely represented by the periphery; much of humanity is born, grows, lives in the urban suburbs".

Projects in open public spaces in residential neighborhoods of the twentieth century: powerful tools for modification

The public residential districts, built in the twentieth century, are morphologically complete urban parts.

They were built to provide healthy and decent housing to families who do not regulate access through families. The neighborhoods offered the new inhabitants common spaces and services.

They are internal and domestic living spaces, but also external living spaces to be shared to integrate and expand, in the intentions, a principle of habitability.

The morphological recognition of these urban parts contributes to the measures and forms of the built-up area, in addition to the scale and the type of what is built.

Open spaces play a fundamental role here not only in articulating the physical form, but also the social one; in fact, they have been entrusted with the task of generating relations between the inhabitants and making communities of citizens grow.

The city and the public space are inextricably linked: there is no city without public space and the other way around. Public space represents a powerful tool through which to provoke a material and even radical modification of the urban form.

However, many realizations have shown how public open spaces, which we can define urban interiors, have not always managed to become those habitable and common places that the original projects had imagined. They have not always managed to transform themselves into ambitions of quality and proximity.

There are many reasons for this, which vary from case to case. Often left undefined, unused, residual, empty, they have long been "distance", not only between buildings, but also between people (Di Biagi, 2001). From the 1980s to today, alongside the redevelopment of existing fabrics and urban recovery strategies, the problems of the widespread city have emerged, around which the theoretical reflections that animate the current debate revolve.

There have been numerous studies on the subject in recent years.

Knowledge of the neighborhood of Primavalle

We started from the knowledge of the preexistence and of the transformations with respect to the original project. In recovery and reuse projects, it is necessary to start from the pre-existence that must be studied and analyzed in order to determine its main characteristics (Reichlin, 2011).

The analysis began with the study of the urban system and the houses, which constitute an urban ensemble of quality in form and architecture.

The shape is legible on the scale of the entire city.

The neighborhood has undergone many transformations over the years and has been restored. The restoration project did not take into account many aspects.

The transformations were sought through the visible relief and the comparison of the preexistence with the photographs and drawings of the original project. Criticalities have been noted.

Figure 3: Students of Urban Morphology at Primavalle.

The urban system and the houses, the transformations

The neighborhood of Primavalle was inaugurated in 1939. It was built by the Autonomous Institute of Popular Homes. The author of the project is the architect Giorgio Guidi.

The land is in an elevated and panoramic position. The unitary urban system is based on open forms, in which there is complementarity between the grid of streets and squares and the plot of lots and buildings. The urban structure is set on the axis of Federico Borromeo Street, which is between two squares. Over the years, the Primavalle district is surrounded by private housing settlements and this also changes its social fabric.

The period of greatest building development in the parts near to the historic core of the district is between 1961 and 1971 with economic and social housing interventions.

Spontaneous construction then led to a structural lack of public use spaces.

The original nucleus of Borromeo Street has assumed the role of centrality and identity towards the neighboring areas. Quartaccio was built between 1982 and 1988. Recent redevelopment projects have involved Primavalle.

Reading theoretical texts

The methodology considered the relationship between text and iconographic apparatuses.

The use of images and architectural drawings made it possible to deepen the reflection on architecture and analogue composition understood as a design method and tool for critical analysis.

The reading of theoretical texts is an essential reference for making architecture and for inducing students.

Among the critical texts studied by the students of Urban Morphology there was: Architecture of the city of Aldo Rossi.

The search for design references

The students have searched for an example of contemporary architecture of recovery intervention in an open public space.

Among the examples studied as design references:

- the one in Malmö in Rosengard, a modern neighborhood where a strategy for outdoor spaces is developed;
- the one of the Polyform architects for the Taby center in Sweden in 2015, in which an urban densification strategy is implemented;
- the one of OKRA landscape Architects in Grunewald kirch Berg in 2008 in which the unifying design of the horizontal plane is the key to the regeneration project.

3. POSSIBLE PROJECTS: RESULTS OF THE TWO TEACHING EXPERENCES

In the neighborhood knowledge laboratory, the students identified the main elements of the landscape of Rome and Primavalle on maps. They made a model of the study of the part of the neighborhood and they designed an idea of a courtyard / garden in a lot of the public houses in Primavalle.

In the Urban Morphology module the students' projects brought to light the characteristics of the urban quality of Primavalle:

- through the design of a new unifying architectural parter;
- the inclusion of new functions.

A small-square, which functions as a horizontal antipole with respect to the verticality of the houses in line and of the towers.

There are two strong elements: the "artificial soil" and the architectural pre-existence of the houses.

In the first place there is the inseparable link between ecology and health: the use of public space as an extension of the inhabited space, up to the integration of greenery in and around the neighborhood.

They worked on the project looking for:

- spatial and visual integration between the open spaces between the houses;
- spaces for physical and playful activities in the open air;
- meeting places not only for residents but also for visitors to the neighborhood;
- places for small outdoor concerts and to listen to music;
- the insertion of small boxes for catering and other functions, in order to produce work;
- the planting of new trees to cope with carbon dioxide emissions.

The projects found their strength in the internal courtyards, used as squares, meeting places, places where interpersonal relationships and a sense of community can be increased.

The term "community" defines both a physical place and a cohesive social context. The community represents the minimum unit of intervention in which the social and spatial dimensions converge.

Maria Alessandra Segantini in the "Atlas of contemporary living" demonstrates the profound link between social disciplines and the morphological conformation of the spaces intended for living.

Elements taken into consideration for the development of the projects were:

- the lighting project;
- the highlighting of the perspective-views;
- the insertion of services without altering the spatial layout;
- improving accessibility and overcoming discontinuities.

The authors of the selected projects (figs. 3, 4, 5, 6) are the students: Giovanni Croce, Barabas Karola Csilla, Melissa Kouzmzayek, Theresa Purk,.

Giovanni Croce created a new urban carpet with a unitary design that incorporated several internal courtyards. Through the design of the meaning he wanted to reconnect the parts, giving it new meaning. He inserted a large fountain and sculptural objects.

Barabas Karola Csilla integrated the existing green with a new urban project: there are terraces, large spaces with games for children, held together by a unitary design of the horizontal plane.

Melissa Kouzmzayek worked on the theme of light and music on the roofs for everyone, residents and visitors; she thought about the project of light in the open spaces between the houses, inserting led strips and luminous objects; she inserted small pavilions for different functions that create new forms of work.

Theresa Purk intervened in a smaller area, one of the courts. In addition to the design of the flooring and the arrangement of the green areas, she inserted canopies, gradients, seats.

CONCLUSIONS

Open Questions

This contribution tries to highlight the significance of the architectural project in the contemporary city, through educational experiences.

In the laboratory of knowledge of the neighborhood it was possible to verify that also students of the Institute Comprehensive were able to develop ideas for one of the public open spaces of Primavalle.

The teaching of architecture and knowledge of the heritage and the landscape in which one lives, should begin already in primary school so as to educate the view of middle school students, future designers, in architecture.

At University, on the other hand, teaching how to design means stimulating the student to produce new architecture; it means being able to produce something that is representative of our time.

The projects of university students propose spaces suitable for socializing and improving living conditions in neighborhood of Rome that needs further reflections and recovery projects as part of the contemporary city in continuous transformation, recognizing the value of the urban design of the whole and of the main elements of the composition. They tried to strengthen the identity of the urban space through the design of the horizontal plan, underlining the strength of the planimetric figure, of the urban model with new paving designs and with the arrangement of the green areas. New relationships between the houses and outdoor living areas were sought. Open spaces between the houses are like fragments of the contemporary landscape.

“New teaching strategies must be tested to bring students, as far as possible, to the simulation of a real process, as future designers of healthy cities and inhabitants of the city.

An area of interest is the urban open space, as a common good, an important social investment in terms of improving health ”(Giofrè, F., Zoran, D., 2017).

Figure 4: Urban Morphology, G. Croce's project.

Figure 5: Urban Morphology, T. Purk's project.

Figure 6: Urban Morphology, B. K. Csilla's project.

Figure 7: Urban Morphology, M. Kouzmzayek's project.

Figure 8: Urban Morphology, M. Kouzmzayek's project.

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Cultural Heritage - A Tool for the Development of Local Opportunities and Exposure of the Danube Culture

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ABSTRACT

A methodology is proposed for the study of shrinking cities, peripheral areas, and the corresponding "shrunken" functional areas of riparian spaces. The methodology covers: a) research such as determining the points of intervention for sustainable use of cultural heritage, archetypes of the Danube settlements: research on morphology and local values; study of shrinking cities and shrinking functions with growing potentials along the Danube; mapping a network of local stakeholders and completing the DANUrB platform; local documentation for cultural and natural heritage for development; b) Planning tools - creation of planning tools and development documents for maximum impact; centers - peripheries, border situations: defining different possibilities for action; planning an optimal medium-term equilibrium for shrinking cities and functions; creation of new cooperatives of stakeholders using the DANUrB platform; local heritage development plans; c) education - raising awareness of the sustainable use of cultural heritage at local, regional and international level; education for intercultural and cross-border values; promoting the values of the periphery and the slow life in a local and interregional context; promotion of local values and products based on a regional quality assurance system; promoting local heritage in international tourism; d) actions - implementation of the Danube heritage in action: local, regional and international projects; network of peripheral and border cities of the Danube for the formation of competitive regions; regional building of a brand of initiatives of the local communities along the Danube; cooperation projects involving cultural heritage; heritage valorisation projects for sustainable tourism.

Keywords: *Shrinking cities, Methodology, Planning tools, Education, Actions.*

INTRODUCTION

Within DANUrB+ project cultural heritage will be considered as a tool for the development of local potential opportunities, exposure and socialization of the Danube culture. The project, supported by the Danube Transnational Program (DTP) strives for a better Danube region, to form transnational partnerships for cooperation in four thematic priorities and specific objectives:

- Priority 1. Creating an innovative and socially responsible Danube region;
- Priority 2. Preservation of the environment and culture in a responsible Danube region;
- Priority 3. Maintaining a better connected and energy responsible Danube region;
- Priority 4 Institutional cooperation and capacity.

"Analysis of territorial challenges, needs and potentials of the Danube Region and strategic options in view of the transnational cooperation for the period 2021-2027" is a document developed by CESCI to secure starting the process of programming the next Danube Transnational Program 2021-2027. The final of the territorial analysis offers a complete analytical toolkit. Its content consists of:

- Statement of the mission;
- Recommendations (arising from the findings of the analysis);
- Territorial analysis;
- SWOT analysis and the main challenges in cohesion in the Danube region.

This analysis determines the current state and challenges of the convergence of the Danube region. The document gives a focus on the tools for transnational cooperation. This concerns the area of the Danube Program and the area covered by the EU Strategy for the Danube Region (EUSDR) [5][1]. A table with recommendations defining the most appropriate goals and priorities for transnational cooperation is also included in order to build a unified and compact Danube region.

The whole methodology presented in this way implies improvement of the environment and cultural and historical heritage, which will lead to the creation of conditions for revitalization of the area of shrinking cities and their transformation into healthy cities for its inhabitants and guests. It is also used in implementation of Danurb+ project.

The economy in a globalized world is an arena for competing cities and regions. Today, cities are drivers of social and cultural development, and as such they have the power to stimulate themselves, regions and states to grow and develop. To achieve a better position in a system determined by a network of global cities, they must be capable to strongly attract the best organizations, professionals. Each of the mentioned components of the city as a product represents individual levels of the overall experience and perception of a city. The social space of the city is the frame.

1 EU Strategy for the Danube region

1. METHODOLOGY OF THE DANURB+ PROJECT

The main objective of the DANUrB Program is to carry out a comprehensive territorial analysis of the Danube region to serve as a strategic preparation for the ETC Danube Transnational Program 2021 to 2027 [2][2]. The program aims to conduct a territorial and socio-economic analysis, identifying the main challenges, needs and potentials that characterize the area of cooperation in the Danube region, as well as the participants who have such needs and/or are able to develop such potentials. It also aims at transnational projects, in line with the proposed legislative package for the new cohesion policy 2021-2027 and further developments (available as early as the first half of 2019), in line with the revision of the European Union Strategy Action Plan for the Danube Region (EUSDR)[3] [5] the aim is to achieve sustainability for the region.

The cohesion-based transnational CESCI[4] planning model is followed for the territorial analysis of the Danube region. The complexity of the challenges of transnational development and cooperation requires a complex combination of tools. One of them is designing a transnational strategy. This means a different approach than the usual "interior" planning, as the understanding of the space in question is quite different.

These territories are complex, with unique problems and interests in development and cannot be considered as a combination of several different "containers" with clear development goals and state competencies. This requires the application of a special planning approach. The planning methodology developed by CESCI (fig. 1) is not purely theoretical, as it was used in the SKHU INTERREG VA program 2014-2020, in the Analysis of the territorial background of INTERREG Danube for the transnational program 2014-2020 and in some strategies prepared for the operating EGTCs. together the Hungarian borders such as EGTC Rába-Duna-Vág (HU-SK), EGTC Banat-Triplex Confinium (HU-RO-SRB), EGTC Gate to Europe (HU-RO), EGTC Tisza (HU-UA), Region Mura EGTC (HU-HR) and others.

In terms of transnational planning, a transnational region is a territory shared by several national, local or regional authorities located jointly in different national states. The transnational region is both a physical and a soft space, where ecological, social and economic processes take place across borders, where the social and economic relations of societies cross administrative barriers. The transnational region is also defined by border regimes. This means full integration, cooperation and coexistence on all sides.

Cohesion analysis is an approach developed by CESCI that provides a basis for transnational (and/or cross-border) planning and strategy development. It does not interpret the border region according to the traditional "container-based" approach. It views the region as a coherent unity and independent planning body. In this type of status analysis, the aim is to answer the basic question of how to strengthen convergence between neighbouring areas and what are the obstacles to this process of more dynamic internal spatial organization.

2 Analysis of territorial challenges, needs and potentials of the Danube Region and strategic options in view of the Transnational cooperation for the period 2021-2027, CESCI

3 EU Strategy for the Danube region

4 Central European Service for Cross-Border Initiatives

Figure 1: The idea of cohesion analysis; Source CESCI [2].

The main goal of the method is for a transnational region to be able to strengthen its internal, cross-border and international relations (based on its endogenous resources). Cohesion can be improved territorially, economically and socially. Moreover, in the transnational region, administrative barriers have a much weaker role. In this way, situations can be developed that are equally useful for people living on all sides of the border. The analysis of the situation is not based on the traditional sectoral analysis, but the logic of cohesion: institutional cooperation), economic (infrastructure, shared and complementary economic conditions) and social cohesion (social situation, demographic conditions, inter-ethnic relations, civic and institutional networks)"[5][2]. This shows that many factors that are usually analysed in other methodologies are not taken into account.

The recommendations for the development of transnational cooperation are based on the analysis of the situation and summarize the extremely difficult or strengthening factors of each of the three aspects of cohesion and identify the challenges of enhanced cohesion of the transnational region as a whole. In order to gain access to the necessary information, available statistics at European and national level are used, but (taking into account the shortage of transnationally measurable data available in the Danube region). It should also be borne in mind that transnational regional statistics are being developed with the help of local stakeholders. The available scientific and policy research is analysed, as well as the pre-prepared strategies and plans. To compile a clearer picture, the applied methods are proposed, describing the state of the territorial, economic and social cohesion of the transnational zone.

With the analysis of convergence in planning, the aim is to understand the nature of the region and to interpret the territory in a broader context. Internal spatial relations are studied, references are made to the main trends and directions for development of the last decades. The analysis covers "typical landscape and environmental factors (such as landscape structures, climatic conditions, water regime, soil conditions, land cover, etc.); characteristics of the urban network (based on gravity models and function analysis: where are the main infrastructure assets and institutions [eg. schools, ports, transport hubs, etc.] located in the region; state and permeability of borders (type of border regime; density and capacity of border crossings); existing cooperation structures and their management frameworks"[6][2].

5 Analysis of territorial challenges, needs and potentials of the Danube Region and strategic options in view of the Transnational cooperation for the period 2021-2027, CESCI

6 Ibidem

For the real state of economic cohesion in a given region, an economic analysis is made, focusing on cohesion rather than on sectoral taxonomy. “All economic sectors are analyzed (primary, secondary, tertiary) by applying traditional methods, but the induction is shaped differently, emphasizing the factors for economic cohesion of the Danube region. The focus of the study is on the general and complementary economic characteristics (existence of parallel or complementary economic sectors; potential for development of vertical integration; set of economic infrastructure, etc.) of the macro-region”[7][2].

An analysis is also made of the third direction of cohesion - social. The success of transnational cooperation is mainly determined by the way in which local actors participate in its implementation. The level of social cohesion in the transnational area is measured by analyzing its demographic characteristics, the peculiarities of migration, social differences, labor supply and its mobility, the level of education and employment, interethnic and cultural relations.

All analyzes are set out in planning documents (national, macro-regional strategies, plans, sectoral analyzes and related EU policy documents) of the target area. These are the documents that provide possible development guidelines for funding. All these materials and regulations at EU and national level must be assessed in an interconnected way.The analysis ends with a summary (SWOT - analysis), listing the factors that strengthen and weaken the territorial, economic and social cohesion in the considered transnational region. These summaries are the basis for identifying territorial, economic and social challenges to cohesion.

On the basis of the typical and the specific, as a characteristic of the shrinking cities, a methodology for their study is developed, peripheral and the respective “shrunken” from functionality to the riparian spaces. The methodology includes:

1. **Research** such as determining the points of intervention for sustainable use of cultural heritage, archetypes of the Danube settlements: research on morphology and local values; study of shrinking cities and shrinking functions with growing potentials along the Danube; mapping a network of local stakeholders and completing the DANUrB platform; local documentation for cultural and natural heritage for development, analysis, preservation, exhibition and socialization.

2. **Planning tools** - creation of planning tools and development documents for maximum impact; centers - peripheries, border situations: defining different possibilities for action; planning an optimal medium-term equilibrium for shrinking cities and functions; creation of new cooperatives of stakeholders using the DANUrB platform; local heritage development plans.

3. **Education** - raising awareness for sustainable use of cultural heritage at local, regional and international level; education for intercultural and cross-border values; promoting the values of the periphery and the slow life in a local and interregional context; promotion of local values and products based on a regional quality assurance system; promoting local heritage in international tourism.

4. **Actions** - implementation of the Danube heritage in action: local, regional and international projects; network of peripheral and border cities of the Danube for the formation of competitive regions; regional building of a brand of initiatives of the local communities along the Danube; cooperation

7 Analysis of territorial challenges, needs and potentials of the Danube Region and strategic options in view of the Transnational cooperation for the period 2021-2027, CESCI https://www.cesci-net.eu/docs/DTP_3a_Final-Territorial-Analysis.pdf

projects involving cultural heritage; heritage valorisation projects for sustainable tourism.

The methodology includes research and development of the territory in the following four priority areas:

Priority 1. Creating an innovative and socially responsible Danube region

According to the Innovation Union flagship initiative of the Europe 2020 strategy, in the countries of the Danube region, the program covers a number of innovative topics in the field of cooperation - eco-innovation, knowledge transfer, cluster policy, social innovation and skilled entrepreneurship, including technological and non-technological aspects of innovation. The social dimension such as social innovation, educational aspects and entrepreneurial skills are given great importance. Research and innovation are also interlinked with other thematic objectives of the program (6). The objectives covered by Priority 1 are:

- Improving the framework conditions for innovation;
- Increasing the competencies for business and social innovations;
- Implementation of DTP achievements in innovation and competencies.

Priority 2. Protection of the environment and culture in a responsible Danube region

The Danube Transnational Program strengthens joint and integrated approaches to the conservation and management of the diversity of natural and cultural values in the Danube Region as a basis for sustainable development and growth strategies. The program also envisages investing in the creation and / or maintenance of ecological corridors of transnational importance in the region. Such intervention is directly related to water management and control of risk factors affecting the environment (flood risks). Disaster prevention and management is considered in relation to the risks posed by dysfunctional ecosystems and man-made climate change. The objectives covered by Priority 2 are:

- Strengthening transnational water management and flood risk prevention;
- Promoting the sustainable use of natural and cultural heritage and resources;
- Promoting the restoration and management of ecological corridors;
- Improving preparedness for environmental risk management.

Priority 3. Maintaining a better connected and energy responsible Danube region

The cooperation program also addresses common challenges related to environmental issues - noise levels, low-carbon and safe transport systems, including inland waterways and ports, and multimodal connections, to contribute to sustainable regional and local mobility, modal integration and intelligent transport. It aims to support regional connectivity and balanced accessibility of urban and rural areas. Better management of regional mobility and border permeability at regional level ensures that urban and rural areas take advantage of the opportunities created by the main transport networks developed at European level. Energy is a typical issue for a transnational approach. It is essential for market integration and more effective regional planning, and to jointly identify the most critical infrastructure problems. Intelligent distribution systems are

another aspect of the region's development. The program aims to contribute to the development of smart energy distribution systems, to the construction of renewable energy sources, to increase energy efficiency and to more efficient smart grids. The objectives covered by Priority 3 are:

- Support for ecological and safe transport systems and balanced accessibility of urban and rural areas;
- Improving energy security and energy efficiency;
- Application of DTP achievements in sustainable transport and energy;
- Better governance of the Danube region.

Figure 2: A map of 'Danurb+ cultural heritage sites' Source: www.danurb.eu.

Priority 4. Institutional cooperation and capacity

Establishing institutional cooperation under the program, together with good governance for confidence-building and social capital, must contribute to improving the legal and policy framework, developing strategies and action plans, developing joint capacity and coordinating the provision of services in large areas. societal challenges such as labor market policies, education systems and policies, demographic change and migration challenges, inclusion of vulnerable and marginalized groups, civil society participation and participation planning process, cooperation and partnership between cities and rural areas, cooperation on issues of safety, justice and security. The objectives covered by Priority 4 are:

- Improving the institutional capacity to address major societal challenges;
- Support for the management and implementation of the EUSDR;
- Achievements of DTP in management;
- Improving institutional capacity.

2. DANURB + PROJECT

2.1 Nature of the DANUrB + project

The DANUrB + project was launched in July 2020 to activate the underused cultural heritage and resources in the peripheral and border regions along the Danube. It is co-financed by the Interreg Transnational Danube Program 2014-2020. The project concerns the implementation of priority 2. The expected result is to increase local development and international tourist attractiveness [4].

DANUrB + means creating a DANube urban brand, building regional and local sustainability through the valorisation of the Danube cultural heritage.

DANUrB + aims to activate the underutilized cultural heritage and resources in the shrinking settlements in the peripheral and border regions of the Danube River in order to create new opportunities for cities and regions to become attractive again.

The stage DTP 1-249-2.2 DANUrB is being upgraded, in which the foundations of the Cultural Alley have been laid - a promenade with a strategy, a functional platform based on a wide cultural network and thematic areas. At DANUrB, the tools are most useful for peripheral and border regions, where there is a serious breakdown and contraction of socio-economic status and can only rely on the development of the Danube's special resources.

DANURB + creates a dense network of stakeholders and projects along the Danube. The aim is to build capacity for local stakeholders to enable them to work together at local and interregional level to valorise their Danube heritage with local actions under a single brand, strong enough to increase local prosperity and international tourism attractiveness. .

DANUrB + contributes to promoting the sustainable use of cultural heritage and resources in dwindling communities along the Danube.

The project consists of 4 horizontal thematic areas. They are:

- Interregional network as an opportunity;
- Shrinking cities as a challenge;
- Local residents and their cooperation as an asset for development;
- Heritage as a tool.

In this work matrix, the goals of DANUrB + become clear and easy to follow. The novelty of DANUrB + is that it builds on these strategic goals and involves real stakeholders with their action plans, applicable in all sections of the Danube, and the initiatives are marked by inclusive and effective approaches.

2.2 Objectives and priority of the DANUrB + project

Specific objective - Promoting the sustainable use of natural and cultural heritage and resources.

The main goal of the project is to create a complete unified spatial and cultural network, "Danube Cultural Alley-Promenade", connecting all communities along the river, in one brand tourist destination, offering thematic routes and developing opportunities that can increase the number of visitors. and to extend their stay in the region.

Priority - Danube region, responsible for the environment and culture.

2.3 DANUrB + project platform

The DANUrB + platform combines good practices for cultural and historical heritage. The DANUrB + platform has been activated and is ready to enrich its content with good new practices of cultural and historical heritage in the Danube regions. This is done through partnership meetings. They bring together online partner organizations from 6 Danube countries (Bulgaria, Croatia, Hungary, Romania, Serbia and Slovakia). As a result of the previously implemented DANUrB project, the platform already contains 450 traditional local customs, attractions and other valuable culture and historical heritage. The DANUrB + project aims to increase the number of cultural and historical heritage collected, raise awareness and increase the visibility of the platform [4].

Three brand new PocketGuide strands are launched as a continuation of the previous DANUrB project. Work continues on DANUrB + films, school curricula, university projects, stakeholder cooperation and the creation of a "DANUrB + Quality Label". Good practices and partnerships are monitored, such as between Hungary and Slovakia - theme parks and EGTCs.[8]

Demonstrations of the DANUrB platform are held during the online meetings - a short training on its interface and its functionalities.

DANube Urban Brand - works to build a regional network through tourism and education to strengthen the "Danube" cultural identity and solidarity.

2.4 Compilation of DANUrB + atlas

We are also working on a version of the DANUrB + atlas, which will contain demographic, economic and spatial and morphological maps of the shrinking settlements on the Danube. The collection of international, cross-border and regional projects continues in addition to the so-called "Danube Cultural Promenade" [1].

2.5 DANUrB +

With the establishment of the DANUrB cultural network, the regional cultural identity of the Danube region must be strengthened and a common brand created by promoting transnational cultural links between the settlements along the river. The study of unused or hidden resources of cultural and social capital is expected to improve economic and cultural potential and contribute to a synergistic effect [3].

The project partners - relevant universities, research and development centers, regional municipalities, cultural NGOs, tourism councils and market-based professional agencies - will create a network and a common platform to work on a sustainable cultural and tourism strategy, proving that a a common Danube city brand can have a synergistic effect - social and economic benefits [3]. It is very important in this process that international knowledge and practices will be applied in local conditions. The closest cooperation with the communities and regional stakeholders of the 7 Danube countries is the creation of a common strategy based on an individual approach and site-specific. The aim of all this is to ensure the sustainability of the results of the project, expressed in the sustainable maintenance of the Danube Cultural Alley - a promenade of local neighboring communities with economic independence, ie. stimulating the development of tourism and the cultural industry.

8 EGTCs European Territorial Cooperation Groups (EGTCs) have been set up to facilitate cross-border, transnational and interregional cooperation between Member States or their regional and local authorities. EGTCs allow these partners to implement joint projects, share experiences and improve the coordination of spatial planning.

Figure 3: Atlas of Danubian shrinking cities (Metodology) Source: Antonić Br., Djukić Al., Atlas – Metodology: Profiling periferial shrinking cities in the middle and lower Danube region, University of Belgrade – Faculty of Architecture, Belgrade, Serbia [1].

CONCLUSIONS

The implementation of the DANUrB + project it is expected to achieve:

- Increasing the intensity of the cooperation of the key participants in the program area, in order to strengthen the sustainable use of the natural and cultural heritage and resources;
- Creation of a new network of "DANUrB" communities to cooperate in the common valorization of their cultural heritage and resources;
- Building a common platform for research and reconstruction of common heritage and identity, themed around the similarities and differences of the local cultures of the settlements on the Danube;
- The project partners to work on the joint development of cultural and spatial resources, and the creation of economic value from new tourism products, as well as social cohesion through a common interpretation of their cultures;
- Establishment of institutional cooperation and networks for cooperation - cultural heritage - arts and tourism;
- The main result of the program is to build a new model for cooperation in the use of common resources of cultural heritage on the Danube, synchronizing research institutions, politicians, cultural institutions and members of civil society from the 7 countries working on a common strategy based on of cultural sustainability;
- Promoting the sustainable use of natural and cultural heritage and resources;
- Strengthening joint and integrated approaches to preserving and managing the diversity of natural and cultural heritage and resources in the Danube region as a basis for sustainable development and growth strategies;
- Protecting the environment and promoting resource efficiency by preserving, protecting, promoting and developing the natural and cultural heritage.

Such organization of work and implementation of the project should lead to the construction of peripheral, border areas and, respectively, settlements1u, which should bear the marks of healthy territories and settlements.

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Challenges of Creating a Low–energy House in Bosnia and Herzegovina, Case Study: House VLHS

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ABSTRACT

Designing and constructing low-energy buildings, buildings which consume up to 70% less energy than code-compliant buildings of the same type, is a difficult task in itself globally, but when viewed within the context of underdeveloped building industry and deregulated legislative system of Bosnia and Herzegovina this experience tends to become even more challenging. This article aims to present an almost five years long process of designing and building a house as such in Mostar (B&H), while explaining it from the first-hand point of view. This case study will try to develop general conclusions regarding threads, challenges and obstacles observed within the process and hopefully contribute regarding the process of creating guidelines for similar situations, within similar contexts.

Keywords: *House VLHS, Low-energy building, Sustainable architecture, Passive house.*

INTRODUCTION

House VLHS is a single-family home, situated in the sunny Mediterranean surroundings of rural Herzegovinian landscape, below southern rocky mountains of Bosnia and Herzegovina, near the beautiful Neretva River, and relatively close to the rich cultural heritage within the city of Mostar. In essence, this building is a successful outcome of almost a four-year long struggle regarding design and development process, which, at the end, was recognised and awarded as the Best Built Design at the yearly exhibition Collegium Artisticum 2021, traditionally organized by Association of Architects in Bosnia and Herzegovina. Complete design, construction management and construction control was done by the Sarajevo based studio *Filter Architecture*, with the authors listed in the following order: Vedad Islambegović - project leader, Ibrica Jašarević, Asmir Mutevelić, Nedim Mutevelić and Kenan Vatrenjak.

In terms of design, spatial organization, and final materialization of space, this building seeks to create a healthy micro-environment that provides its users with a high level of comfort and security while stimulating them to enjoy active outdoor life. The house itself is an open system with no clear boundaries between outdoor and indoor space, and it is highly customized to meet the specific needs and habits of the users.

Figure 1: House VLHS, south-west elevation © Anida Krečo.

Besides being unconventional in terms of conceptual, programmatic and spatial design within the general context of Bosnia and Herzegovina, this building is also unusual because it tends to contribute the general urban health in terms of being a low-energy edifice which audits only 12.7 kWh/m^2/year, for a net conditioned area of 600 m2. This outstanding environmental result, at least in comparison to local standards, was achieved by various methods which include careful spatial distribution and planning, as well as elaborate engineering and usage of relatively sophisticated technical means. When these kinds of requirements are brought in touch with deregulated and underdeveloped, economic and social

conditions of Bosnia and Herzegovina today, the task of creating architecture as such becomes a demanding challenge. Dysfunctional and slow building permission bureaucracy, lack of public subventions for low-energy buildings, underdeveloped and unspecialized construction industry, deficiency of specific construction materials and systems, are only some of the issues that one has to face when involved in development of a low-energy design.

This article will try to explain the House VLHS in conceptual and technical sense, while paying attention to the threads, challenges and obstacles which kept emerging during the construction process. The text will present data that predominately relies on a first-hand experience of the architect involved. As such, the article might provide helpful insights for similar attempts to create energy-saving, environmentally friendly, healthy built environments in contexts that are connatural to Bosnia and Herzegovina.

CONCEPTUAL EXPLANATION OF THE HOUSE

In a conceptual sense, the House aims to recreate spatial patterns inherent to traditional Herzegovinian culture and urbanity. Therefore, at the level of direct, first-hand experience it resembles a notion of a small Herzegovinian village placed under "one big roof".

Viewed in a larger scale, the volumetric layout of the House consists of carefully scattered 'box-like structures' set on a leveled platform which follows the slope of the terrain. While being situated under the regular geometry of a shallow quadruple ceiling, 'Boxes' represent intimate and servant units of the house, that are circling around the central atrium and are forming "public'' street-like corridors, 'plazas' and 'squares' in-between them, as can be seen in figure 2. As a consequence, the inner landscape of the House contains a variety of different scales created in the act of collision between the regular geometry of boxes and the irregular geometry of the roof, while a multitude of visual and pedestrian "gaps" towards the outside are emerging as a consequence of the fragmented horizontal layout. In such spatial conditions roof begins to be experienced as a canopy and thus a strong bond between inner space and the surrounding landscape appears as an outcome.

Apart from its phenomenological and utilitarian role, layout as such is proposed in regard to various environmental reasons. For example, a multitude of horizontal openings which are scattered all around the house allow easy and effective cross-ventilation, while the central atrium serves the house as a certain kind of solar-chimney which pulls out the hot air and allows the constant air flow at the shaded terraces (Allard, 1998.), as visible on figure 3. Fragmented structure of the house is organized in a way which serves to enhance efficient control of the sun entering the house through the glass. For the same reason the size of the roof eaves is unequally distributed all around the house, in accordance to the orientation and the expected angle of the sun.

Observed on a smaller scale, the House is designed as a series of separate experiential sequences, whereby each single element of space is equipped differently, in dependence to the activities or functions which are associated with it. For example, the space at the entrance into the atrium is equipped with a lattice for fragrant creeping roses, as visible on the figure 4 and figure 5. This was done in accordance with Herzegovinian customs, according to which, the scent should 'welcome visitors' before entering the house. For similar reasons, a bench is placed to the wall right next to the main entrance, which, apart from serving its basic function, also serves as a shade above the storage space for

outdoor footwear. High terrace inside the atrium is equipped with the outdoor 'sleeping niche', a space which is to be used as a bed for occasional sleepovers in the summer season. At the openings which lead to the attic, wooden ladders have been installed which not only serve as ordinary ladders, but also as 'Swedish ladders' and a hanger for portable shelves. These examples, as well as many other, purpose-designed sequences, are created in order to contribute to the general impression of multiformity inside the house, by generating a multitude of different corners serving specific activities, events and moods.

Figure 2: House VLHS, ground floor plan © Vedad Islambegović.

A specific detail situated in the centre of the atrium is a small 'stream', the element of water surrounding a tree placed in the middle of the composition, as visible on the figure 4. Apart from the sound it creates - water murmur, it also contributes to the creation of a more comfortable climate in the main outdoor seating place while psychologically producing an atmosphere of a cooler environment (Hadrović, 2010.). This spatial element also serves as a useful utility - an above-ground watercourse connecting a house well and a water tank for garden watering. It additionally waters the tree, whose canopy should cover most of the atrium and thus in the foreseeable future make the house climate

even more enjoyable (Hadrović, 2008.). Indirectly, the element of water in the centre of the house pays homage to the ruined hotel 'Ruža' in Mostar, the work of Aga Khan Laureate and Bosnian academician, Zlatko Ugljen.

Figure 3: House VLHS, natural cooling and ventilation principles, together with mechanical systems © Vedad Islambegović.

Figure 4: House VLHS, central atrium with the tree and the element of water © Anida Krečo.

Figure 5: House VLHS, entrance to the atrium with the lattice for the fragrant creeping roses on the left, and a detail of the small "stream" inside the atrium on the right © Anida Krečo.

TECHNICAL EXPLANATION OF THE HOUSE

In technical terms, the VLHS House is a low-energy facility, whose heat transfer coefficients range from 0.114 to 0.326W/m2K, and which is therefore classified as category A of the energy passport (Humm, 1998.). The simulated and achieved energy requirements of the house needed for heating, cooling, and ventilating amount 12.7 kWh / m2 / year (421,57kWh per month) for the 612 m2 of the conditioned area, which at current electricity prices roughly represents an expenditure of 28 euros per month. Besides these figures, a 10-hectare property consumes an additional 18,141 kWh / year for irrigation, pool use, lighting of the entire property, and power supply of household appliances, which approximately represents the cost of 100 euros per month.

Although it is placed far from the sea, the house is situated in a sunny Mediterranean surrounding of rural Herzegovinian landscape. The climate in this area is characterized by long, hot, and dry summers in which temperatures can reach up to 45 ° C, while winters are windy and mild, with temperatures down to -6 °C occasionally. Generally, this area is well known as the hottest part of Bosnia and Herzegovina, having the highest number of sunny days in the country. Therefore, special attention had to be paid in regard to the environmental stability of the house in the summer regime (Šimetin, 1983). This was achieved by the correct orientation of the space, the correct choice of materials, the appropriate mass of the building, the ventilation layers inside the fencing surfaces, and proper mechanical systems (Bradić, 2013).

The house is equipped with an external passive heating and cooling system that relies on the air-water heat pump technology, combined with the inner system of floor heating/cooling and fencoil devices, which is partially visible on the figure 3. Due to the low air exchange coefficients of the whole house, especially regarding its openings, energy recuperating mechanical ventilation has been installed as a supporting mechanical system. During the summer, spring and partly during the autumn season, the hot water system of the house relies on the solar heat collectors, which have been installed outside the house, as a part of the carport, in order to achieve easier long term maintenance. Photovoltaic panels have not been used in this case due to the fact that their price was far above 1$ per Watt during the time of the design, as well as due to the underdeveloped network exchange systems and non-transparent legal procedures in Bosnian and Herzegovina which are related to it. However, as prices of photovoltaic cells have dropped significantly and tend to drop further, it is reasonable to expect that a small-scale solar power-plant will emerge next to the house in the foreseeable

future (Carter, 2006.). In a case as such, connection to the existing electrical system will be easy to establish because all necessary outlets have been installed already.

The walls of the house are built of massive brick blocks that are interconnected with a special polyurethane masonry glue, in order to reduce the thermal bridges at the positions of the joints in the wall up to 17%. The size of the structural part of external walls varies from 38 cm, up to 50 cm depending on the specific conditions such as orientation, aside from the basement walls which were made from 25 cm thick concrete. Inner walls are also massive and their thickness varies from 20 to 25 cm. Vertical and horizontal masonry wall reinforcement was retracted for the size of 10 cm and covered with the extruded polystyrene, in order to equalize the heat transfer coefficients between the masonry surface and the surface of the concrete reinforcement. Generally, in this case massive structural walls were used in order to increase the total mass of the building and in order to magnify the overall thermal capacity of it.

Figure 6: House VLHS, ventilated façade details © Vedad Islambegović.

For this reason walls in the sleeping area are especially massive and all rooms are covered with the upper concrete slab. In this manner rest rooms tend to naturally have lower temperatures than the rest of the house, especially at night.

The remaining space between the upper concrete slab and the roof additionally forms a thick buffer layer of air above the rooms. This space additionally serves the house as the attic, as well as the space for the mechanical equipment and installation lines.

In addition to thick masonry walls and concrete slabs, the mass of the building has been additionally increased by using the thick and heavy layers of the concrete mortar and plaster cladding used at the inner side of the house. For the same reason predominant pavement of the house has been made from the 3 cm thick white stone, and some inner walls have been cladded with the 15 cm thick rough stone masonry. Besides being very useful in a micro-climatic sense, these stone surfaces tend to cross outer-inner space boundaries, and in this manner add more to the phenomenological experience of the house not having a clear separation between the external and the internal landscape.

All surfaces of the house which are in connection with the external environment, including those in touch with the ground have been covered with the thermal insulation which varies in size from 10 cm to 20 cm. Ground floor concrete slabs have been sided with the 10 cm thick layer of the extruded polystyrene facing the earth, and with 8 cm thick expanded polystyrene facing the upper surface of the slab. Foundation walls as well as basement walls have been treated in the similar manner, while having 10 cm of extruded polystyrene on the sides of the wall which are facing the earth. While the majority of external walls are covered with different types of ventilated facades which include at least 15 cm of low λ mineral wool, some external walls of the house, those which belong to the service areas, have been covered with 15 to 20 cm of extruded polystyrene.

Figure 7: White roof viewed from the air © Vedad Viteškić.

As visible on the figure 6, two types of ventilated facades were used on the building: a facade with a 15 cm thick masonry coating and a monolithic ventilated facade with a base of mineral-lime plates. Besides final cladding, these systems by default include 3 cm of the ventilated air gap and at least 15 cm of the mineral wool. Both types were relatively difficult to build because supporting systems

were not available in Bosnia and Herzegovina, they were too expensive to import due to the relatively small amount needed on the construction site, and difficult to implement in relation to unconventional types of the building. Therefore, supporting systems used in this case were locally custom made, while using reverse engineering methods. That is to say, standard systems which were not available, were examined and contextualized in order to make a similar system which could be produced locally on a small scale.

Total heat transfer coefficients at the glassed surfaces of the house range from 0.07 to 0.9 W/m2K, and are covered with low-e glass in three layers. Used systems had to be imported from abroad, specially tailored locally, and installed according to the manufacturer's instructions. In order to do this local co-manufacturer had to be trained. Unfortunately, many mistakes were made during the process.

A special challenge in the project was the roof surface and its overheating problem in the context of sunny Herzegovina. Its basic structure consists of the high-span laminated wood beams having a cross section size 40 x 20 cm, while the secondary structure was made in three layers of ordinary having a cross section 5 x 8 cm. The space between the primary beams was filled with 30 cm of low λ mineral wool, while the space between secondary elements was filled with the additional 10 cm of wool in order to achieve the U value of 0.11 W/m2K. In addition to thermal insulation, a 10 cm thick ventilating layer was used to produce the airflow beneath the surface of the roof, while white coloured tiles were used as final cladding[1] to reduce thermal burden to an unavoidable minimum.

Relying on the rich heritage of stone carving of the Neretva basin, the House was built with a wide spectrum of different indigenous materials, ranging from paving of the house made of white Mostar stone called 'Živac', through protected wall surfaces lined with Herzegovinian 'Tenelija'[2], all the way to the rustic facade coating made of limestone from the Velež mountain tops. It is very likely that one of the last generations of people who practiced this, unfortunately, extinct craft, showed their craft skills at this house.

THE PROCESS OF DEVELOPMENT AND CHALLENGES ASSOCIATED WITH IT

Development of the house lasted almost four years, while two years and nine months were dedicated to the process of intensive construction. Conceptual design, together with the development of the major technical drawings lasted a year, while detailed technical drawings were being made all the time throughout the process of development. Preliminary design process started in 2014 and lasted until 2015, while the process of construction started two years later, in 2017 and lasted until 2020. As visible from the presented dates, the project experienced a two year delay in development, due to health issues experienced by the construction site manager and private issues experienced by the client.

Challenges which were experienced during the process of development can be roughly divided in two categories: government policy and support in regard to low-energy buildings, and the general problem of the underdeveloped construction industry in Bosnia and Herzegovina.

1 Visible on figure 7

2 Tenelija – a stone categorized as Oolite limestone.

Figure 8: House VLHS, construction phase details © Vedad Islambegović.

First category of challenges represents only a small part of the policy problem that anyone involved in the construction process can experience on an every-day basis, ranging from the lack of regulatory and urban plans, across prevailing bureaucratic clutter, excessively slow processes, up until complicated and expensive process of obtaining building permissions. However, several specific observations concerning low-energy houses can be made in this regard, from the experience of the VLHS House:

- The process of obtaining building permits for low energy buildings lasts equally long in comparison to standard buildings, and in this particular case it lasted even longer - more than one year and six months. Reason for this delay can be found in the fact that project documentation literally "got lost" inside the bureaucratic mess within the local municipality. Luckily, client had preserved initial documents which marked the fact that the project was handed over to the municipality, but the process of obtaining permission had to be restarted. In the end, it lasted two years. From the direct, on-site experience one can claim that many informal buildings which were being built nearby, at the same time as this house, got their permissions retroactively much sooner than this particular one. Although this experience does not only concern low-energy buildings, it represents a rather discouraging start of the process, especially from the point of view of someone who, in environmental sense, is trying to build something that reaches beyond the average.
- The process of obtaining building permits for low energy buildings costs equally in comparison to standard buildings, and equally in comparison to the process of legalization of informal buildings. As irrational as it may sound, compared to first two cases the third one appears to be even more cost effective because it saves time in the beginning of the process.
- Initiatives to support or to subsidize low-energy building are lacking at the levels of local or national government. This may vary regard to the different state entities and cantons, but at the time when this house was built there were almost no subsidies that could be useful in the process of development. However, one private bank was offering limited interest-free loans for low energy buildings, with the help of EU grant. Again, this

subsidy was not provided by the local or national government.

- Specific materials and systems which are necessary for low-energy construction development are not subsidised as well. As one could debate, it would be reasonable for some necessary systems which have to be imported to be exempt from VAT, or at least to have reduced VAT. The same could be done for the insulation or for the low-e wall/roof materials.
- Photovoltaic systems are problematic to use in the context of Bosnia and Herzegovina due to the underdeveloped network exchange systems and non-transparent, complicated legal procedures which are related to it.

Second category of challenges strongly relates to the general problem of underdeveloped construction industry in Bosnia and Herzegovina, with specific problems related to low-energy construction:

- Construction industry in Bosnia and Herzegovina lacks the specialised and trained labour force in terms of low-energy systems. This problem is also a broad issue of the construction industry in general, because the qualified labour force is leaving the country due to low wages and low living standard in this economic sector. In the case of House VLHS, it was relatively hard to keep the flow of construction intact, due to the constantly present lack of labour force, labour fluctuation and especially lack of qualified labour force, such as professional bricklayers, stonemasons, tinsmiths, welders and many other.
- Construction industry in Bosnia and Herzegovina is inexperienced in terms of low-energy development. Although house VLHS had many experienced artisans involved in the process, none of them had any previous experience with building a low-e building. Before the start of any unconventional activity on the construction site many elaborate explanations and technical drawings had to be made on behalf of engineers involved. In many instances craftsmanship had to be additionally educated, which was additionally slowing down the process.
- Time needed for implementation of unconventional low-energy systems and materials is almost impossible to calculate by using available time norms provided by manufacturers. This problem is closely related to the lack of experience in regard to new materials in the Bosnian construction industry. For example, the masonry construction process with special masonry glue took three times more time than expected because clay blocks were heavier than standard ones, they were harder to cut because special equipment was needed, and craftsmanship was hesitant to use it.
- It is hard to estimate the consumption of unconventional materials despite the norms provided by the manufacturer. This problem proved to be a case on many occasions at the VLHS construction site. For example, much more concrete, up to 30% more than calculated, was used in horizontal wall reinforcements because the gaps in the masonry blocks were sucking too much concrete inside, and it took a while for the engineers to come up with the solution. In another instance, mortar on the masonry blocks kept cracking because the thick blocks were absorbing the water more quickly than expected, so many walls had to be overdone for two times. Some quantities of material were also lost due to the lack of adequate tools.
- Support systems on behalf of manufacturers are insufficient, especially when unconventional materials are being used. The main reason for this issue is, again, lack of experience even on behalf of people representing the

manufacturer in Bosnia and Herzegovina. In the case of the House VLHS, engineers were misinformed by the representatives of the manufacturer, or were given too many technical instructions to read without any direct, on-site support.

- Some unconventional materials and systems are extremely hard to obtain in Bosnia and Herzegovina, especially in small quantities, and if inevitable, they have to be custom made locally. As mentioned before, this was the case with the structural support systems for the ventilated facades at the VLHS building site.

Despite many obstacles and challenges which emerged during the construction process, the House VLHS did not suffer almost any reduction or deviation compared to what were the original goals of design. Although most of the work was done in a manner that is far above the local average of expectation, the most important resource that was sacrificed during the process was the time itself.

CONCLUSION

As can be noted in the above, all artisans involved in the construction process were faced with a number of challenges such as atypical building systems, specific details/elements of space, complex spatial-geometric relations, unusual technology and the general problem of underdeveloped construction industry in Bosnia and Herzegovina. However, when observed from the time distance, the long and exhausting experience of working on this project did not present a process of creating just another house, but rather an exciting learning journey and an adventure of building friendships, which finally resulted in creating a micro-community gathered around a mutual feeling of pride related to the accomplished result.

Presented experience shows that almost all challenges which emerged during the process of development are either policy related or related to the lack of practical experience in regard to low-energy construction.

The latter challenges might probably be solved as the number of low-energy buildings rises in Bosnia and Herzegovina. In this sense more companies and craftsmanship would obtain necessary experience and hopefully, some of them would become specialized. Further on, if eventually low-energy buildings start to rise in numbers, materials which are viewed as unconventional at the moment, would become more conventional and easy to obtain.

However, in order to have low-energy buildings more present in the environment of Bosnia and Herzegovina many of the state policies have to be changed, especially those which elaborate the issue of economic subsidies. Hopefully this aspect will be approved in the foreseeable future, as the country will continue to approach legislative standards of the European Union.

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Inclusive Education in Macedonia - Analysis of the Current Situation and Identification of Architectural Barriers

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ABSTRACT

Obtaining proper education is an essential aspect towards a better quality of life. In spite of the fact that education is a basic right of every child, many groups of children are not provided with the same opportunities to education. Among many challenges that our country faces towards inclusion, naming prejudice and poverty, findings show that building design is a major barrier to education for children with special needs. In a modern society with increasing demand for accessibility and quality, inclusive education must be embraced and planned adequately. Although inclusion is mentioned in the education strategy for 2018-2025 in Macedonia, many schools are not fully equipped or prepared to serve children with special educational needs. This paper attempts to discuss Macedonia's progress in implementing inclusive education, by analysing the current institutional framework of the education sector and infrastructure constraints in mainstream schools. Data has been collected from different schools to learn about the current status of primary schools and to know whether or not they have been transformed into inclusive learning environments. While some school buildings were supposedly well resourced and supported, others were in need of such resources. These schools need to adapt the learning experience to suit each child's differences. The research also focuses on understanding the symptoms and effects of disablement, for the purpose of a more careful understanding of the specific accommodations and requirements of a disabled user. Based on building codes and regulations in the field of inclusive schools, informal interviews, direct observation, and analysis of user's needs, design guidelines are established. Aspects such as movement, space, safety, nature, colour, light, shape, patterns and wayfinding are thoroughly analysed. Analysis and discussions of how the previously mentioned aspects can have a direct and lasting impact on the growth and development of children are brought in conclusion.

Keywords: *Inclusive education, Architectural barriers, Children with disabilities.*

INTRODUCTION

The purpose of inclusive education is to provide a better-quality education for all children, by finding different ways of teaching, so that every child can actively participate in co-curricular and extracurricular activities and gain positive experiences through regular education.

Respecting the principles of "Education for All", the Republic of North Macedonia is engaged in providing quality education for all children, including children with special educational needs. However, this process does not rely on a long tradition, it started in recent years and although efforts are made, a limited understanding on how to deal with disability issues is still evident (Hasipi, Hajrullai, Trpevska, Samardziska-Panova, & Conteva, 2018).

The implementation of inclusive education depends on multiple factors, starting with appropriate conditions and physical accessibility in schools. In order to obtain an objective picture of the situation with inclusive primary education in the Republic of North Macedonia, in terms of the accessibility of the built environment, this research takes place in several stages:

1. Analysis of user's needs and their impact on architecture;
2. Collection and analysis of relevant information (building codes and regulations, informal interviews) that would facilitate for a resolution of the problem that has been presented;
3. Observation and analysis of primary schools, on the degree of inclusiveness, with detailed report of conclusions and future recommendations for better quality inclusive education.

The infrastructural attributes of a learning environment can make a space feel more or less compatible and motivating for learning. Aspects such as movement, wayfinding, space, safety, nature, color, lighting and acoustics are distinguished as basic elements towards the inclusion or exclusion of children in mainstream schools. Considering that the safety of children is an incredibly delicate and serious matter to deal with in any setting, we assumed that is more convenient, this element to be handled and thoroughly explained in a further research.

Space and movement will be treated in relation to accessibility, in order to define necessary improvements to the physical environment of the school (such as rearranging room space, removing obstructions, provision of ramps, equitable doorways, adapted toilets, and wayfinding systems). Color, texture, acoustics and lighting, as well as landmark features, will be considered in helping people orientate themselves on their journey around the school.

UNDERSTANDING DIFFERENT NEEDS

Children develop at different rates and have contrasting ways in which they learn best. Just because a child is making slower progress than expected, doesn't necessarily mean that the child has special educational needs. However, where there are concerns, an identification of children who have any difficulties is required as soon as possible so that appropriate support can be given from an early age. The purpose of identification is to understand what measures the school needs to take, not to place a student into a category. The SEND Code of Practice 2014[1] (updated April, 2020) presents four broad areas of special educational needs:

1 The SEND Code of Practice is statutory guidance for organisations that work with and support children and young people with special educational needs and disabilities.

Cognition and Learning (C&L)

This category includes moderate, severe or profound learning difficulties or specific learning difficulties, such as: Aphasia-an impairment of language, which affects speech, writing, and ability to understand language, dyslexia- difficulty with fluent word reading and spelling, dyscalculia- a condition that affects the ability to acquire arithmetical skills, memory difficulties-difficult time remembering past events, new events, or both, etc. Children who have these needs require specific strategies to help their learning and understanding (Sims, 2019).

Social, Emotional and Mental Health difficulties (SEMHD)

Children and young people may experience a wide range of social and emotional difficulties, which may take on the form of highly disruptive behavior, or showing a tendency to be withdrawn. Schools should control disruptive behavior so it does not adversely affect other pupils. Children with these needs may require a structured learning environment, with clear boundaries for each activity and a comfortable distance between themselves and others. They may need a safe place to calm down (Hawkins, et al., 2014).

Communication and Interaction (C&I)

Children with a speech and language impairment or delay, children with learning difficulties, those with a hearing impairment and those who demonstrate features within the autistic spectrum, may need specialist support, speech and language therapy, alternative forms of communication and a quiet place for specialist work. They need an environment with easily understood layout, low level of distraction and sensory stimulus to reduce anxiety or distress (Hawkins, et al., 2014).

Physical and/or Sensory Needs (P&SN)

Some children have a physical disability which prevents them from making use of the educational facilities generally provided. Children with motor impairments may use mobility aids, wheelchairs, or standing frames, whether they are able to move around independently or need support, there should be sufficient space for them to travel alongside their friends (Mistrey, 2011).

Sensory disabilities are the disabilities affecting an individual's senses, such as hearing, sight, touch, smell, and taste. Children with sensory impairments may need particular acoustic or lighting conditions. Some may need extra space and additional 'clues' to help them negotiate their environment independently. The main types of sensory disabilities include blindness and low vision, hearing loss and deafness, deaf-blindness, and sensory processing disorder. Individuals with sensory processing disorder tend to misinterpret the sensory information where they either overreact to the information, under-respond to information, or not react at all (Abraham, 2017).

Overreaction appears when autistic children are hypersensitive to sensory information. They dislike bright lights, look down most of the time, and maybe frightened by sharp flashes of light. Usually are frightened by sudden unpredictable sounds (telephone ringing, a vacuum cleaner, baby crying). To block out the stimulus which the brain cannot tolerate, an autistic individual might hit their ears, press their eyes, twist, or make repetitive noises to block out other disturbing sounds (Daly, Daneski, Ellen, Sue, & Hawkins, 2007).

Figure 1: A neurotypical view of a learning environment compared to hypersensitive (analysis by the author).

Hyposensitive is the opposite of hypersensitive, the channel is not open enough and as a result, not enough information gets to the brain. An individual may not be able to see the world around them clearly. To get their nervous system working better an autistic individual might seek out loud noises, wear tight clothing or self-injure. These individuals are attracted to lights, they are fascinated with reflections and bright colored objects (Bogdashina, 2006).

Figure 2: A neurotypical view of a learning environment compared to hyposensitive (analysis by the author).

Leestma (2015) states that: The difficulty in understanding how the process of perception works for autistic individuals is that the process varies from person to person and can even fluctuate for an individual.

Now that we understand difficulties that these children face, this research will delve into aspects of how the built environment can serve to facilitate the learning, growth and development of children. Every aspect of the built form needs to be carefully considered as they are directly tied to the experiences of the users.

Table 1: Categories of special educational needs (SEN).

MAIN TYPES OF SEN	
1. Cognition and learning	
Specific learning difficulty	*Dyslexia, dyspraxia and dyscalculia come under this term.*
Moderate learning difficulty	*Greater difficulty in understanding concepts, associated speech and language delay, low self-esteem, low levels of concentration and underdeveloped social skills. It may occur as part of a larger condition such as Down's syndrome.*
Severe learning difficulty	*Difficulty in understanding, learning and remembering new skills and troubling with adapting these skills to daily life. Difficulties may be further compounded by emotional and behavioural issues, or within a diagnosed condition like autism.*
Profound and multiple learning difficulty	*A profound and multiple learning disability (PMLD) is when a person has more than one disability, with the most significant being a learning disability. People diagnosed with PMLD may also have a sensory or physical disability, or mental health difficulties.*
2. Behaviour, emotional and social development	
Social, Emotional and Mental health difficulties	*Attention deficit disorder (ADD), attention deficit hyperactivity disorder (ADHD) or attachment disorder come under this term. It also includes behaviours that may reflect underlying mental health difficulties such as anxiety, depression, self-harming and eating disorders.*
3. Communication and interaction	
Speech, language and communication needs	*Language and communication needs (SLCN) encompasses a wide range of difficulties such as a receptive language, expressive language, social communication and pragmatics, speech, fluency, voice, speech delay.*
Autistic-spectrum disorder	
4. Sensory and/or physical	
Hearing impairment	*Examples of physical disability include cerebral palsy, multiple sclerosis, epilepsy and spinal cord injuries. Sensory impairment refers to visual impairments and hearing impairments or sensory processing issues.*
Visual impairment	
Multi-sensory impairment	
Physical disability	

INCLUSIVE EDUCATION AND INCLUSION BY DESIGN

Inclusive education is about responding to diversity in all its forms and creating an education system to accommodate all. Inclusion is the process of adjusting educational settings, curricula, and buildings, to be able to include different pupils to receive appropriate education in one place (Stubbs, 2008).

The built environment can contribute to a more equal, inclusive and cohesive educational system if the places where we learn are designed to be accessible and inclusive. The process of designing inclusive spaces that can be accessed by every single vulnerable group of society, involves many different aspects of architecture, urban design and engineering, it is quite a complex task. But, the impact of these spaces on the well-being and the psychology of children could be incredibly positive if achieved.

ARCHITECTURAL DESIGN REQUIREMENTS FOR BARRIER-FREE LEARNING ENVIRONMENTS

Being mindful of architectural needs of all pupils (children with motor and physical disabilities, with cognitive, linguistic, visual, hearing and mental impairments) is essential in inclusive schools. Barrier – free design refers to the careful design and construction of the built environment (interior and exterior) so that one school building supports all the needs which pupils with disabilities can experience, by enabling accessibility, orientation, safety and usability on the physical, sensory and cognitive level (Degenhardt & Schroeder, 2016).

Degenhardt and Schroeder (2016) state that: "According to the universal design approach, the barriers to attending school for children and adolescents with disabilities that arise from the physical school environment may be categorized as follows:

- The way to school;
- The infrastructure of school buildings;
- Extracurricular learning spaces including transfer.

The way to school

When designing inclusive school environments, architects need to pay attention to the quality and accessibility of roads under different weather conditions, the distance from home to school, drop-off points for private and public transport, designated parking areas, clear pedestrian routes separate from vehicles and cyclists, steps or obstacles, signage and lighting. Some people, due to their disability or impairment have less awareness of the risks of traffic and this must be taken into account when the site is planned. Visual, audible and tactile information (such as a change in material or tactile walking surface indicators) should be provided to assist in orientation and wayfinding (Hawkins, et al., 2014).

The design and material of the path/route to the building from the parking area or the entrance of the site should be designed and constructed to enable all people to approach, enter and exit the building. Locations of accessible parking spaces should be clearly signposted at the entrance of the building site with information providing direction to designated parking spaces and to other accessible facilities. The use of the building elements, especially the location of the main entrance, needs to be clearly visible. Provision of ramps beside steps, elimination of obstacles, wide openings, adequate maneuvering space in front of the door are also important (ISO, 2011).

The infrastructure of school buildings

School designs should ensure full access to every part of the building, this relates to classrooms, school canteen, school administration, workshops or the school garden as well. Aspects such as circulation space and orientation (for users of wheelchairs, walking aids, and walking sticks), seating and workplace design (furniture and fixtures, space requirements) have to be taken into account when designing for children with disabilities. These students may need special support or therapy rooms, which have to be incorporated into the planning of school buildings as well (Degenhardt & Schroeder, 2016).

Horizontal circulation should be designed to facilitate ease of movement for all people, be accessible and easily understood. Where differences in level cannot be avoided, ramps or lifts shall be provided. All circulation areas should be wide enough for wheelchair users with slip-resistant surface. Bays off circulation routes can be provided for children to sit and talk, but they need to allow clear sightlines and passive supervision, since hidden spaces can encourage inappropriate behavior. Flooring systems or surface indicators can help in locating reception counters for people who have vision impairment. Such products should be designed to minimize hazards (Hawkins, et al., 2014).

It is also important to mind travel distances between different spaces and activities, and consider suitable means of vertical movement: stairs, ramps, lifts and platform lifts. Where a stair is in an open area, a tactile attention pattern should be provided at the top and bottom of every flight of stairs. Support and guidance by a handrail should be provided on each side of a flight of steps that consists of two or more risers. Width of a ramp shall be not less than 1 200 mm with clear space at the beginning and at the end of the ramp. The area of a landing shall be clear of any obstruction including the path of swing of a door or gate. Gradients should be as shallow as practicable, as steep gradients create difficulties for some wheelchair users who lack the strength to propel themselves up a slope, or have difficulty in slowing down or stopping (ISO, 2011). Some children who can walk but have restricted mobility can find it more difficult to negotiate a ramp rather than a short stair, so a choice of routes should be provided (Mistrey, 2011).

Although the exact requirements depend on the school's particular arrangements, the minimum unobstructed width of an entrance doorway shall be not less than 800 mm, 850 mm or more is recommended for a person using a powered wheelchair (ISO, 2011). However, accessibility does not only refer to enabling children to "physically get into a room", but making use of it as well.

Environments for very young children need to be spacious enough to allow different layouts for a variety of activities, toys and play equipment. A mix of larger spaces with smaller ones is equitable for autistic children, as some may feel afraid of large open spaces and prefer being in smaller spaces, others may not like enclosed spaces, due to their different perception of spaces (Leestma, 2015). Providing and keeping a visually clear structure in the classroom, preventing disturbing noise, keeping aisles clear of obstacles, providing adequate wheelchair storage and circulation/turning spaces and several other strategies not only enable use these areas without assistance, but provide the necessary prerequisite for evacuation in case of emergency as well (Bucholz & Sheffler, 2009).

Furniture and equipment may have to be re-arranged daily to suit diverse activities and needs. There should be enough space for everyone to move easily and safely. Providing appropriate furniture, fittings and equipment helps to ensure full access to learning and social activities, regardless of children's disability.

Furniture must be specified with the needs of the user in mind. Surfaces should be smooth and there should be no sharp edges or projections that could cause harm by accident or inappropriate use. Work surfaces need to be at a suitable height both for a child's size and for any special needs. It may be useful to provide various heights of work table (or adjustable height tables), a range of chairs of appropriate size with full back support, arms on chairs as additional postural support for some pupils (Hawkins, et al., 2014).

In order to accommodate a variety of users (pupils may need one or two helpers to assist them, others may require grab rails or back support to help themselves to move from a wheelchair to the toilet), at least one toilet should have enough large space for a wheelchair, helpers, grab rails, hoists, and other important equipment. Accessible toilets that can be used by both sexes allow the greatest flexibility for people who require assistance (Abouelsaad & Shafik, 2017).

Outdoor circulation needs to have a clear layout and provide a variety of accessible routes to suit the whole spectrum of children, so that they can easily access all outdoor facilities (Mistrey, 2011). There should be shelters along routes for more vulnerable children, with seats along pedestrian routes, safe and easily navigable surfaces (wheelchair accessible), with ramps and steps, and good sightlines for overseeing children's safety.

For pupils with visual impairments and other special needs may be difficult to find their ways in large open spaces, so orientation should be facilitated by differences in acoustics, material, light and color. Signs should be readable for people who have vision or mental impairments. Information with text and graphical symbols facilitate comprehension for everyone. Signs should be provided in relief and Braille. Moreover, using sign language around the school would be helpful as well for other pupils, to teach them how to communicate with their peers who are using sign language (Abouelsaad & Shafik, 2017).

Wayfinding design should allow people to detect logical movement patterns. Across large areas, halls and complex buildings, blind people need a tactile route or guiding line to follow. The different noise levels, smells and signs could be guides for some users to navigate around the school. Orientation signs should be repeated, not too often, but every time there is a possibility of alteration in the traffic direction (Arthur & Passini, 1992).

Besides the use of sensory clues and signage, the planning of spatial layouts is the first step to ensuring successful wayfinding. Wayfinding schemes can be created, by defining routes with contrasting textures or floor finishes, contrasting colour or tone on walls, using voice signals which react to movement or other triggers, placing signs at junctions or in long passageways to indicate direction or position (Hawkins, et al., 2014).

Extracurricular learning spaces including transfer

Very often children with disabilities are not able to attend different events, school trips or field trips and are being left behind and excluded from their class. This exclusion is commonly underestimated. The importance of extracurricular learning spaces (institutions, companies, theatres, museums) as barriers to inclusion needs to be addressed accordingly (Degenhardt & Schroeder, 2016).

INCLUSIVE EDUCATION IN RNM

For understanding the perception and practice of the inclusion of children with disabilities in regular education in the Republic of North Macedonia, we made a research in 12 regular primary schools, by direct observations of physical conditions, informal interviews and survey questionnaires addressed to teaching-administrative staff.

The purpose of the survey was to gather as many quantitative and qualitative as possible data on the education of children with special needs in regular schools. The survey provided information on the institutions and their readiness for inclusion. The question about the type of disability of children enrolled in regular education proved to be exceptional problematic to answer. Schools are not sure how many children with special needs they work with and what kind of disability they have. Inconsistency in the answers was completely expected and inevitable.

Table 2: Data on the surveyed schools [(C&L)-Cognition and Learning, (C&I)-Communication and Interaction, (SEMHD) Social, Emotional and Mental Health difficulties, (P&SN) - Physical and/or Sensory Needs, Different types-combination of above-mentioned needs].

	Location	Year of construction	Number of floors	Number of students	Number of students with special needs	Type of special needs
School 01	Tetovo	1951	2	1300	5	SEMHD
School 02	Tetovo	1988	2	900	4	SEMHD
School 03	Tetovo	1948	3	1200	15	Different types
School 04	Tetovo	1968	2	800	No evidence	No evidence
School 05	Gostivar	1962	2	350	5	SEMHD/ P&SN
School 06	Gostivar	/	2	1100	1	SEMHD
School 07	Gostivar	1947	2	1200	No evidence	Different types
School 08	Skopje	1981	2	300	1	P&SN
School 09	Skopje	2019	3	1200	No evidence	No evidence
School 10	Kichevo	1995	2	1000	2	SEMHD
School 11	Kichevo	/	2	4000	2	SEMHD
School 12	Struga	/	3	900	6	Different types

The tables were produced by the author, and were derived from building codes and regulations, design guidelines in the field of inclusive schools, informal interviews, and direct observation of 12 primary schools, out of which 4 schools in the region of Tetovo, 3 in Gostivar, 2 in Skopje, 2 in Kichevo and 1 in Struga. Only mainstream public schools were part of the research, private or special schools were not included.

Table 3: Implementation of architectural design requirements for inclusion [(+)- school building provides the required elements, (-) - school building does not provide the required elements, (+/-) there is an attempt towards provision of these requirements].

Schools Design requirements	01	02	03	04	05	06	07	08	09	10	11	12
Vehicular circulation that allows public and private transport	+	+/-	+	+	+/-	+	+/-	+/-	+	+	+	+
Designated safe pedestrian routes	+/-	+	+	+/-	+	+	+	+/-	+	+	+/-	+
Cycle and motor vehicle parking near the main entrance	+	+	+	+	+	+	+	+	+	+/-	+/-	+
Accessible parking space	-	-	+/-	-	-	-	-	-	+	-	-	+/-
Suitable drop-off point near main entrance	+	+/-	+/-	-	+	+	+/-	+/-	+	+/-	+/-	+
Accessible paths to the entrance	+	+	+	+/-	+	+	+/-	+/-	+	+	-	+
Appropriate external lighting	+	+	+	+	+	+	+	+	+	+	+/-	+
Accessible external furniture	-	-	+	-	-	+	-	-	-	+	-	-
Outdoor circulation with a variety of accessible routes to suit the whole spectrum of children, so that they can easily access all outdoor facilities	+	+	+	+/-	+/-	+	+/-	+/-	+	+	+/-	+
Sufficient circulation space for people (including those in wheelchairs) to gather inside the building at the start and finish of the school day	+	+	+	+	+	+	+	+	+	+	+	+
Use of visual or audio signals to assist orientation and way-finding	-	-	+	+/-	-	+	+/-	-	+/-	+/-	-	-
Ramp beside stairs in entrance	+	+	+	-	-	-	-	+	+	+	+	-
Simple and logical layouts	+	+	+	+	+	+	+	+	+	+	+	+
Accessible indoor circulation routes, broad enough for people using wheelchairs or sticks	+	+	+	+/-	+	+	+	+	+	+	+	+
Easy access to information desks for disabled persons	-	-	+/-	-	-	-	+	-	+/-	-	-	-
Wide door openings and easy door operation	+	+	+	+	+	+	+	+	+	+	+	+
Different size teaching spaces	+	-	+	-	-	+	+	+	+/-	+	-	+
Safe clearances around furniture and equipment, especially for wheelchair users	+	+	+	+	+	+	+	+	+	+	+	+
Flexible and adjustable furniture	+	-	+	-	-	+	-	+	+/-	+/-	-	-
Changes in colour, texture or proportion, used to help children orientate themselves	+/-	+/-	+	+/-	+/-	+	+/-	+/-	+/-	+	+/-	+
Clear signage and symbols around with visual and sound signal alarms	+	+/-	+	+/-	+/-	+	+	+	+/-	+/-	+/-	+/-
Vertical circulation includes stairs and suitable handrails	+	+	+	+	+	+	+	+	+	+	+	+
Vertical circulation includes ramps and lifts, suitable for people with disabilities	-	-	-	-	-	-	-	-	+	-	-	-
Accessible toilet(s)/changing room	-	-	+	-	-	-	-	+	+/-	-	-	-

DISCUSSIONS

As mentioned in the previous chapters there are many factors that need to be considered when developing accessibility strategies, to begin with: the way to school. Only 8 out of 12 schools offered properly designed pedestrian routes, wide enough for circulation of wheelchair users and ramps or platforms where differences in level occurred. Only 6 schools had suitable drop off points near the main entrance which means that in half of the schools these points were far off the main entrance, leading to larger travel distances for people with motor disabilities. Only one of the schools provided accessible parking space, 2 of them were working on this issue. However, most of the pathways that were leading to the entrance area were properly designed, the routes were wide enough and materials used did not impede the movement of persons with disabilities. One of the most concerning facts was that 5/12 schools lack access ramps, thus directly affecting access to schools. Although all schools have more than one floor, the elevator appears only in one of the cases studied. In most cases it is noticed that the horizontal circulation can take place without obstacles, the corridors are wide, door openings that lead to learning environments are designed properly according to dimensions and materials requested, which provides easy circulation and door operation and in a good part of the classrooms there is enough space for movement within the classroom for people with disabilities.

The lack of suitable furniture and sanitary facilities is more than evident. Furniture layout, display and finishes can all contribute towards inclusion. Some children need adapted equipment and/or adjustable furniture to enable them to take part in all activities, which in more than half of the schools was missing. 9/12 schools lack accessible toilets, only 2 of them have properly designed spaces while in one of the schools the supposed accessible toilet was wide enough for use of people who need assistance, but grab rails were missing which made the toilet inadequate for independent use. Another problem we face is way-finding, which is problematic not only for people with mobility impairments, but also those with sensory impairments and children with autism. The signaling used is not adequate to assist the orientation of children with different needs. In half of the schools there are visual signals to assist orientation, but most of them lack audio signals.

For enabling accessible built environments and educational settings that are accessible to every student, the design requirements mentioned in the table are high-priority. According to the data collected, these schools need to adapt and work towards meeting students' needs in order to be considered inclusive learning environments.

CONCLUSIONS

In order to help development and growth of all children we need to remove barriers, both physical and social, thus everyone becomes able to participate in everyday activities equally, confidently, and independently. Making spaces accessible is not equal to making spaces inclusive. However, providing equitable approach and use of school environments, by paying attention to dimensions and materials, is a step towards inclusive education. For learning spaces to accommodate a variety of users, designers must include furniture and equipment that fit different body sizes and shapes and provide spaces with plenty of room for movement, interaction, use and reach of assistive devices regardless of body size, mobility, hand and grip size. In addition to physical accommodations, by providing ordered and comprehensible layouts, a mix of large and small spaces, and controlling the amount of colour, lighting, textural elements and audible

elements one can create a coherent atmosphere and environment which is easy to navigate.

Based on observation carried out, the present-day conditions of schools in our country do not leave room for adequate practice of inclusive education. The current challenge is to find solutions for the design to meet everyone's needs, which is a quite complicated task, yet not impossible. We need to understand and perceive the obstacles these children face. For example, a child using a wheelchair finds it difficult to use stairs, to open a heavy door or some spaces become too small for wheelchairs to maneuver. As well as a child with visual impairments uses hands or ears for orientation so we need to consider the use of different textures, smells, or audio signals to help their wayfinding. However, designers must make sure that inclusive architecture designs are realistic and achievable, and before anything else, when meeting the needs of some pupils we need to make sure not to disadvantage others.

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Rehabilitation of Soil Trough Botanical Gardens as an Useful Interplay Between Larning Spaces and Halthy Paces in Urban Evironments

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ABSTRACT

Soils are the main carriers of heavy metals, released into the environment by many different anthropogenic activities and unlike organic pollutants which are oxidized, most metals do not undergo microbial or chemical degradation and their concentration in the soil continues for a long time. Increasing social awareness of the need to adequately address mineral waste in order to protect the environment has led to an increase in research in this area. Contemporary trends and the development of technology have revealed numerous methods of cleaning these degraded lands and what would best serve such an area based on numerous studies globally are plants and vegetation. Based on centuries of historical development, botanic gardens have now developed into leading institutions in the fields of conservation, research, education and recreation on a global scale. Botanic gardens increasingly play a role in providing a scientific basis towards sustainable use and conservation of plant diversity. The purpose of this research is to analyse the methods of treatment of these areas, then giving a proposal which in addition to solving a very serious problem of this municipality, will become a research and study area for students of various fields related to botany. This research will be based on analyses and research in field, literature review, data provided by the municipality of Graçanica, interviews and online surveys. Through this research we will understand user expectations, spatial preferences and intended purpose of the Kosovo Botanical Garden, and will convey them through the proposal into a concept that will be functional and present new solutions, modern and functional in this facility.

Keywords: *Healthiness, Healthy places, Educational spaces, Botanical gardens, Healthy design.*

INTRODUCTION

Botanical gardens are a special category of gardens, distinctive for their scientific grounds, which play an important role in the gathering of people and assemblage of plants, insuring inspiring plantings for humans, and assuring plant conservation. These gardens also play a key role in meeting human needs and providing welfare. Plant diversity is currently being lost at an unprecedented rate, and causing decline in ecosystem services. The purpose of this study is the creation of an area where scholars, students or even citizens in addition to research and study, will have a place away from the hectic city life with variety of plants and fresh air. In addition to solving a major problem for the citizens of the Gracanica municipality, the Jalovina landfill of mineral waste with the endangered soil and constant threat of urban and rural environmental degradation.

The Municipality of Gracanica is located in the central part of Kosovo (fig. 1), respectively in south of Kosovo's capital, Prishtina. The municipality has a rural character with high quality agricultural land (UN Habitat Kosovo, 2014). The administrative centre of the municipality is Gracanica town. The residence is located near the river Gracanka, supplier of the river Sitnica, within the large valley of Lake Gracanica and the industrial waste landfill of Kishnica - Novobrdo, with lead and zinc mining facilities. The territory of the municipality covers an area of 122.25 km. With its convenient location, close to the capital Prishtina, it offers great opportunities for the development of Gracanica in commercial and residential trade of prosperous, multi-cultural settlement (UN Habitat Kosovo, 2014).

Figure 1: Geographical position of Gracanica.

According to the Kosovo Spatial Plan, the Municipality of Gracanica is located in the designated blue zone of economic development (fig. 2). The blue coloured area indicates areas with population density that is characteristic of the urban centres, and with developed rural areas, high quality agricultural land, natural underground resources (lignite, nickel, lead, zinc, gold), important archaeological and cultural places, free green areas, while economic activities are characterized by industry, trade and services (Ministry of Environment and Spatial Planning, 2010).

Figure 2: Kosovo Spatial Strategic Development - Blue zone (MESP, 2010).

General goals of the blue zone, are the development of the city network, easy and attractive access to life and work; Local Economic Development for the support of Kosovo Economic Development; promotion of Triangle of Kosovo Economic Development locations for grouping activities from the spatial aspect, foreign investments and multinational companies.

According to Kosovo Spatial Development Plan there are areas of special interest where an established development regime should be offered, and in addition to other capital investments at the central level, it is underlined the environmentally polluted areas that needs to be rehabilitated and used for other purposes, such as industrial waste landfills in Kishnica (Ministry of Environment and Spatial Planning, 2010).

"JALOVINA" - LANDFILL OF MINERAL WASTE OF KISHNICA

Kishnica mineral waste represents an ecological catastrophe in the municipality and region as well, as the constant threat of environmental degradation. Threat for the environment is reflected in the pollution of the water, air and surrounding soil. Since 1965, pollution poses a risk to watercourses with waste erosion mining, as well as for air through winds that disperse waste dust

mining, but also agricultural land in the vicinity where the dumped dust is collected. Among the accidents described in the report of the international

commission on major dams, as well as in the United Nations Environment Program, there have been recorded two accidents on the territory of the former Yugoslavia, and one of them is the disorder on the slope of the mine waste in Kishnica (fig. 3). The accident occurred in September 1988, when a volume of 10,000 m3 of water was spilled above the mining waste dam. Polluted water has flooded the fields and about ten houses. Over-discharge has come as a result of long negligence during waste mining exploitation, while the accident has largely been politicized (UN Habitat Kosovo, 2014). The "Jalovina" problem dates back to 1965 and is considered to be the biggest polluter of the environment, not only in these municipalities but also much more widely. Materials waste of the Kishnica mine, which has been stored in one place for more than 50 years, additionally to pollution of the Gracanka River, which flows immediately near Jalovina, the long heavy rainfall which collects the heavy metals, reaches up to the basin of Black Sea as well. Given the minerals of the Kishnica mine, it is understood that this area contains a considerable amount of arsenic, which in addition to being quite harmful to the ecosystem, is also carcinogenic and very dangerous for human health.

Figure 3: Landfill waste mining in Gracanica.

Raising social awareness of the need to adequately treat waste mining in order to protect the environment, has led to an increase in research studies on this field. Mining activities lead to many negative environmental and socio-economic impacts. Methods such as removing tons of contaminated soil involve years of work and large sums of money. Contemporary trends and the development of technology have revealed numerous methods of clearing these kind of degraded lands and according to numerous studies what would best serve to a such area, are plants and vegetation. Certain plants have a special ability to absorb specific chemicals, making itself poisonous but "non-consuming". When these plants are planted in contaminated soil, they absorb contaminants into their tissues, gradually reducing the amount in the soil until it is safe for humans.

The purpose of this research is to analyse the means of treatment of Jalovina area, by delivering a proposal which in addition to solving a very serious problem of this municipality, it will be transformed into a research and study centre for

students and scholars of various fields, especially related to botany. The idea is that after restoring polluted soil which was once among the most fertile, to transform it into a botanical garden.

Botanical gardens maintain documented collections of living plants and are usually run by universities or other research organizations therefore, the proximity of Gracanica to the capital city would suit the University of Prishtina, the biggest public university of Kosovo, for the purposes of scientific research, conservation, display and education. On the other hand, botanical gardens increasingly play a role in providing one scientific basis towards sustainable use and preservation of plant diversity. The presence of these spaces that among other things contribute to the well-being of people will help botany scholars a lot in their research as well as to create job opportunities for a large number of them. In addition to research, citizens will have a place that; would provide instructions for home gardening, for plant propagation; will be the source of plant supply through sale or exchange as well as serve as a get away from the busy city and stress.

METHODOLOGY

Methodology is built on the use of grounded theory as a strategy of the mixed methods starting from the quantitative data collected from the understandings of a large number of surveyors, the study later undertakes a more in-depth investigation done in a qualitative manner. The qualitative phase of the mixed inquiry is the principal whilst the quantitative method helps to identify the areas of concern. The qualitative study involves the gathering of numerous data and a considerable amount of time spent on the site while attaining information. The instruments for data collection are observation, interview, textual documents and visual data. The benefit of grounded theory is that it can be used to analyse any kind of data. So the purpose of using the mixed method inquiry is to get as practical, useable and comprehensive diversity of data in order to create a concrete cohesive theory of a broader actuality (Basha-Jakupi, Nushi, 2017).

Data and analysis of the current situation are obtained from:

1. Municipality of Gracanica - Directorate of Urbanism which offered information about Urban and Municipal Development Plan, geodetic data for the area where the plot is located, other information about this area, such as plot ownership, land use conditions, storey of buildings, destination of buildings, maintenance of open public spaces, etc.
2. From field analysis, such as: site analysis with use of space, analysis of activity development, attendance of vehicles and pedestrian movements. Identification of pedestrian and automobile accesses. The most frequented and congested spaces, as well as identification of problems with parking, noise, lack of space for activities
3. Interviews with citizens about their opinions of the problems, the daily dissatisfaction they encounter in the use of spaces around this area, and their needs and propositions.
4. Survey includes the electronically distributed questionnaire to the students, where the opinions, requests and needs that they generally have for the spaces in the University were obtained. The subject of this inquiry were also the students of the Faculty of Biology, Faculty of Agriculture and Veterinary Medicine, in order to extract data from their experiences about the importance of the botanical garden.

Following this stance, the basic research hypothesis would be:

The Botanical Garden will regenerate the soil, will create opportunities for various studies in the field of botany and will provide recreational spaces for all.

APPLIED PRINCIPLES IN THE PROJECT

The conception, design of a botanical garden is a unique and rewarding experience, with ecological, cultural, educational and economic aspect that can last for generations. Bearing the complexity of the research, the study proposes the application of some of the main principles of sustainable design that would address some of the issues of the Jalovina area, as well as test some of the design aspects that matter to planning and building a botanical garden. The main approaches are:

- Treatment of contaminated soils

Metal contaminants are long-lived and can be toxic to organisms in all parts of an ecosystem, including people. Heavy metals like lead, mercury, arsenic, copper, zinc and cadmium are very poisonous when entering the biological system.

Technologies to correct contaminated soils as physic-chemical remediation techniques usually result in secondary air or groundwater pollution, reduce soil fertility and make them unsuitable for agriculture. Moreover, the physic-chemicals method is usually very high in cost, limiting their use especially in developing countries (Muthusaravanan, et al 2018). Whereas, bio rehabilitation has gained attention in recent decades as a growing approach and eco-friendly that uses the natural abilities of living organisms to improve polluted soils. Bio rehabilitation among different techniques includes phytorehabilitation as a plant-based technology, where raw plant species or genetically modified are used to restore polluted soil and water resources. The main reason for implementing phytorehabilitation is the possibility of low cost adjustment, as well as the advantages that is practically possible and publicly accepted; directed by the sun; works with hydrophobic compounds; planting vegetation in one place also reduces wind and water erosion; generates metal-rich recyclable plant waste; eliminate secondary air or water debris (Muthusaravanan, et al 2018). But given some of the limitation it has and the level of pollution, such a method would only work on certain parts of the plot where the level of pollution is lowest (more superficial; where plants could clean), while in the rest of the area it is proposed to intervene through bio rehabilitation with microorganisms.

The main elements in bio rehabilitation are microscopic organisms, living bacteria. Microorganisms are ideally suited for the destruction of pollutants because they possess enzymes that allow them to use environmental pollutants as food and because they are so small that they are able to easily contact pollutants. The purpose of this process is to stimulate the microorganisms with the substance nutrients and other chemicals that will allow them to destroy contaminants (National Research Council 1993).

- Flexibility of the design

Flexibility design can tolerate a building to change over time as users need modification. The flexibility of a building or its design elements can allow it to be used efficiently despite changes in working requirements. Flexibility can be defined in relation to the amount of change that occurs and the degree of sustainability of that change, and it can be realised through a) convenience of a building, to support multiple functions without changing the architecture

itself. Simply put, the function of the building changes but the building does not, b) transformation which allows the interior or exterior space to be changed in response to certain stimuli without the need for new constructions. Changes can be permanent or temporary, and c) convertibility by changing the function of a building through a certain amount of construction work. By planning the conversion during the design phase, potential future needs can be assessed and the time and cost required can be reduced. The resulting changes are often permanent (Sadafi, et al 2014).

- Green walls

As a vertical typology of greenery, where a vertical built structure is intentionally covered by vegetation. It is considered as living walls or vertical gardens, and are associated with the provision of many ecosystem benefits (Medl, A., et al 2017). Green walls provide an additional layer of insulation that can protect buildings from dense rainwater, which leads to water management and provides a thermal mass. They also help lower the temperature of a building because of the vegetation absorbs large amounts of solar radiation. This can reduce energy requirements and clean the air of volatile organic compounds. Vegetation in green walls can help mitigate the effect of heat island and contribute to urban biodiversity (Gunawardena, et al 2017).

- Green roofs

Vegetative roofs, also known as green roofs, are thin layers of living vegetation installed on top of conventional flat or sloping roofs. These roofs have great potential for wide use as their very convenience makes it inquire for little or no support from the building itself (Miller, 2016).

In addition to their impact on reducing energy consumption in the building, green roofs are significantly more durable than other forms of roofs. Extensive green roofs have several benefits, such as: provide water flow from storms, erosion and pollution improve water quality, heat reduction inside the city by cooling and purifying the air, reduce the energy consumption, reduce the reflection and sound transmission, give impressions of untouched nature and affect the aesthetics of the home environment (Hashemi, 2015).

- Solar panels

Renewable energy is generally defined as energy that comes from natural sources and is used for heating and direct lighting of buildings, for electricity generation, for heating and cooling of water and for many other aspects. Renewable energy can be from: Solar energy which is for the production of electricity, as well as Geothermal energy which is for the production of heat energy. directly and instantly, solar energy converts into electricity without the use of any kind of fuel (Shinn, 2018).

Solar panels made up of multiple solar cells produce electricity from the power that resides in photons of sunlight.

- Collection and utilization of rainwater

Rainwater collection and utilization represents the collection of water in another structure or surface in order to preserve it for later use. Traditionally, this involves collecting rain from a roof. Rainwater is proposed to be collected from gutters that channel water into the outlet and then into storage reservoir (Torres, 1997).

Sustainable design must be anticipated from the earliest stages of design. The use of all these systems that make the facilities of botanical garden sustainable,

aims to minimize the environmental impact during the development of the new project, to create a building compound that consumes little energy and thus make it as efficient and eco-friendly as possible.

CONCEPTUAL PROJECT PROPOSAL

After selection of the location and analyses made around it, the formal concept of what the main object of this complex will look like is formulated. Initially, the local architecture was analysed, more specifically that of campus of University of Prishtina, where certainly the dominant effect is given by the iconic building inside the campus, that of National Library (fig. 4) whose main characteristics are the game with volumes and domes, highlighting the expansion of the university premises. The pattern of the steel construction is inspired by the domes of the spherical shape of the conservatory which derived from the need for an object which is resistant to winds and storms, that enables good air circulation and ventilation, has a uniform temperature (ideal for plant growth) and enables maximum absorption of light and heat. Regarding the visitor centre, it has been attempted to merge the architecture into the surrounding landscape by applying the green architecture.

Figure 4: Architecture Pattern (author: D.Hajrizi).

The wider situation - The situation within the plot was organized in a way that initially the north-western part (fig. 5) of the plot will have a garden which expands in proportion to the cleaning of the site from polluters. Knowing that the only drawback of the engineering bio rehabilitation method was the release of a considerable amount of carbon dioxide, this organized area of 7 hectares will clean the air with plants which absorb this CO_2 for the process of photosynthesis and in this way will minimize the negative impact on the environment.

Figure 5: Analysis: a) terrain, b) and c) wind, d) sun exposure (author: D.Hajrizi).

The designed space is placed in this position not by chance, as such positioning of the garden allows easier access and the shape of the garden derives from the shape of the plot. In the western, southern and eastern part where the terrain has a noticeable slope, it is proposed to plant high deciduous plants to isolate it from the noise coming from the highway (fig. 6) and to stop the erosion caused by rainfall. The same proportionally reduced space that will be realized as the first stage will be planted with plants that create an intimacy within the complex.

Figure 6: Wider situation of the area (author: D.Hajrizi).

Figure 7: Project proposal area (author: D.Hajrizi).

Close up situation - Looking more closely (fig. 8) we can clearly see the organization of the garden which is characterized by organic forms both in buildings and in the ground floor. On the left side in the north-western part of the plot is the main entrance for visitors with parking spaces in the buffer zone controlled by the entrance control gate. Also along the road are foreseen bus stops which bring students or visitors from different places. This complex aims to generate revenue and support itself financially, so various forms have been devised to attract visitors. At the entrance is the place for bicycle parking and the bicycle corner for rent, as the surrounding complex has trails for cyclists and jogging. On the north side of the visitor centre (building 1) which has open visors on all sides, is the kindergarten so that kids play and activity is more easily monitored by parents. Next is the garden of herbs and spices while at the bottom is the garden of nutritious plants, both of these gardens are placed in these positions due to the proximity to this facility (the restaurant utilizes garden produced food). Near the herb garden is the so-called low green garden meadow (different types of grass). Furthermore, an Institute for Research and Study was foreseen, the access to which is made by the same path which is extended to the north of the plot but on the opposite side as it should be more “private” with separate entrances.

Between building 1 and 3 is the “maze garden” which are usually bush fences. The shape of this garden is inspired by the unique Dardanian labyrinth of the closed circuit, without visible entrance that in antiquity appears very rarely, and proves a higher philosophical-religious level of its Dardanian creators. Near this garden is the expanded shrub garden and a mini artificial lake which represents the garden of aquatic plants.

On the southeast and east side of building 3, a free training space is planned which in addition to students and researchers can be used by farmers and ranchers to learn more about agriculture or by citizens to be informed about home gardening.

Between building 2 (Plant Conservatory) and 3, there is a flower garden surrounded on 2 sides by a gallery with a width and height of 5m where hanging plants (mainly flowers) are cultivated.

Below this garden is the orchard of fruits and trees which are sold in the shops at the visitor centre.

Figure 8: Project proposal (author: D.Hajrizi).

Around the conservatory there is also an artificial "lake" where aquatic plants are cultivated, which is in front of the "sensory garden", which is one of the most attractive parts of this complex. The latter is proposed in order that when entering the area, almost all of the senses are activated. This effect is achieved by using plants of different colours, water, fragrant plants, plants that attract birds and butterflies, etc. Opposite building 1 is the plateau which is divided as space for events (weddings, birthdays or various holidays).

From the fifth facade we can see more clearly the level quotas which show that the total height of the visitor centre is 9.5m, while that of the conservatory 30m. At the top of the visitor centre, which is green and usable, there are also south-facing solar panels for maximum sunshine all the time.

Architecture - In terms of architecture (fig. 9) the aim was to make the most of the principles of sustainable design, this approach has been used in order to minimize the harmful effects on human health and the urban / rural environment. Organic forms, the use of recyclable materials, the use of solar panels, green walls are the means to an end for a higher level of energy efficiency and imitation of nature. At the visitor centre there are also wooden panels which, in addition to the decorative role, have the possibility of complete closure and play the role of double thermal insulator and make insulation at the same time. The combination of wood with glass in this building is intended to create the feeling of warmth and closeness but at the same time pleasant transparency and visibility. As for the conservatory, the structural efficiency of this facility means that it consumes less material than conventional buildings. As for the closed volume, this building has a much smaller surface area than traditional 'box-shaped' buildings which

means that this building has reduced exposure to external temperature changes and this makes it less costly to heating and cooling of the building.

Figure 9: 3D views of the proposal (author: D.Hajrizi).

CONCLUSIONS AND RECOMMENDATIONS

Arsenic is a metalloid that causes harm to humans and the environment. However, certain species of prokaryotes have the ability to use arsenic (through the process of oxidation or reduction) for energy storage and growth purposes. It is important to remove and reduce this pollutant from the environment through various physical, chemical and biological approaches. Using bio rehabitation to remove and mobilize pollutants from contaminated soils and waters can be an effective and economical way as a wide range of microorganisms have been found to be degrading successfully these pollutants from the environment.

During the field research as well as literature review most of research results have been achieved. While on the stage of recognizing the problem, a special role was played by the survey with students, professors and professionals of different fields who through their knowledge and needs gave us a lot of information on the issue that has been discussed. The literature review of this issue revealed how the impacts of mineral waste and geogenic arsenic resources can be combined to increase the risk of arsenic exposure to communities near mining sites. At the stage of analysis of similar examples around the world as well botanical gardens of different time periods, helped the compilation of the functional scheme of the complex. In the last stage, the proposal for the botanical garden was given, taking into account the new concept as well as the functional scheme, while using impetus from the local architecture.

With the recommendation of the realization of a project such as: “Kosovo Botanical Garden”, it is projected the improvement of the student’s study conditions and the wellbeing of the citizens, but foremost by solving a very serious problem such as that of the mining landfill of Kishnica.

The design and implementation of such a project will be a great challenge, given that the infrastructure in Kosovo does not offer great opportunities for the realization and functioning of these complexes, but it would be best that this project is funded and overseen by EU investment or other foreign organizations.

Suggestions for further implications are: more detailed research in the region, opportunities to use the latest technology, inclusion of all stakeholders into a comprehensive discussion related to botany or botanical garden in general.

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Planning and Designing for the Mediterranean Games in Split – From Sports to Health Legacy of a Host City

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ABSTRACT

The VIIIth Mediterranean Games held in Split, Croatia in 1979 sparked an architectural and infrastructural renaissance, unique in the city's history, with little chance of ever being surpassed in its near future, leaving behind economic, cultural, and environmental legacies to the host city and its Dalmatian region. However, at its most fundamental level, the MG (Mediterranean Games) is a sporting event. One of the most important sports legacies was the general change in people's perception of sports and recreation as a part of a healthy everyday life. Other tangible legacies included planning, design and construction of sports and other public facilities. For the needs and requirements of sports events such as the MG, building sports infrastructure meant reconstruction and refurbishment of many existing and construction of a smaller number of new sports facilities, such as the City Stadium with a swimming pool complex, and a new sports hall at the Sports–Trade Center "Koteks–Gripe" in Split. At the time, Split was still expanding to the east and most of the MG sports facilities were located in its western part, around its historic city area. The MG local urban development plan "Integralni Plan MIS-79" planned continuity of sports and recreational zones along the coast and outside the city's ring road, as well as protective green zones between the city in the south and its industry in the north. Despite clearly demonstrating lasting social and health benefits through sports planning and design, the legacy of MG hasn't been addressed in research work so far. The aim of this work is to historically analyze the tangible sports and health legacy of the Mediterranean Games held in Split in 1979 to indicate its significance for building a healthier, more sustainable, and resilient city and urban community.

Keywords: *Mediterranean Games, Split, Sports, Health, Legacy.*

INTRODUCTION

There are some events in the history of a city that cannot be dimmed even by the passage of time. They include its beginnings, its struggle for freedom, its economic development, and its most important cultural, artistic, and sports events. Like the Roman Palace of Diocletian, the symbol of Split since the year 305 AD, the urban and architectural interventions constructed for the VIIIth Mediterranean Games in Split have become part of the city's notable history and lasting legacy. The aim of this historical research into the tangible (built) legacy of the Mediterranean Games held in Split in 1979 is to indicate the significance and trigger a possible debate on the health and well-being of an urban community related to sport and recreation – in a liberal and socialist city.

THE MEDITERRANEAN GAMES

The Mediterranean Games are an international sports competition held every four years amongst contestant states that are part of the Mediterranean civilization. The establishment of the competition was proposed by Muhammed Taher Pasha, chairman of the Egyptian Olympic Committee, during the 1948 Summer Olympics. The first Mediterranean Games were held in 1951 in Alexandria. Split made its first attempt at being selected as a host of the Mediterranean Games in 1971 in Izmir. Although its candidacy was then turned down, just four years later, Split was ready to try again. Following the approval of the Tito, then president of Yugoslavia, and Džemal Bijedić, then president of the SIV (cro. Savezno izvršno vijeće – Federal Executive Council, i.e. the Yugoslav government), Split reapplied for candidacy in Algeria in 1975. This time, Split won the vote against Casablanca by 16:9, and was therefore chosen as the host of the following Games.

Figure 1: Cities and countries that have hosted the Mediterranean Games: yellow – once, orange – twice, red – three times.
(source: Wikipedia. Last accessed June 17, 2021. https://en.wikipedia.org/wiki/Mediterranean_Games).

THE VIIIth MEDITERRANEAN GAMES

Though one of the most sports–minded towns in ex–Yugoslavia, at the time when it was entrusted with organizing the VIIIth Mediterranean Games, Split did not have a single sports facility meeting the needs of such a large-scale athletic contest. As some of the events were to be hosted by Zadar, Šibenik, Trogir, Sinj, Omiš, Makarska, Supetar, and Hvar, the municipalities of these towns also participated in the organization of the Games.

Figure 2: The official logo of the Games, since 1979.
(source: Zagreb Society of Architects webpage. Last accessed June 17, 2021.
http://www.d-a-z.hr/hr/aktualna-tema/mediteranske-igre-u-hdd-u,1796.html.).

One of the most important tasks of the joint organizers was to reconstruct and adapt the existing sports facilities and build a number of new ones. The largest investment went into the building of the three main facilities for the Games: the City Stadium "Poljud", where the opening and closing ceremonies, the track–and–field events and the football final took place; the swimming pool complex, where the competitions in swimming, waterpolo, and diving took place; and the Sports Center "Gripe". The preparations for the Games, including the building of all the facilities, were determined by the fact that they had to be completed in less than three years and with limited financial resources. This influenced the choice of the venues for the events, the location of the sites for new facilities, the final program of the Games, how the Games were financed, the town planning projects, the design of the facilities, and the implementation of all the projects.

Nevertheless, all the facilities built for the Games combined functionality with simplicity, the most modern equipment with architectural originality and attractiveness, and thus lived up to the importance of the event for which they were built. All the work proceeded according to schedule thanks to the extraordinary commitment of all the participants, notably the Games Building Department, the project engineers, the designers, and the building contractors. And finally, to give a full picture of the conditions under which the facilities for the SMG were built, it should be mentioned that, because of the financial difficulties, work on some smaller facilities could not begin before the second half of 1979.

Figure 3: The opening ceremony of the Games in Split on September 15th, 1979. (source: Zagreb Society of Architects webpage. Last accessed June 17, 2021. https://www.gkmm.hr/stranica/kako-je-split-dobio-mediteranske-igre-1979-godine).

THE URBAN PLANNING OF GREEN AND RECREATIONAL AREAS IN SPLIT – PRECONDITIONING THE GAMES

The Split Peninsula Project: Program for the Implementing Urban Plan (PUP 1975.)

The analysis of the "status quo" in the Program for the Implementing Urban Plan from 1975, points out the fact that green areas in the city were usually not an integral part of a functional recreational system, but their role was rather reduced to a formal effect. It also points out that, on average, the older parts of the city had less green space than those built after WWII. Sports facilities were concentrated at several points and were, in general, in poor condition.

When planning the space for recreation and sports, the Program started from the basic setting that was to enable premises and equipment for playing sports to the residents at all organizational levels, starting from the unit, neighborhood, district, and city. The green and sports areas were mostly located along the edge of the Split peninsula. The Youth Park complex in the north was intended partly for sports (Stadium "RNK Split"), and partly for mass recreation (parks and children's amusement park). The Spinut–Poljud zone in its eastern part planned contents of high-performance sports, where the "Hajduk" Stadium with all auxiliary spaces was located, alongside other parts intended for mass recreation. The coastal belt, from the City Port to Duilovo in the east, except for the hotel companies "Duilovo" and "Split" and "Žnjan", the Tennis club "Firule" and Swimming club "POŠK", was also intended for mass recreation with various playgrounds, harbors, parks, bathing areas and other facilities of complimentary program. In addition to these zones, in the central part of the Split peninsula, several smaller individual zones were planned for this purpose: Emanuel Vidović Park, City Park, and Park Lovrinac, sports and recreational zones alongside the city's watershed, a sports zone with a memorial center on what is the old "Hajduk" playground, and the "Gripe" sports zone.

Figure 4: The Split Peninsula Project / Program for the Implementing Urban Plan / Green and Sports Areas (Planned), Dalmatia Urban Planning Institute, 1975. I – Poljud area, II – Youth Park area, III – Gripe area, IV – Firule area. (source: Split Society of Architects Archive).

THE GENERAL URBAN PLAN OF SPLIT (GUP 1978)

The General Urban Plan from 1978 was conceived as a sort of an equalizing mechanism for revision, since it largely summarized the already completed stages of the city's development, with an emphasis on the polycentric model. Significant population growth and low unemployment as a result of economic migration from underdeveloped surrounding areas, has heated up housing in the northern and eastern parts of the city, destroying several of the city's green natural hills located at the site of the natural watershed of the Split peninsula. The watershed defined a green recreational zone which, contradictorily, was simultaneously called a healthy recreation and a buffer zone between housing and industry. With purified zoning, characteristically for that time and the corresponding social order, the distribution of areas was based on a linear model that arose from the natural topography and the previous development of the city. The working, industrial part in the area along with the Northern port, which was joined by the activity of production crafts and partly warehouses and services, was clearly separated by a recreational zone from the area of residential and central, public character. Recreational facilities, which included sports fields and landscaped parks, tried to permeate the entire area, but they were still reduced to a few spaces: City Park (Strossmayer Park), Emanuel Vidović Park, and a sports stadium in the Youth Park on the northeastern part of the city center expansion. By planning the so-called circular road into which the three main roads flew, the plan tried to solve the problem of city core's traffic. In this scheme, the roads planned to end in large parking lots right next to the city center, which would enable a smoother and clear system of pedestrian areas.

Figure 5: The General Urban Plan of Split (clip), Dalmatia Urban Planning Institute, 1978. I – Poljud area, II – Youth Park area, III – Gripe area, IV – Firule area. (source: IGH Institute. 2011. Spatial – Traffic Study of the Wider Area of the City of Split. Split: IGH.).

PLANNING AND (RE)DESIGNING FOR THE GAMES – SPORTS INFRASTRUCTURE

The planning of the sports and recreation zones along the coast and on the outside of the circular road, and of the protective green zones between the town and its northern industrial zone, which had been emphasized in Split's development plans since 1945, was given its full continuity by the construction of the ring-road starting at Marjan hill in the west and continuing via a tunnel as far as Meje area in the south. The ring-road went through the sports and recreation Spinut-Poljud zone and the Youth Park, connecting them into a green belt with two stadiums, swimming–pool complex, and numerous facilities for aquatic and other sports. It winded towards the southeast and the Sports Center "Gripe with its continuing its way to the "Firule" tennis courts. All the sports facilities that were used during the Split Mediterranean Games were thus connected by a trunk road, which was a great advantage for the smooth running of the competitions and was very important for the future use of these facilities. The "SMG Integral Plan", as the special operative plan for the construction and adaptation of the facilities other than those used for the competitions was called, was adopted in 1978 as the priority part of Split's Town Development Plan for 1976-1980. It included the following: hotels to be used for the accommodation of the participants in the Games, public utilities, transports facilities, and other facilities that were indispensable for the SMG program.

Figure 6: Urban setting of the interventions (re)built for the Games in Split. I – City stadium "Poljud" with a Swimming-pool complex, II – Stadium "RNK Split" in the Youth Park, III – Sports Centre "Gripe", IV – Tennis Centre "Firule". (source: Pezo, Vladimir (ed.). 1979. VIII Mediterranean games Split 1979. Split, Zagreb: CIO.).

CITY STADIUM "POLJUD" WITH A SWIMMING-POOL COMPLEX

Figure 7: Aerial view of the City stadium "Poljud" and the swimming pool complex (source: Stadium Poljud Split Facebook page. Last accessed June 17, 2021. https://hr-hr.facebook.com/pg/POLJUDSPIT/photos).

The stadium was designed according to the prize-winning project of the architect Boris Magaš in the invited competition held in 1976. [1] At a previous competition for sports grounds and a football stadium, held a year earlier, the design of Boris and Olga Magaš had won the first prize. [2] However, the program requirements

were changed after Split had been entrusted with the organization of the VIIIthe Mediterranean Games and the stadium was finally constructed as an Olympic one, immediately preceding the opening of the Games in 1979. It was soon to become one of the most important visual landmarks of the city, particularly with its form resembling a seashell and the Roman amphitheater constructed in the 2nd century AD nearby in a once ancient city of Salona. The elegance of the curved roof shell has been achieved by an extraordinary structure of the self-supporting spatial steel rack of MERO system. The stadium holds a total of 50 000 seats, including a grass field 150 x 68 and eight athletic tracks. [3]

The swimming pools, designed by the Belgrade architect Ivan Antić are located near the city stadium. The curved surface of the roof, metaphorically resembling a sea wave, covers a complex of indoor pools, the auditoriums seating 2180 and 720 spectators respectively, as well as a number of sports halls. [4] The roof surface structure is composed of pre-stressed cabled stressed between two basic lateral pre-stressed reinforced concrete supports. The facades are glazed, and next to the east one, following the line of the roof, there is an entrance annex. An elongated part of the annex forms the space of the outer plateau, housing a 33 m long outdoor pool with a diving platform, as well as an auditorium seating 500 spectators. [5]

Figure 8: Architectural models of the City stadium "Poljud" and the swimming pool complex (source: Pezo, Vladimir (ed.). 1979. VIII Mediterranean games Split 1979. Split, Zagreb: CIO).

STADIUM "RNK SPLIT" IN THE YOUTH PARK

The stadium in the Youth Park was designed by Vuko Bombardelli, Slavica Bombardelli, and Mira Zupan of the rest of the "Arhitekt" collective from Split. It is bounded on three sides by city roads, including the ring-road on the south, with its western side bordering with the recreational zone constituted by the park. The design for the stadium was based on the earlier preliminary design from 1955 and the master design from 1964, comissioned by the Split football club and the Split Municipality. When designing the stadium, the architects retained the facilities built earlier: the supporting wall, the football pitch with the all-weather six-lane track, and, with some alterations, the other athletic facilities. The stadium has four separate stand sections seating 21 615 spectators and was designed for football matches and all athletic meetings conducted according to IAAF regulations. Because of lack of funds and because of the stadium's function during the Games (training for athletes and qualifying matches in football), it wasn't completed before the Games. The completed facilities include: 1. the reconstructed football pitch, the athletic tracks, and the area inside the stadium; 2. major work on the ground floor and the first floor of the Community Hall, sanitary facilities and changing rooms for athletes and referees, the lobby and the surgery on the ground floor. Outside the stadium itself, auxiliary facilities

for shot putting and hammer and javelin throwing, an auxiliary football pitch, parking lots, and a recreational area were completed. The whole complex is yet to receive its definitive shape.

Figure 9: Aerial view of the Stadium "RNK Split" in the Youth Park (source: RNK Split webpage. Last accessed June 17, 2021. https://rnksplit.hr/klub/stadion).

SPORTS–TRADE CENTER "GRIPE–KOTEKS"

Figure 10: Aerial view of the Sports and Trade Center "Koteks–Gripe" (source: Slobodne veze / Loose Associations webpage. Last accessed June 17, 2021. https://slobodneveze.wordpress.com/2016/01/19/save-pc-koteks-gripe-in-split).

The architectural complex in Gripe consists of the Sports and Recreation Center "Gripe" and the Trade Center "Koteks", as an intertwined urban whole. It was designed by the architects Slaven Rožić of Split and Živorad Janković of Sarajevo. [6] The collaboration has resulted in an expressive architectural form interpolated in the relief void of the former cement-clay quarry. The sports facilities were built close to the first basketball hall of the then "Jugoplastika" basketball club, in the place of the football club "Nada" field. Apart from the main sports hall (57x33 m, seating 6 000 spectators) and the small hall (44x27 m, seating 1 000 spectators), other accompanying facilities are located. [7] The sports hall volume, seemingly hovering above the terrain depression connected by pedestrian bridges and access squares. It is known for its dramatically fractured roof surfaces, as well as the exposed truss of the main hall and the full surfaces being lined in white ceramics, contrasting the dark glazing.

In the south part of the zone the Trade Center "Koteks", designed by architect Slaven Rožić, was at the time greeted as the first true shopping and trade center in the country (ex–Yugoslavia). [8] The program was organized on terraced levels

within its impressive area of 23 000 m² above ground and 10 000 m² underground. A number of its public squares, streets, and open staircases were offered to the citizens as an additional value. The basic commercial-mixed program has been modeled and fitted into the urban void, to an unprecedented extent for such a typology.

Despite the negative impact of the transition social processes, a walk through the complex remains an outstanding spatial experience, and Koteks a unique example of the local, Mediterranean interpretation of the shopping center scenery for socialist consumerist leisure. This architectural contribution of Koteks to the local built heritage is especially significant regarding its relationship to the local context. [9]

Figure 11: Architectural model of the Sports and Trade Center "Koteks–Gripe" (source: Pezo, Vladimir (ed.). 1979. VIII Mediterranean games Split 1979. Split, Zagreb: CIO.).

TENNIS CENTER "FIRULE"

Figure 12: Aerial view of the Tennis Center "Firule" courts (source: TK Split 1950 webpage. Last accessed June 17, 2021. https://tksplit1950.hr).

The facilities of the Split Tennis Club at Firule were expanded and renovated for the SMG according to the urban design by Žarko Turketo from the Dalmatia Urban Planning Institute. [10] The five old courts were renovated and three new ones were built. The club building was also renovated and another wing was added to it. New stands were built around the center court with 1500 seats in total for the spectators. The new wing of the club building housed the new changing rooms, the common rooms, a conference room, and a cafeteria. [11]

CONCLUSIONS

It would not be an easy task to identify all the components that constitute the importance and influence of the Split Mediterranean Games to its host city. Underlying this athletic contest is the strengthening of friendship and co-operation among the nations of the Mediterranean region – within an important social and cultural event – while sharing the view that the Mediterranean Sea should not divide the countries of three continents but unite them despite their different races, ideologies, and social systems. The contribution the event has made to the development of sport and its legacy in the host city and the country (Croatia and then the whole of Yugoslavia) must also be viewed in the broader context of its influence on the overall development of sport in the Mediterranean. Finally, the successful SMG financial and planning / designing / building model enabled investing in tangible legacies such as (re)building sports and public infrastructure which ultimately lead to the enhancement of local pride for the residents of the host city. Within its wider socio-cultural impact, we can say that the Games were generally changing the people's perception of sports and recreation as a part of a healthy everyday life.

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Healthy engineering

Overview

Healthy engineering

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Healthy Engineering session was open for papers integrating issues health into planning, technical design, construction, operation, and all other processes, with specific focus on architectural, civil and mechanical engineering-related branches. In this session we are exploring topics like noise reduction (in all of its forms), air pollution, toxic and health- damaging substances, and finally, the potentialities of modern technologies like Internet of Things (IoT).

Finally, only 3 papers as solely engineering research, were submitted, as well as one additional that is multidisciplinary, a mixture of healthy engineering and healthy urban and architectural design. The papers came from Croatia, Bosnia and Herzegovina and Serbia. Their contributions range from the sustainable redesign of existing buildings, aspects of energy efficiency to life cycle assessment.

Sustainable architecture design have positive impact on health, comfort, physical well-being, emotions, as well as on finances of inhabitants. Today, people spend around 90% of their time indoors, especially recently, facing the time of Covid pandemic, so it became more and more important to explore and research all aspects of housing,in order to understand and improve living conditions. In order to limit their environmental impact, existing buildings must define the way in which the people who inhabit them live both in their own neighbourhoods and in the entire city. Living quality is not only about buildings and the homes they contain, but also the experiences offered to residents by the development as a whole. The graduate course 'Architecture and Technology' at the Faculty of Architecture, University of Zagreb, attempting to educate students on assessing the environmental performance of existing buildings is described in one of the papers. Learning from own experiences of occupation of different houses and apartments and assessing the overall energy savings and indoor thermal comfort of the building, the paper discusses possibilities of life quality improvement by using simple based solutions. With examples of different housing architecture, the paper discusses methods, technical solutions, and architectural approaches for a variety of interventions: from upgrading the existing facilities to new complementary physical structures designed in accordance with sustainable development principles. The primary result is the teaching outcome of the course and the secondary is the assessment of low-cost interventions to existing buildings' energy performance and thermal comfort conditions.

The district heating system can be considered the healthiest, the most economical and environmentally friendly alternative in densely populated urban areas. District heating tariffing in Western Balkans is often based on the heated area instead of actual energy consumption, making any energy efficiency measure irrelevant. One of the challenges in these systems is the correct energy cost distribution, especially in collective residential buildings. The paper is based on the case study of the city of Zenica, Bosnia and Herzegovina. Since 1967, most residential buildings have common heating installations, making the installation of direct meters of supplied heat energy technically and economically inefficient and even impossible. Fairer thermal energy cost distribution is achievable by installing a common thermal energy meter for the entire building, but the question of how to distribute the costs of supplied energy to individual household units remains open. A pilot project implemented by the local heating distribution company for using a central heat meter as one of the ways of cost allocation is presented in the paper. The paper points out the advantages and disadvantages of the cost distribution methods.

Bosnia and Herzegovina, like most countries in transition, is characterized by high energy intensity. Given that more than 50% of the total energy in Bosnia and Herzegovina is used in the dwellings sector, which is significantly higher than the EU average, one of the priority goals should be to find ways to reduce energy consumption in both existing and new residential buildings. Analyses performed in Bosnia and Herzegovina and countries in the region show that individual family dwellings are the category with the highest specific energy for heating, over 400 kWh/m2/year. By applying architectural and construction measures and measures related to the improvement of thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina, significant savings in delivered and primary energy, and carbon dioxide emissions are possible. The paper compares the constructed building in the “traditional” style with its variant having an external thermal insulation composite system (ETICS) based on expanded polystyrene and based on mineral wool.

Life Cycle Assessment (LCA) is a scientific method used to assess the impact of a product, process or activity on the environment during its life cycle. Disability-adjusted life year (DALY) refers to the age adjusted to the disability, i.e. years of life lost due to premature death as well as years of life lived with the outcome of disability. Integration of LCA and DALY provides a complex approach for investigation of the working environment and assessment of human health impacts. In the study presented, the impact of EU pallet production on the worker was investigated using the DALY method. The results are presented through the distribution of impacts of the EU pallet, classified into three impact categories: impact on workers (work environment expressed in WE-DALY units), impact on climate change (DALY), and toxicity to humans (DALY). The investigation of the worker impact assessment expressed in WE-DALY showed that 47% of the worker impact comes from the use of an air separation plant. Climate change categories show that climate change impact categories indicate that about 63.2% of DALY belongs to chipboard, while the results of the category toxicity to humans showed that chipboard accounted for 58.63%, wood 28.86%, and steel 12.51%. By pairing two databases, the impact on workers expressed through WE-DALY was obtained. This method can be a useful tool for evaluation of health impacts on workers in all branches of industry.

The variety of topics discussed in this session shows that engineering practice can offer different solutions to cope with climate change, environmental pollution, the quality of life and human health in general.

Thermal Energy Tariffing Model for Energy Efficiency

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ABSTRACT

The district heating system can be considered the healthiest, the most economical and environmentally friendly alternative in densely populated urban areas. District heating tariffing in Western Balkans is often based on the heated area instead of actual energy consumption, making any energy efficiency measure irrelevant. The costs are not calculated or charged. One of the significant challenges in these systems is the correct energy cost distribution, especially in collective residential buildings. The pressure consumers and consumer protection associations put towards the thermal energy distributors, asking to enable the measurement of delivered thermal energy, is justified.

Distance heating of urban and suburban parts of Zenica, B&H, began in 1967. Most residential buildings have common heating installations, making the installation of direct meters of supplied heat energy technically and economically inefficient and even impossible. It is possible to enable fairer thermal energy cost distribution by installing a common thermal energy meter for the entire building. However, the question of how to distribute the costs of supplied energy to individual household units remains open.

This paper also presents possible ways of allocating the thermal energy costs applied in the cities and countries facing the same problems. A pilot project implemented by the local heating distribution company for using central heat meter as one of the ways of cost allocation is presented. The paper points out the advantages and disadvantages of the cost distribution methods.

Keywords: *Energy Efficiency, Tariffing, District Heating, Cost Distribution.*

INTRODUCTION

The whole world is facing great challenges in order to bring negative climate changes under control. This goal was quantified by the Paris Agreement in such a way to keep the increasement of global temperature below 2° C, with maximum efforts to keep it at 1.5° C. As greenhouse gases (GHG) emissions recognized as main cause for climate changes, first, the European Union (EU) pledged to reduce greenhouse gases emissions by at least 20% below 1990 level, and do so by 2020, while improving energy efficiency by 20% and increasing the share of renewable energy sources up to 20%.

In October 2014, the EU approved the Energy and Climate Framework. The aim of this framework is to continue to reduce greenhouse gases emissions by at least 40% below 1990 level by 2030, while setting new goals for both: renewable energy sources and energy efficiency. The goal of 40% by 2030 was the starting point for the EU before the international climate talks in Paris in December 2015, where a global climate agreement was agreed. Within the framework of the Paris Agreement, in November 2018, the European Commission also agreed a strategy for a climate-neutral economy until 2050.

To achieve the above-mentioned goals for 2020, 2030 and 2050, the EU has taken several concrete actions, while encouraging other countries and regions to do the same. As someone who is responsible for approximately 10% of global greenhouse gases emissions, the EU is acting a leading role in those processes, knowing the fact that Eu is in a transition to an economy with net-zero greenhouse gases emissions.

One of the seven gases that are classified in the group of greenhouse gases according to the agreement from Kyoto (Kyoto Protocol) is CO_2. At the end of 2010, the city of Zenica Mayor signed the Covenant of Mayors Agreement, which voluntarily commits districts, cities and regions to reduce CO_2 emissions in their whole area above the set goal of 20%. As part of the activities prescribed by this agreement, the city of Zenica developed and published in early 2013 the Sustainable Energy Action Plan (SEAP) [1]. The action plan provided precise and clear guidelines for the implementation of energy efficiency projects and actions and methodology about how to use renewable energy sources at the city level, which by 2020 should have resulted in a reduction of CO_2 emissions by 48% compared to the reference year of 2006. That is significantly more than the planned 20%. According to this plan, as much as 38% reduction of CO_2 emissions should have been achieved through the implementation of actions and activities in the building sector, of which more than two thirds were actions related to the distance heating system in city of Zenica. Almost half reduction of this 27% reduction of CO_2 emissions, is related to Energy efficiency increment by replacement of fuel in the distance heating system.

With a six-year delay compared to the deadline defined by this plan, in 2021 the construction of a new heating plant will be completed and, according to the reference inventory of CO_2 emissions from 2006, CO_2 emissions will be reduced by about 13%. However, in the meantime, there has been a significant reduction in the number of users of distance heating system services in the city of Zenica and it is necessary to take additional actions to ensure that the replacement of fuel in the distance heating system really gives the expected results.

HEATING METHOD OF RESIDENTIAL BUILDINGS IN THE CITY OF ZENICA

The delivery of thermal energy for heating the residential buildings and business premises of the city of Zenica began in 1967. In the same year, the heating of urban and later suburban local communities began. The company that distributes thermal energy has gone through various forms of organization and since 2008 has been operating under the name public company for production and distribution of heating energy "Grijanje" Zenica. Although its name states that it produces thermal energy, the company has been engaged only in the distribution of thermal energy since its establishment, while the producer and supplier of thermal energy was the "Željezara Zenica", the ironworks company, and today that is ArcelorMittal Zenica. The boiler plant for the production of thermal energy has deteriorated, which is why there are frequent interruptions in its work. This is, along with the dilapidated warm and hot water network, the main reason for the poorer quality of heating, which has led to an increase in the number of dissatisfied consumers who use the services of heating company "Grijanje" Zenica. In addition, in most residential buildings and business premises, common heating installations are installed, which makes it difficult to measure delivered heat energy because the installation of direct heat measurements devices is technically and economically inefficient and sometimes impossible.

Poor heating quality and the inability to pay the actual costs of the heating service are the main reasons why there has been a trend of increasing disconnected consumers from the distance heating network in the last ten years. According to available data, out of 1,040,000 square meters of residential buildings and business premises that can be heated by a distance heating system, 16% were disconnected from the network in 2010, while that percentage increased to 40% in 2020. Such a high disconnection rate is not unique to the city of Zenica and Bosnia and Herzegovina. The situation is similar in most Central and Eastern European countries in the post-communist transition period [2]. According to the available data in the heating company "Grijanje" Zenica, about 94% of the heated space consists of multi-apartment buildings, so it is very important which alternative heating methods in these buildings are used by heat consumers who have been disconnected from the distance heating system. Inadequate heating of the space adjacent to the space heated by the distance heating system additionally affects the poorer quality of heating, which then further increases the number of people disconnected from the network. This process seriously threatens to go out of control and to lead to the collapse of the distance heating system in the city of Zenica. The existing distance heating system of the city of Zenica, which is designed on the principle of one boiler plant and a very diverse hot water and warm water network in the length of 120 BAM and with most consumers in multi-apartment buildings, does not allow the less thermal energy purchase in proportion to disconnected consumers. Since that a significant part of thermal energy passively heats even disconnected consumers, approximately the same amount of energy is needed regardless of the active area that is heated, whether it is 650 or 850 thousand square meters.

During the creation of the Action Plan for Energy Sustainable Development, a research on which source of thermal energy is used by consumers who have been disconnected from the distance heating system was done. This research presented that the majority of excluded spaces in multi-apartment buildings are heated by electricity. This method of heating poses a great risk for electrical installations in buildings that are not designed for that level of electricity consumption. In addition, the question arises whether the use of electricity for heating in multi-

apartment buildings is a contribution to reducing CO2 emissions or the situation is slightly different.

CO_2 EMISSION FACTORS OF MULTI-APARTMENT BUILDINGS HEATING ENERGY SOURCES

If it is assumed that the rooms in multi-apartment buildings are heated only by a distance heating system and by electricity, then it can be said that in these buildings all CO_2 emissions related to heating occur in two ways. The first is direct through the combustion of fuel used in the city heating plant, while the second is indirect using electricity. Emission from fuel combustion is determined by multiplying the emission factor of that fuel and the consumed energy. For emission from electricity there is the emission factor, which is calculated based on the electricity produced during a certain period of time and the CO_2 emissions from the plant for its production in that period.

The data from the Sustainable Energy Action Plan were used to define the emission factors shown in Table 1. In the heating plant through which the city of Zenica was heated until 2021, coal was mainly used as fuel, with the addition of a certain percentage of natural gas. The Action Plan lists data from 2006. This data can be considered as now days data since the source of thermal energy has not changed since that year. From 2021, the city will be heated by a new heating plant that will use blast furnace, coke and natural gas. The emission factor of the new heating plant is assumed on the basis of available data according to which the total CO_2 emissions of the new heating plant on an annual level will be 11% lower than the total emissions of the existing heating plant. The emission factor of electricity shown in Table 1 is calculated on the basis of electricity produced in BiH for the period 2005-2010 and CO_2 emissions from all thermal power plants in BiH.

Table 1: Emission factors.

Energy source	Emission factor [tCO_2/MWh]
Electric energy	0,763
District heating – coal and natural gas	0,328
District heating – blast furnace gas, coke oven gas and natural gas	0,292 (assessment)

If only the emission factors are compared, it can be concluded that the negative effects on the environment of the use of electricity for space heating in multi-apartment buildings will be more than two and a half times higher than if a distance heating system with a new heating plant would be used. However, this can be claimed only in those cases when electricity is converted into thermal energy in a ratio of 1:1. Such ratio is present when convectors are used as heating elements, which in the best case have conversion of electricity into thermal energy of 95% degree. However, if air conditioners are used as heating elements, then the ratio between the consumed electricity and the obtained thermal energy can even reach a ratio of 1:4, which makes electricity a more acceptable solution.

In the first years of mass disconnection of consumers from the distance heating system, convectors were mainly used as alternative heating elements, while in the last few years the installation of air conditioners began. The reason why convectors were initially purchased is a smaller initial investment and the possibility of installing a heater in every room. After the citizens were convinced

that a larger initial investment in the purchase of air conditioners began to pay off after only two years, their massive installation began. However, due to the impossibility of heating the entire apartment with one air conditioner, the best solution for apartments that have been disconnected from the distance heating system is the combined use of these two heat sources. This ultimately leads to the loss of positive effects of installing an air conditioner.

MEASUREMENT OF DELIVERED THERMAL ENERGY

The commissioning of the new heating plant will ensure satisfactory heating quality and will eliminate the main reason why consumers were disconnected from the distance heating network. In this way, consumers who planned to disconnect themselves from the distance heating network, could invest the financial resources needed to purchase air conditioners and/or convectors into thermal insulation of multi-apartment buildings in which they live. However, if citizens are not stimulated to invest in increasing the energy efficiency of their building, it is difficult to expect that, in the situation like is in Bosnia and Herzegovina, they will do so. One of the ways to stimulate citizens to invest into increasing energy efficiency is to create preconditions for reducing heating costs. The current tariff structure does not provide sufficient financial incentive for building owners to invest in heat savings (similar to the case described in [3]). The integration of meters and sensors with existing building energy management systems (BEMS) is critically appraised [4]. Therefore, it is necessary to change the tariff system according to which the delivered thermal energy is charged in the city of Zenica. This tariff system must provide the possibility of charging for the delivered thermal energy, which can be determined by direct or indirect measurement. There are a large number of different tariff systems that can be found in areas that are or have been in a similar situation as the city of Zenica. Based on their experiences, it can be concluded that this is not an easy job. But no matter what the tariff system is, if you want to motivate consumers to pay for what they have spent, it is necessary to meet the technical conditions for measuring the delivered thermal energy. According to the estimate stated in the action plan for energy sustainable development of the city of Zenica, the cost of installing tools for delivered thermal energy measurement would be about 7 million euros, which would take 7 years to be done. As it is not realistic to expect the realization of this project in the next period, it is necessary to find some other acceptable solutions.

PILOT PROJECT OF CUMULATIVE DELIVERED THERMAL ENERGY MEASUREMENT

At the beginning of 2021, public company “Grijanje” Zenica launched an internal pilot project of the delivered thermal energy measuring in four almost identical residential multi-apartment buildings located in one city local community. This paper explains the advantages of thermal insulation. Some studies said that the annual energy consumption can be reduced by 57% via retrofitting of existing buildings [5]. Two residential buildings were thermally insulated in 2020, while the remaining two were not.

Figure 1: Appearance of one of the analyzed buildings during and after the completion of the thermal insulation procedure. Retrieved from https://www.skyscrapercity.com/threads/zenica-%D0%97%D0%B5%D0%BD%D0%B8%D1%86%D0%B0-development-news-2020.2234552/page-4.

One cumulative measuring tool for delivered thermal energy is installed in each building. The tenants in those buildings were not informed that this pilot project was being implemented, so they kept the habits of "saving" thermal energy that they had until then. Although there was not enough time that has passed to be able to give adequate conclusions, the data obtained after three and a half months can be used to observe certain phenomena.

Table 2: Active and inactive residential areas heated in the four analyzed buildings.

Num	Building address	Thermal isolated-object	Active areas [m²]	Inactive areas [m²]	Percentage of inactive areas [%]
1	Jalimamov put 14	No	1.628,88	1.116,45	41
2	Sejmenska 10	No	1.729,65	1.013,85	37
3	Bul. E. E. Arnautovića 12	Yes	1.194,39	1.496,00	56
4	Bul. E. E. Arnautovića 8	Yes	1.818,97	862,30	32

The percentage of residential areas that are disconnected from the distance heating system ranges from 32% to 56% (Table 2 and Figure 2). It is convenient for the research subject that these two extremes referred to buildings that are thermally insulated so it will be possible to clearly see the impact of passively heated spaces on the total amount of delivered thermal energy.

Figure 2: Ratio of active and inactive residential areas heated in the four analyzed buildings.

MEASUREMENT DATA ANALYSIS

Table 3 represents the total quantities of delivered thermal energy for each of the four analyzed buildings in the period from January to the end of April 2021. The total billing period is 3 and a half months.

Based on the specific consumption of thermal energy per square meter of heated space, the expected reduction can be observed in buildings that are thermally insulated. In order to get an answer as to whether this reduction has the expected value, a longer period of time is needed than the one currently being observed. What is characteristic for both: insulated and non-insulated buildings, is the higher specific consumption in buildings with a higher percentage of areas that are temporarily disconnected from the distance heating network. This supports the theory that part of the thermal energy is also used for passive heating of the disconnected spaces.

Table 3: Thermal energy delivered in the period January-April 2021.

Num	Building address	Thermal isolated object	Active areas [m²]	Percentage of inactive areas [%]	Delivered thermal energy [kWh]	Specific consumption per area [kWh/m²]
1	Jalimamov put 14	No	1.628,88	41	183.593	112,71
2	Sejmenska 10	No	1.729,65	37	163.229	94,37
3	Bul. E. E. Arnautovića 12	Yes	1.194,39	56	99.867	83,61
4	Bul. E. E. Arnautovića 8	Yes	1.818,97	32	132.814	73,02

Although we have only two samples on the basis of which it is not possible to occur an adequate dependence, it can still be assumed that reducing the number of disconnected consumers would reduce the specific consumption of thermal energy. Its value can be expected in the range of 60 to 65 kWh/m2.

Figure 3: Comparative overview of the percentage of inactive consumers and specific heat consumption.

DELIVERED THERMAL ENERGY COSTS

Based on the known heated area, the known billing period, the measured total delivered thermal energy and the applicable tariff system, it is possible to make a comparison between the price of delivered thermal energy if the payment was made in a lump sum per heated area and the price if the payment was made on basis of measured thermal energy. Existing decision of delivered thermal energy price for heating residential buildings and business premises in the city of Zenica in the heating season 2020/2021, provides the possibility of payment in both of these ways.

In accordance with this Decision, the price of heating residential buildings in which a heat meter is not installed is 2,40 BAM/m² per month, or 0,07869 BAM/m² per day (month = 30 days), without value added tax and it is paid during the delivery of thermal energy. The product of the area of the apartment (m²) and the unit price (2,40 BAM/m²), i.e., the product of the area of the apartment and the unit-daily price (0,07869 BAM/m²) and the number of days in the month, increased by the value added tax represents the monthly price, i.e., the monthly debt paid by the consumer.

The price of delivered thermal energy for heating a residential building in which the amount of delivered thermal energy is measured with a heat meter, is 94,36 BAM/MWh without value added tax. The total monthly price of residential building heating in this case is the sum of the price of delivered thermal energy measured with a meter and a fixed cost of 10% of the unit price of heating (2,40 BAM/m²) and living space, increased by value added tax and paid during the delivery of thermal energy.

Table 4: Apartment building costs calculated in two ways.

Num	Building address	Thermal isolated building	Active areas [m²]	Total delivered thermal energy [kWh]	Heating costs per area [BAM]	Heating costs per amount [BAM]
1	Jalimamov put 14	No	1.628,88	183.593	13.682,59	18.692,09
2	Sejmenska 10	No	1.729,65	163.229	14.529,06	16.855,19
3	Bul. E. E. Arnautovića 12	Yes	1.194,39	99.867	10.032,88	10.426,74
4	Bul. E. E. Arnautovića 8	Yes	1.818,97	132.814	15.279,35	14.060,26

Figure 4: Comparative presentation of residential building heating costs calculated in two ways.

Table 4 and figure 2 show the total heating costs for the four analyzed buildings. The billing period that was taken into account while determining the price of delivered thermal energy according to the area of the heated space was 3 and a half months.

If we analyze two buildings that are not thermally insulated, it can be concluded that, according to the current tariff system and current prices, consumers are not stimulated in any way to start creating conditions for paid heating costs according to the actual amount of heat supplied. And if the high costs of installing meters were ignored, which of course is not possible at all, consumers would, despite the application of maximum savings measures, pay a higher price for heating than they pay now.

In the case of buildings that are thermally insulated, this unfavorable difference in price is not present, but there are no significant reasons why someone would engage in the process of installing heat meters. If consumers in an isolated building in which the number of disconnected consumers is more than 50% would maintain the level of comfort they had so far (which is the goal of energy efficiency measures), they would have even higher costs than they have now. Only in the second isolated building, where the number of disconnected consumers is lower than the average, there are savings that would have to be even greater in order for the investment in the installation of heat meters which would be paid off in a reasonable period of time.

PROPOSALS FOR CREATING CONDITIONS FOR PAYMENT OF ACTUALLY CONSUMED THERMAL ENERGY

The best way to meet the conditions "the more you spend, the more you pay" is to install an individual heat meter for each user. It has already been mentioned in the paper that this option is technically, time-consuming, and therefore financially, very demanding. Although this ultimate goal should not be abandoned, some other more acceptable methods of charging should be defined as a transitional solution until the conditions for individual measurements are met. This especially refers to buildings for which insisting on this condition is completely economically unacceptable.

Another way of charging that would be more acceptable for consumers in multi-apartment buildings is the installation of a central meter of delivered thermal energy for the entire building and the installation of heat distributors-allocators. In this way, the percentage part of each heating element in the total heat consumption can be determined. Although this way of distributing the costs of thermal energy is theoretically very simple, in practice it has proven to be very questionable. The first problem is that it requires the consent of all individual consumers in the shared multi-apartment building and the installation of an allocator on each heating element. This has proved to be an almost unsolvable problem in the surrounding countries that have tried this method of distribution and which are very similar to the mentality and habits of people very similar to Bosnia and Herzegovina. In addition, the tariff system that accompanies this method of payment is very complex and has not proved to be good in practice. The most recent example is the problems that arose in Zagreb, where very soon after the implementation of such a project, there were requests to return to the old billing system per square meter, until a better way is found.

The third way of charging the delivered thermal energy is that the total delivered thermal energy, which is determined by the central meter, is divided among each consumer in proportion to the area of the space used by the consumer. In this

way, a completely correct distribution of the consumed thermal energy is not achieved, but it is much more correct than when the payment is made in a lump sum.

CONCLUSIONS

Poor quality of heating and inadequate way of charging for used thermal energy are the main reasons why an increasing number of users of the services of public company "Grijanje" in the city of Zenica are disconnected from the distance heating system. These consumers use electricity as an alternative source of heat, which, contrary to popular belief, does not have a more favorable impact on greenhouse gas emissions than heating through distance heating systems. Procurement of new boilers in the plant that produces thermal energy for the needs of the city of Zenica, guarantees good heating quality from the next heating season. It is now necessary to create conditions as soon as possible that will attract disconnected consumers to reconnect to the distance system. This is possible by creating a more favorable tariff system that will stimulate consumers to use the central heating system. Public company "Grijanje" is conducting a pilot project of measuring the total consumption of thermal energy for four almost identical buildings, two of them are thermally insulated. Based on the first data collected in insulated buildings, it can be concluded that, even if the method of distribution of total consumption according to the heated area is applied, sufficient savings will not be achieved that will stimulate consumers to invest in thermal insulation. This could be achieved by reducing the price of MWh of thermal energy compared to the current one. Suburban settlement Nemila is heated by a heating plant that uses biofuel (wood and wood waste) and all consumers who use the heating service of this heating plant pay 1MWh of thermal energy 76,00 BAM. The price of thermal energy in the city of Zenica, which would be in line with the price paid by consumers in Nemila, would be a serious incentive for consumers to use the services of distance heating and to invest their funds in increasing energy efficiency. Although efforts are being made to raise citizens awareness of the far-reaching consequences of increasing energy efficiency, financial constraints are still high to make that awareness prevail. Therefore, to expanding district heating, it is necessary to rely on experiences from other countries, which of course should be adapted to the specific local environment according to culture, technological capabilities, existing energy structure, institutions, regulations, policies, etc. [6].

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ETICS System of Individual Family Dwellings in Bosnia and Herzegovina

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ABSTRACT

Bosnia and Herzegovina, like most countries in transition, is characterized by high energy intensity. Given that more than 50% of the total energy in Bosnia and Herzegovina is used in the dwellings sector, which is significantly higher than the EU average, one of the priority goals should be to find ways to reduce energy consumption in both existing and new residential buildings. Analyses that have been performed in Bosnia and Herzegovina and countries in the region show that individual family dwellings are the category with the highest specific energy for heating, over 400 kWh / m2 / year. Bearing in mind that this category of buildings is the largest by the share of surface in the entire housing stock with as much as 73.71%, the obtained results show that this category of buildings in fact has the greatest savings potential. By applying architectural and construction measures and measures related to the improvement of thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina, significant savings in delivered and primary energy, and carbon dioxide emissions are possible. The paper deals with the comparison of the constructed building in the "traditional" style and its variant, which includes an external thermal insulation composite system (ETICS) based on expanded polystyrene and based on mineral wool.

Keywords: *Thermal, ETICS system, Dwellings, Energy.*

INTRODUCTION

Consumption of energy from non-renewable sources leads to the depletion of natural resources and environmental degradation in all segments: air, water, and soil, and one of the direct consequences is changes in climate and living conditions on Earth.

A key approach to mitigate climate change is to reduce the levels of energy use, and energy intensity, while maintaining the same or providing greater comfort that provides such an effect of energy. This approach is the basis for all activities undertaken in the field of energy efficiency improvement.

Bosnia and Herzegovina, like most countries in transition, is characterized by high energy intensity. According to the International Energy Agency (IEA, 2014.) the energy intensity of Bosnia and Herzegovina is 0.5 toe / 1000 USD of GDP. By comparison, it is four times higher than the average in the European Union and OECD member countries. The average European country earns four times more than national income of Bosnia and Herzegovina for the same amount of energy consumed. The energy intensity of Bosnia and Herzegovina is similar to that in Serbia (0.52) and Bulgaria (0.48), while Croatia (0.17) and Slovenia (0.18), and Switzerland (0.06) have significantly better intensities, (Arnautović-Aksić et al, 2016).

Considering the estimate that approximately 58.44% of the total energy in Bosnia and Herzegovina used in the residential sector (FNEEAP, 2012), which is significantly higher than the EU average, one of the priorities should be finding ways to reduce energy consumption as in existing as well as new residential buildings.

TYPOLOGY OF RESIDENTIAL BUILDINGS IN BOSNIA AND HERZEGOVINA

Based on the comparative analysis and specifics of the architectural heritage of Bosnia and Herzegovina, the basic criteria for defining the typology of residential buildings have been determined (Arnautović-Aksić et al, 2016):

- Period of construction;
- Architectural and urban characteristics of buildings'

The systematization of residential buildings according to the given criteria resulted in a matrix of typology of residential buildings, ie, a graphic and tabular presentation of the chronological development of the typology of residential architecture in Bosnia and Herzegovina.

PERIODIZATION OF RESIDENTIAL BUILDINGS IN BOSNIA AND HERZEGOVINA

With the aim of creating a chronological overview of the development of the typology of residential buildings, characteristic time periods are defined, conditioned by the socio-historical context, construction technology and applied materials, and regulations governing the field of thermal protection of buildings. In this sense, key historical thresholds have been identified in which the emergence of new concepts of construction, architectural styles or the use of new technological procedures and materialization of buildings have been recorded.

On the other hand, the periodization of types of residential buildings was also

influenced by the application of regulations in the field of thermal protection of buildings.

Based on the analysis of the historical aspect of the most important architectural and urban characteristics, as well as the review of regulations, the following periodization of the typology of residential buildings in Bosnia and Herzegovina is defined (Arnautović-Aksić et al, 2016):

- Period until 1919 - this period includes objects dating from the Ottoman period; mostly ground level and one floor buildings of skeletal wooden construction are filled with clay; and buildings from the Austro-Hungarian period, the construction of multi-storey residential buildings with massive walls up to 60 cm thickness;
- Period from 1919 to 1945 - in addition to family residential buildings, multi-storey buildings for collective residence are being built, they are being built using bricks, and the use of reinforced concrete begun;
- Period from 1945 to 1960 - the post-war period is characterized by residential buildings made of brick and reinforced concrete with external walls without thermal insulation;
- Period from 1961 to 1970 - in this period the construction of large residential settlements, rational and unified collective residential buildings begin, buildings are built with external walls without thermal insulation;
- Period from 1971 to 1980 - residential buildings built in this period have poor thermal insulation characteristics due to the application of thin layers of insulating materials, poor quality windows with numerous thermal bridges at the joints of different materials and structural elements;
- Period from 1981 to 1991 - the construction of prefabricated collective housing has intensified. During this period, 5 cm thick thermal insulation was applied on the facade walls of the buildings, most often made of expanded polystyrene in the contact facade system;
- Period from 1992 to 2014 - The first three years of this period were marked, due to the war, by the devastation of a large number of residential buildings. Post-war construction is characterized by the renovation of damaged buildings, and the construction of a large number of new buildings of family and collective residence. The renovated residential buildings have been completed in most cases, and the facade walls have been insulated with 5 cm thermal insulation, in accordance with the regulations.

URBAN-ARCHITECTURAL PARAMETERS IN CLASSIFICATION OF RESIDENTIAL BUILDINGS IN BOSNIA AND HERZEGOVINA

Urban-architectural parameters, based on which classification of residential buildings in Bosnia and Herzegovina was performed, have the following criteria: position of a building on a plot, connection of the building with adjacent buildings, number of floors, number of house numbers and number of dwelling units.

Based on the above criteria, a matrix of typology of residential buildings in Bosnia and Herzegovina was formed, which consists of two categories of individual and four categories of collective housing (Arnautović-Aksić et al, 2016):

- Single-family housing: single family houses - A single family house is a building of individual housing with three floors maximum and three

dwelling units maximum;

- Single-family housing: terraced houses - A terraced house is a building of individual housing with three floors maximum and three dwelling units maximum, it borders with adjacent buildings;
- Collective housing: multi-family house - A multi-family house is a self-supporting building of collective housing with more than three floors with more than three dwelling units;
- Collective housing: attached apartment building in urban blocks - An attached apartment building in urban block is a building with more than three floors, it borders with adjacent buildings;
- Collective housing: apartment block - A large residential block is a multi-floor building of great floor area, with three and more house numbers;
- Collective housing: high-rise building - A high-rise building is a freestanding building with many floors, at least eight floors.

SPECIFICITIES OF TYPOLOGY OF RESIDENTIAL BUILDING IN BOSNIA AND HERZEGOVINA

Results of inventory of residential buildings in Bosnia and Herzegovina point to the fact that a number of buildings of single-family housing (97.63%) compared to collective housing (2.37%) is significantly higher. However, if we analyse the number of dwelling units, difference in representation of single-family (66.47%) and collective (33.53%) housing is less expressed. According to the gross surface of residential space (Figure 1), single-family houses dominate (73.71%) whereas other types are present significantly lesser: apartment block (11.49%), multi-family house (8.77%), individual terraced houses (2.81%), attached apartment building in urban blocks (2.51%) and high-rise buildings (0.70%) (Arnautović-Aksić et al, 2016).

Figure 1: Distribution of typologies of residential buildings in B&H by gross surface (Arnautović-Aksić et al, 2016).

In the category of single-family housing, the dominant part is made of single family houses (96.2%), while terraced houses are in a small percentage (3.8%) (Arnautović-Aksić et al, 2016).

In the category of collective housing, the most numerous are multi-family houses (58.6%), followed by apartment blocks (21.2%), attached apartment building in urban blocks (19.3%) and high-rise buildings (0.9%) (Arnautović-Aksić et al, 2016).

Based on statistical data, it was determined that the construction of residential buildings was most pronounced in the following time periods: 1992-2014. (30.9%), 1981-1991. (28.3%) and 1971-1980. (24.1%) (Arnautović-Aksić et al, 2016).

As the focus of this research is energy efficiency in residential architecture, the level of completion and finishing of facades of residential buildings was determined by observation in the field. The results of the census show that as many as 25.9% of buildings in Bosnia and Herzegovina do not have a finished facade, while 26.9% of facades were done later.

ENERGY NEED OF BUILDINGS

In accordance with the regulations in force in the Federation of Bosnia and Herzegovina, as well as the standard BAS EN ISO 13790, the energy needs of buildings are calculated and expressed according to the annual energy required for heating (Sn FBiH, 2009, 2010). The classification of buildings into energy classes is done according to the value of specific annual energy for heating expressed over the useful, heated area, and for the purposes of the calculation it is assumed to heat the entire area of the building used for housing.

In the countries in the region, it is estimated that in only 50% of households over 50% of the usable area (Csoknyai et al, 2016) is heated with slightly more favorable indicators for the countries of the European Union (Atanasiu, 2014). Therefore, this criterion is not met for several categories of buildings, and especially for single family houses, which according to the share in the total area of the housing stock represent the dominant category.

Analyses performed in Bosnia and Herzegovina and countries in the region show that single family houses are the category with the highest specific energy for heating, over 400 kWh / m2 / year (Csoknyai et al, 2016) . The highest values of the shape factor were also recorded for this category, which is an indicator of a higher value of the energy required for heating.

No typical building in the category of single family houses meets the permitted values of annual energy for heating according to the current regulations (Sn FBiH, 2010). Taking into account that this category of buildings is the largest in terms of the share of area in the total housing stock, with as much as 73.71%, the obtained results show that this category of buildings has the greatest potential for savings.

By applying architectural and construction measures and measures related to the rehabilitation of thermotechnical systems in individual, single family houses, significant savings in delivered and primary energy and CO2 emissions are possible.

Energy need for heating of residential buildings in Bosnia and Herzegovina

Data on the annual thermal energy required for heating residential buildings in Bosnia and Herzegovina were obtained on the basis of statistical data on the total number of buildings and actual data on typical buildings (Table 1.) (Arnautović-Aksić et al, 2016).

Table 1: Energy need for heating of residential buildings in Bosnia and Herzegovina (MWh/yr) (Arnautović-Aksić et al, 2016).

	SINGLE FAMILY HOUSING		
	SINGLE FAMILY HOUSE	TERRACED HOUSE	TOTAL
-1945	244.439	8.433	1,48%
1946-1960	719.865	28.327	5,24%
1961-1970	2.752.871	87.198	18,32%
1971-1980	6.350.897	156.250	37,74%
1981-1991	3.101.309	89.498	17,90%
1992-2014	3.528.879		19,32%
TOTAL	16.698.261	369.706	
TOTAL	85,22%	1,89%	

The analysis of Table 1 shows that the energy needed to heat single family houses is 85.22% of the energy needed to heat the entire housing stock. The thermal energy required for heating is the highest for buildings built in the period from 1971 to 1980 (37.74%), and single family houses should be singled out (Arnautović-Aksić et al, 2016).

Due to the shape factor, single family house represent a category of energy inefficient residential buildings.

ENERGY SAVING AND THERMAL INSULATION

In order to meet today's regulations and to build in accordance with modern energy efficiency guidelines, all external structures should be thermally protected.

Thermal insulation of the building is necessary, because the basic construction materials, which provide the building with load-bearing capacity and rigidity, conduct more heat than is acceptable. In addition to significantly saving the energy required for heating, insulation also protects the building element from overheating, prevents water vapor condensation (which causes building material to rot, and the formation of microorganisms, fungi and mold) and contributes to thermal comfort in the room.

Heat losses through the building element depend on the composition of the element, orientation and coefficient of thermal conductivity. Better thermal insulation is achieved by installing materials with low thermal conductivity, ie high thermal resistance. The thermal resistance of the material increases with respect to the thickness of the material. The purpose of thermal insulation, therefore, is to improve the thermal insulation characteristics of buildings that can achieve less heat loss in winter, overheating of the space in summer, and protects the load-bearing structure from external conditions and strong temperature stresses.

When choosing a suitable material for thermal insulation of a building, characteristics such as thermal conductivity (λ), thermal resistance (R) and heat

transfer coefficient (U) should be taken into account. When choosing thermal insulation materials, in addition to the listed properties, it is important to pay attention to others such as fire resistance, water vapor diffusion, material density, compressibility, durability, sensitivity to water and moisture. In addition to all the above properties, thermal insulation can also be a good sound insulator.

In addition to these properties, the price of materials is often an important factor in decision-making. The offer of thermal insulation materials on the market in recent years is very rich. In addition to the usual classic thermal insulation materials, new ones are coming to the market, ie. alternative thermal insulation materials that manufacturers often present as environmentally friendly materials.

Good knowledge of the thermal properties of building materials is one of the prerequisites for the design of energy efficient buildings and for energy renovation of buildings, which should be one of the most important construction activities in the future.

MEASURES TO IMPROVE THE ENERGY CHARACTERISTICS OF RESIDENTIAL BUILDINGS

All measures that can lead to a reduction in energy consumption in residential buildings are systematized into three groups:

1. Measures to improve the elements of the thermal envelope of the building (architectural and construction measures);
2. Measures to improve the space heating system (thermotechnical measures);
3. Measures to improve the system for preparation of hot sanitary water (thermotechnical measures).

By applying one of the architectural and construction measures, ie. measures related to the improvement of thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina (external composite thermal insulation system (ETICS) based on expanded polystyrene and mineral wool), significant savings of delivered and primary energy and CO2 emissions are possible.

Measures to improve the thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina - architectural and construction measures

The proposed architectural and construction measures, ie measures to improve the thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina are given for two possible levels of improvement:

- *Upgrade 1* - external composite thermal insulation system (ETICS) based on expanded polystyrene (EPS);
- *Upgrade 2* - external composite thermal insulation system (ETICS) based on mineral wool (MW).

The proposed improvement measures are not determined with the aim of the facility reaching a certain energy class, but exclusively with the aim of reducing energy consumption. Upgrade 1 is a standard improvement measure that is defined in accordance with the usual measures applied during the rehabilitation of buildings in Bosnia and Herzegovina. Upgrade 2, although proposed, in Bosnia and Herzegovina is rarely applied due to the high cost and lack of skilled labor. The proposed measures are typical measures that can be implemented in

order to reduce energy consumption, but for each residential building must be considered in detail which measures will be implemented, taking into account the characteristics of the building, as well as economic and technical preconditions for their implementation.

Proposed measures to improve the thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina:

- *Upgrade 1* - expanded polystyrene (EPS) with insulation thickness 10 cm
- *Upgrade 1* - expanded polystyrene (EPS) - mixed graphite plates; thermal insulation thickness 10 cm
- *Upgrade 2* - mineral wool (MW); thermal insulation thickness 10 cm

Case study

Detached ground floor family house with a rectangular base, with a small opening on the facade. There is 1 apartment in the building, with a gross floor area of 114.56 m2. The entrance door is retracted in relation to the façade plane, and a covered pre-entrance space with a balcony has been formed. It is characterized by classic construction, a massive constructive system.

The structural and façade walls are made of brick blocks, 25 cm thick, in both directions, plastered on both sides, with horizontal and vertical reinforced concrete circles. The roof is classic, wooden, on two levels, with tiles as a roof covering (figure 3).

The construction towards the attic is a solid reinforced concrete slab, and the ceiling is made of mortar. There is no thermal insulation in the cladding of the exterior wall and on the mezzanine structure under the attic, but 5 cm of thermal insulation appears in the floor on the ground. The windows and balcony doors are double joined wooden wings that have two plain single panes of glass. The house has unheated attic spaces, and the attic space is not used for living. The net area of heated space is 84.64 m2, and the volume of heated space is 232.76 m3. The year of construction of the facility is 2000.

Using the PHPP methodology for the “case study”, the annual required energy for heating (kWh / m²a) was calculated for the existing condition and for the proposed measures to improve the thermal characteristics of the external walls. In the current condition, the exerior wall consists of mortar (2 cm thick), a hollow brick block (25 cm thick) and facade mortar (2 cm thick). PHPP calculations for the existing condition of the building show that the annual energy demand for heating is $Q_{H,\ nd}$ = 197 kWh / m²a.

Proposed measure for improving the thermal characteristics of external walls Upgrade 1 external wall consists of mortar (2 cm thick), hollow brick block (25 cm thick), thermal insulation expanded polystyrene (10 cm thick) and facade mortar (2 cm thick). PHPP calculations for the proposed improvement measure Upgrade 1 show that the annual energy demand for heating is $Q_{H,\ nd}$ = 140 kWh / m²a.

Proposed measure to improve the thermal characteristics of external walls Upgrade 1 external wall consists of mortar (2 cm thick), hollow brick block (25 cm thick), thermal insulation expanded polystyrene with admixtures of graphite (10 cm thick) and facade mortar (2 cm thick). PHPP calculations for the proposed improvement measure Upgrade 1 show that the annual energy demand for heating is $Q_{H,\ nd}$ = 138 kWh / m²a.

Figure 3: Graphic attachments (ground floor base and facades)

Proposed measure for improving the thermal characteristics of external walls Upgrade 2 external wall consists of mortar (2 cm thick), hollow brick block (25 cm thick), thermal insulation mineral wool (10 cm thick) and facade mortar (2 cm thick). PHPP calculations for the proposed improvement measure Upgrade 2 show that the annual energy demand for heating is $Q_{H,\,nd}$ = 139 kWh / m²a.

For the “casy study”, possible solutions were considered that would result in energy savings by improving the thermal characteristics of the exterior walls of individual family dwellings in Bosnia and Herzegovina, ie. Reducing heating energy without changing energy sources.

By analysing the results of PHPP calculations, for the “case study”, the proposed measure of Upgrade 1 - thermal insulation expanded polystyrene results in energy savings of 29% compared to the existing situation, while the Upgrade 1 - expanded polystyrene with graphite admixtures shows 30% energy savings condition. Upgrade 2 - thermal insulation of mineral wool results in energy savings compared to the existing condition by 29%.

Reducing energy consumption, cost savings, reduced CO2 emissions and eligible investment are key ways to achieve energy efficiency, which was the goal of this paper.

CONCLUSIONS

Socio-economic relations and the tradition of construction have resulted in the specifics of typology of residential building in Bosnia and Herzegovina.

Single family housing units make up the largest part of the housing stock, 93.36% of the number of all housing units, and by improving their energy characteristics can lead to a significant reduction in energy consumption for heating in Bosnia and Herzegovina.

One of the specifics of Bosnia and Herzegovina is that the entire living space is not heated, and that the dominant fuel for heating is still wood.

The results of practical examples show that by investing in a thermal insulation facade system, we achieve lower energy consumption, cost savings, but also improve the comfort of the occupants of the building.

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Analysis of Product's Design Health Impact Using Daly Method

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ABSTRACT

Life Cycle Assessment (LCA) is a scientific method used to assess the impact of a product, process or activity on the environment during its life cycle. Disability-adjusted life year (DALY) refers to the age adjusted to the disability, i.e. years of life lost due to premature death as well as years of life lived with the outcome of disability. Integration of these two methods provides a complex approach for investigation of working environment and assessment of human health impacts.

In this study, we investigated the impact of EU pallet production on the worker using the DALY method. The first step was to select a method for assessing the impact on the worker and analyse the product. Then, LCI product's activities were linked with the relevant industries and the impact on workers in work environment disability-adjusted life year (WE-DALY) units was calculated.

The results are presented through the distribution of impacts of the EU pallet, which is classified into three impact categories: impact on workers (work environment expressed in WE-DALY units), impact on climate change (DALY), and toxicity to humans (DALY). The results show that 47% of the worker impact (WE-DALY) comes from the use of an air separation plant. Climate change impact category indicate about 63.2% of DALY from chipboard production, while the results of the toxicity to humans category showed that chipboard accounted for 58.63%, wood 28.86%, and steel 12.51%.

The application of this method has proven to be useful tool for evaluation of health impacts on workers and it can be applied in all branches of industry. However, the problem is to obtain data on the branches of industry for specific geographic area as well as the subjectivity that is connected to decision making process.

Keywords: *LCA, DALY, Working environment, Working health.*

INTRODUCTION

In addition to the environment and the nature of an employee's work, most injuries at work occur due to ignorance of the dangers and harms, unsafe work, poor organization and non-compliance with the technological regime of work. Inexperienced employees often have no idea about the harmfulness of the conditions in which they work and perform their duties. From this lack of information about the consequences that such a way of working brings, work-related problems occur, such as the impairment of workers' health.

Life Cycle Assessment (LCA) is a systematic method used to determine the potential environmental impacts associated with a product during its life cycle. LCA is a method for analysis and quantification of possible effects of products on the environment, during the entire life of the product, i.e. from extraction of raw materials, through production, use and treatment at the end of product life, recycling and final disposal (SRPS ISO 14040: 2008). LCA is applied to a wide range of products and services, ranging from simple ones such as shopping bags and packaging to more complex products such as cars, computers and buildings (Pryshlakivsky & Searcy, 2021).

DALY (Disability Adjusted Life Year) refers to the age adjusted to the disability, i.e. years of life lost due to premature death as well as years of life lived with the outcome of disability. DALY is a measure of the difference between the current condition and the ideal, optimal health situation in which the population lives to old age without disease and disability (Murray, 1996). DALY is used to indicate the impact of disease on the population.

WE-DALY (Work environment disability-adjusted life year) is a method that refers to the amount produced by the industry represented in the product life cycle, and is used to characterize the impact on human health due to the hazards of the work environment in the industry. The DALY concept was introduced by Patrick Hofstetter into life cycle assessment in the mid-1990s when he sought unique metrics for expressing harm to human health. It is used to quantify the burden of human disease resulting from environmental pollution and to attribute it to the life cycle of products or services (LCA) (Scanlon et al., 2013).

Based on previous life cycle research, it has been concluded that human health impacts attributable to the work environment, in some industries or products, have the same or greater magnitude than the potential human health impacts attributable to environmental emissions. The development of a method for characterizing the impact from the work environment, is based of more than one decade of efforts for inclusion the social and socio-economic aspects of the product in the LCA. Guidelines for the work environment LCA or WE-LCA as well as social LCA concepts provide guidance on how to use qualitative, quantitative and semi-quantitative data to promote socially responsible decisions that take into account occupational health, safety at work and conditions labor, as well as human rights, cultural heritage, governance, and socioeconomic implications (Scanlon et al., 2014).

The workflow approach considers potential impacts on worker health as a relationship of the weighted health factor, for example, DALY, and some production measures from the processes that make up the product system. The weighted occupational health factor takes into account workplace mortality and is usually estimated from enterprise or national health data, for example, estimates of lost working days, incidence of fatal and non-fatal injuries, and disease cases (Li et al., 2020). Some authors consider the weighted impact of workers' health in the form of cash flows based on data from the national economic sector (Kijko et al.,

2015). Others, however, take DALY units as a degree of damage in the industry in their research.

In this study, we investigated the impact of EU pallet production on the worker using the WE-DALY method. It was important to select a method for assessing the impact on the worker and analyse the product. After the selected method, LCI products activities were linked with the relevant industries and the impact on workers expressed in work environment disability-adjusted life year (WE-DALY) units was calculated.

METHODOLOGY OF CALCULATION

Integrating occupational safety into life cycle assessment (LCA) can provide decision-makers with insight and opportunities to prevent shifting the impact on human health between the non- working and working environment. For example, efforts to eliminate the release of hazardous substances into the environment through emission control increase the exposure of workers in some industries (Scanlon et al., 2014). The integration approach uses industry-level work environment characterization factors (WE-CF) to turn industry activities at the expense of human health attributable to the work environment, which is assessed as a disability-adapted life year (DALYs). The method for assessing the impact on workers is based on a methodology from the (Scanlon et al., 2013).

Given that the method in this study is based on Scanlon et al., data was taken from USA for better comparison. Data on fatal and non-fatal injuries and diseases related to industry are used to calculate WE-DALY. In the United States, the type of work that workers perform, the branch in which they work, or the product they produce is identified by the North American Industry Classification System (NAICS). Industries are identified by a six-digit code.

The United States Department of Labor, the Bureau of Labor Statistics (BLS) collects data from U.S. industries regarding the annual rate and number of fatal and nonfatal injuries and illnesses in the workplace and organizes this data in accordance with NAICS (U.S. Department of Labor, 2007). Fatal and non-fatal injuries and illnesses experienced by workers are reported from workplace exposure to chemical, biological or physical hazards associated with the nature of work in each of the specific NAICSs.

For each industry or NAICS (n), the number of years of life lost (YLL_n) is represented by the premature mortality of the working population, and for each non-fatal injury or disease the number of years of life with a disability is (YLD_n) represented by the severity of the injury or disease at work (Scanlon et al., 2013).

For each industry represented in the product life cycle, the YLL_n is based on the number of deaths reported in a given year and the age at which the deaths occur. YLL is calculated as follows:

$$YLL_n = \sum_{a=1}^{9} \sum_{s=1}^{2} (N_{a,s} \; x \; L_{a,s})$$

Where is:

N - Equal to the number of fatal injuries by age and gender;

L - The average number of years of life remaining until death by age and gender; and, n - Type of industry or NAICS.

For each industry or NAICS (n) represented in the product life cycle, YLD_n is based on the number of nonfatal injuries and illnesses reported in a given year, the severity of the injury or illness, and the length of time the worker lived with the injury or illness.

Equation for lifelong injuries (LL):

$$YLD_{n,LL} = \sum_{c=1}^{x}\sum_{a=1}^{5}\sum_{s=1}^{2}(N_{c,a,s}\ x\ W_{c,a,} \times D_{c,a,s})$$

For injuries and diseases with short-term (ST) duration:

$$YLD_{n,ST} = \sum_{c=1}^{x}\sum_{a=1}^{5}\sum_{s=1}^{2}(I_{c,a,s}\ \times\ W_{c,a,}xD_c)$$

For injuries with LL and ST duration, the equation is used:

$$YLD_{n,LL} + ST = \left(YLD_{n,LL} * (\%LL)\right) + \left(YLD_{n,ST} * (\%ST)\right)$$

For the calculation of the total YLD_n, the equation is used:

$$YLD_n = YLD_{n,LL} + YLD_{n,LL}\ +\ YLD_{n,LL+ST}$$

Where is:

I - The number of non-fatal injuries and diseases for each BLS code reported for non-fatal injuries and diseases occurring in each NAICS for each age group and gender;

W - The weight assigned to the code for each BLS code reported for nonfatal injuries and diseases occurring in each NAICS and for each age group;

D - The duration of the disease;

LL - Represents injuries and diseases of lifelong duration; ST - Represents injuries and diseases of short duration;

n - Type of industry or NAICS; and,

x - Represents the total number of non-fatal injuries and diseases occurring in the study population.

The following equation is used to calculate WE-DALYs by industry or NAICS:

$$WE_DALY_n = YLL_n + YLD_n$$

WE-CF are the ratios of fatal and non-fatal injuries and illnesses caused at work that occur in the American working population and the amount of physical production in American industry. Represent hazards and exposures in the workplace, which are compatible with the life cycle inventory (LCI) structure common to process-based LCA:

$$WE_CF_n = \frac{WE_DALY_n}{Output_n}$$

WE-DALY for industry is estimate based on the number of fatal and non-fatal injuries and illnesses in the workplace, the age at which they occurred, the severity of the injury or illness, and the time period in which the injury or illness affected the worker. In other words, WE-DALY represents the number of healthy years of life lost as a result of workplace morbidity and premature mortality (Scanlon et al., 2013).

Table 1 shows one part of a total of 127 branches of American industry and corresponding WE- DALY characterization factors. Two columns from table 1 are important to connect the processes from the Ecoinvent LCI database with NAICS. The first column shows the NAICS code, while the rows show the branches of industry. The second column that is important for connecting to the processes from the first database is the WE-CF column. In assessing the impact, characterization factors were used, i.e. by multiplying by the quantities of material and energy flows obtained from the Ecoinvent database for the analysed product.

Table 1. Work environment characterization factors (data example) (Scanlon et al., 2014).

NAICS Code and Description	WE-DALY	Physical Quantity Produced	Unit	WE-CF
111110 Soybean Farming	166	8.33E+10	kg	1.99E-09
111120 Oilseed (except Soybean) Farming	460	2.47E+09	kg	1.87E-07
111211 Potato Farming	601	1.96E+10	kg	3.07E-08
111339 Other Noncitrus Fruit Farming	472	4.37E+09	kg	1.08E-07
113110 Timber Tract Operations	128	1.98E+12	m3	6.44E-11
113310 Cutting and Transporting Timber	3971	4.51E+08	m3	8.81E-06
1115112 Soil Preparation, Planting, and Cultivating	555	3.74E+12	m2	1.49E-10
112113 Crop Harvesting, Primarily by Machine	1668	1.14E+12	m2	1.46E-09
115114 Postharvest Crop Activities	1069	1.14E+12	m2	9.37E-10
211111 Crude Petroleum and Natural Gas Extraction	1788	3.34E+13	MJ	5.35E-11
212112 Bituminous Coal Underground Mining	3392	1.02E+12	kg	3.32E-09
212113 Anthracite Mining	589	1.52E+09	kg	3.86E-07
212210 Iron Ore Mining	107	4.78E+10	kg	2.23E-09
212231 Lead Ore and Zinc Ore Mining	0	4.25E+08	kg	6.43E-10

Table 2 shows the minimum and maximum values of the characterization factor. The minimum values belong to the corn milling industries and sewage treatment plants, while the maximum values of the characterization factor are taken to be the industries for aircraft production and shipbuilding and ship repair. The higher the value of the characteristic factor, the more the observed industrial process will affect the health of workers.

Table 2. Minimum and Maximum values of the characterization factor.

Industry	Min *WE-CF*	Max *WE-CF*	Unit
Wet Corn Milling	4.35E-12		Kg
Sewage Treatment Facilities	3.61E-12		L
Aircraft Manufacturing		5.80E-01	p
Ship Building and Repairing		6.25E+01	P

RESULTS AND DISCUSSION

An EU pallet product has been selected as a simple an easy to understand product in order to apply the WE-DALY method. An EU pallet is standardized and used in many production and transport services, this example is simple and located in the Ecoinvent LCI database. The EU pallet is an extended pallet made of wood with a certain dimension. The pallet is 0.96 m^2, dimensions are 120 x 80 x 14.4 cm and weight is 20–24 kg. The load capacity of the pallet is 1500 kg. It facilitates the handling and forwarding of goods by forklift, such as in road, rail and air transport of goods. EU pallets can be treated according to the ISPM 15 standard and pallets treated in this way can be exported to all countries of the world. Each EU pallet must have a trademark, on which it can be recognized that it has been treated, and the authorization for the trademark on the product can be applied by any legal entity that has a permit from the competent ministry.

In order to analyse the process from Ecoinvent database, openLCA software was used (Ciroth & Winter, 2014). Although the Ecoinvent 3.7 LCI database is newer and more up-to-date, but in order to compare the obtained results with the results of the previous work (Scanlon et al., 2013), the old Ecoinvent 2.2 database was used. In EU pallet production there are three basic input processes - plywood, wood and steel, which are used to make the pallet. Outputs from the EU-pallet process are related to the processes: packaging of fiber-cement products, injection moulding, explosives, corrugated cardboard base paper, stone wool, packed in the factory, packaging of lime products, cement packaging, packaging of clay products, brick, extrusion, plastic film. Figure 1 shows the results obtained using openLCA software, where we can see how the processes are connected in the Ecoinvent database. The processes related to the production of the EU pallet are classified by units. The units according to which the processes are classified are units of mass (kg), quantity (pcs., Items), area (m^2), volume (m^3), length (m) and energy (MJ).

After selecting the analysed EU pallet process, a list of all 2000 processes related to the EU pallet was obtained from the Ecoinvent LCI database. These processes are related to the database from the author's work (Scanlon et al., 2013), i.e. with the corresponding branches of the American industry marked with NAICS codes for which WE-DALY characterization factors have been developed. During the pairing process of two databases, some processes had the same units that could be paired while others did not, and therefore unit conversion was required (e.g., units for mass, volume, energy, etc.). Most of the processes were successfully connected but there were processes from the Ecoinvent LCI database for which was no suitable processes that could be found in the US industries. The number of processes successfully connected is 1636, while the other 364 could not be matched with processes from American industries. For 170 processes no suitable unit was found, and for the other 194 no suitable activity was found from another database.

Figure 1: OpenLCA software results.

The processes from the Ecoinvent database are connected with the branches of the American industry, of which there are a total of 127. By pairing the databases, i.e. by multiplying the amount of the appropriate process and the characterization factor for the paired branch of industry, the influence on the worker was obtained. For example, the process of "3kWp facade installation, multi Si, laminated, integrated, at building - CH" from Ecoinvent database that models the production of facade installations in a building, the corresponding branch of American industry is commercial and institutional construction, which has NAICS code 236220, and a characterization factor of 1.60E- 05, the impact on the worker is 5.22E-10 m^2.

Table 3 shows the distribution of the impact of the EU range, which is classified into three impact categories: impact on workers (work environment expressed in WE-DALY units), impact on climate change (DALY), and human toxicity (DALY). The second column of Table 3 shows the impact of the process on climate change, i.e. the magnitude of the environmental impact. The results of the worker impact assessment expressed in WE-DALY show that 47% of the impact on the worker comes from the use of an air separation plant, 1% is related to the consumption of high and low voltage electricity and the rest (less than 1% per individual process) is linked to other processes in the EU-pallet production chain. The results of the climate change category show that the climate change impact categories indicate that about 63.2% of DALY belongs to plywood, 31.3% of DALY is wood used in pallet construction and 5.5% of DALY belongs to alloy steel, while the results of the category human toxicity showed that Particleboard accounted for 58.63%, wood 28.86%, and steel 12.51%. The results of the impact of the category of climate change and human toxicity were obtained by calculation in openLCA software. By pairing the databases, the impact on workers was obtained, expressed via WE-DALY, whose values are in the table.

Based on the obtained results of the authors (Scanlon et al., 2013) who investigated two waste treatment activities, incineration and disposal, a comparison was made with the EU palette. The results showed that one EU pallet has a greater impact on the environment and the working environment, because the production process of the EU pallet is more complex than incineration and landfilling. Because it consumes more natural resources and energy.

Table 3. Processes associated with 90% or more of DALYs attributable to emissions to the environment or work environment.

DALYs (% of all processes)			
Process	Working environment	Climate change	Human toxicity
Particle board, outdoor use, at plant		5.39E-6 (63,20)	8.88E-7 (58.63)
Sawn timber, softwood, raw, air drie		2.67E-6 (31.3)	4.37E-7 (28.86)
Steel, low alloyed, at plant - RER		4.69E-7 (5.5)	1.89E-7 (12.51)
Air separation plant - RER	4.70E+01(47)		
Electricity, high voltage, production UCTE, at grid – UCTE	9.05E-03(1)		
Electricity, medium voltage, production UCTE, at grid – UCTE	8.46E-03(1)		

Table 4. Comparison of processes and their impact on the living and working environment.

	Working environment	Climate change	Human toxicity
EU pallet	4.70E+01	8.53E-06	1.51E-06
Incineration	1.30E-07	7.06E-07	2.38E-07
Deposal	2.65E-07	7.06E-07	3.10E-07

One of the shortcomings of this approach was the mismatch of the units of measurement, as well as the impossibility of connecting the processes of these two bases, which resulted in an incomplete analysis. Another disadvantage during the choosing one of several branches of industry is that this selection is guided by a subjective choice and thus the selected branch does not mean that it is the best for most decision makers. For example for Ecoinvent process “Welding, arc, steel – RER” which is arc welding of steel, no suitable unit was found in industry WE-DALY database.

CONCLUSIONS

Based on the analysis conducted on the EU pallet, selected from the Ecoinvent LCI database, a list of all 2000 processes related to the EU pallet was obtained. The data taken from US database were selected for better comparison of obtained results with the ones from the of previous study (Scanlon et al., 2014). The research within this paper was based on pairing the processes of two databases. While pairing of process, majority had the same units that could be paired, while others did not and therefore required the conversion of units (such as mass, energy, volume, etc). The number of processes that were successfully paired is 1636, and 364 processes could not be paired because no suitable processes were found for them in the American branches of industry. The branches of industry that have proven to be the most represented in this paper are energy and chemical, followed by mining and metallurgy. This method can be valuable because it contributes to the improvement of the evaluation of the impact on the worker and as such it can find application in all branches of industry. On the other side, the presented WE-DALY method has its downsides. One of the disadvantages is to obtain the data on industries for specific geographic areas. In this paper USA data were used, but in reality, data should be related to the geographic area within the investigated

system boundaries. Other disadvantage is that the process of connecting the two databases, industry database with Ecoinvent LCI database, is subjective and can lead to significantly different results.

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Sustainable Redesign of Existing Buildings in the Context of a Graduate

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ABSTRACT

Sustainable architecture has positive impacts on health, comfort, physical well-being and emotions for inhabitants. People spend 90% of their time indoors. It is important to explore all aspects of housing with the goal of understanding and subsequently improving the living conditions. The well-being and productivity of the inhabitants depend on the quality of the spaces. In order to limit their environmental impact, existing buildings must define the way in which the people, who inhabit them, live not only in their own neighborhoods but in the entire city. Living quality is not only about buildings and the homes they contain, but also the experiences offered to residents by the development as a whole.

The graduate course 'Architecture and Technology' at the Faculty of Architecture, University of Zagreb, attempts to educate students on assessing the environmental performance of existing buildings. Learning from own experiences of occupation of different houses and apartments and assessing the overall energy savings and indoor thermal comfort of the building, this paper discusses possibilities of life quality improvement by using simple based solutions. Showing examples of different existing housing architecture, this paper discusses methods, technical solutions, as well as architectural approaches for variety of interventions: from upgrading the existing facilities to basic architectural redesign designed in accordance with principles of sustainable development. The results involve primarily the teaching outcome of the course and secondarily the assessment of low-cost interventions to existing buildings' energy performance and thermal comfort conditions. The paper ends with important lessons we can learn for improvement of conceptual system redesign, materials to use, use and reuse of the units, and in particular, how future houses can be developed to be more sustainable

Keywords: *Architectural education, Graduate course, Sustainable architecture, Life quality, Inhabitant.*

INTRODUCTION

The study programme Architecture and Urban Studies at the Faculty of Architecture, University of Zagreb is a five-year-long programme in accordance with the Bologna process divided into two cycles: the first cycle Bachelor degree 180 ECTS (three years) and the second cycle Masters 90-120 ECTS (two years). The paper examines one of the technical courses within the Master‘s degree programme at the Department of Architectural Technology and Building Science available from the academic year 2018/2019 named Architecture and Technology. The course was schemed after the process of re-accreditation of higher education institutions in accordance with the 2018 Re-accreditation Plan conducted by the Agency for Science and Higher Education. An additional module named ‘Research, seminars, projects’ was added within the Master‘s degree programme. This year, most of the Master’s degree courses at the Faculty are dealing with the topic of the reconstruction of Zagreb due to a strong earthquake that hit Zagreb 22 March 2020 while being in coronavirus lockdown. It has been the strongest earthquake in Zagreb since the 1880 and has caused substantial damage in the historical city centre. Many old and historic buildings cracked and walls, chimneys and rooftops were damaged. It was decided that the Department of Architectural Technology and Building Science also takes part in the Institutional Research Project that addresses topics related to a comprehensive renewal of historical units of Zagreb from the aspect of technique and technology in architecture. The institutional framework is taken into account, so targeted topics of seminar research are within the following parameters: the historic city centre of Zagreb, historical heritage buildings and architectural-technological aspects, retrofit, upgrade, energy refurbishment, appropriate structural renovation, nZEB, alternative forms of construction, contemporary materials and architectural details, economic and organizational aspects of reconstruction, BIM technology, efficient thermo-technical and other technical systems.

THE GRADUATE COURSE ‘ARCHITECTURE AND TECHNOLOGY’

The graduate course ‘Architecture and Technology’ at the Faculty of Architecture attempts to educate students on assessing the environmental performance of existing buildings. It addresses the topics of building energy consumption and emissions, rational use of energy, environmental impact, high performance efficiency, high tech technology and sustainable building. Architectural technology is related to the different elements of a building and their interactions, and is closely aligned with advances in building science. The course is compulsory for the 1st year students. AT1 is scheduled in winter and AT2 in summer semester. The course is designed in the form of a seminar. Weekly schedule for teaching the course units is 3 lesson hours a week (for 15 week period) and 1 ECTS credit. Seminars are for smaller groups of students led by a mentor. Seminars are designed for students to talk about topics in the course reading or lectures in detail, so students have to take an active part in the class and make a presentation. The flexibility is given to the teachers to choose the subjects of their expertise. [1]

For the academic year 2020/2021 six general groups were set and it was left up to 136 students to choose a group and a mentor depending on the skills and interests. Topics are ranging from “Refurbishment, adaptation and upgrade” (5 mentors: 45 students), “AF polygon - nZEB” (1 mentor: 11 students, “Transformation” (1 mentor: 15 students), “Redevelopment of the historic centre” (2 mentors: 25 students) to “Re-process” (1 mentor: 18 students) and “Energy renovation of buildings” (2 mentors: 23 students). [2] In a way this paper is a

continuation of the research on the topic presented at the SBE19 Thessaloniki Conference where the new course in edited curriculum was discussed in detail [3]. The paper also presented data of survey carried out among first-generation students based on their attitudes about the edited master's degree curriculum. In the scope of this conference thematic area "Healthy Urban and Architectural Design" and the possible typology of the contribution "Experience in the field of teaching" me as the mentor of one AT1 group, the short overview of the work of the seminar group named "Transformation" is presented.

THE GROUP "TRANSFORMATION"

In architecture transformation can be defined as "The principle that an architectural concept or structure can be altered through a series of discrete interventions in response to a specific context or set of conditions without a loss of identity or concept." [4] For existing buildings transformations are inevitable. Sooner or later the original use of the building no longer meets the contemporary usage so transformation should raise the usability of the building to a higher level. The environment we are living in has a large impact on our health, comfort and well-being. People spend 90% of their time indoors. [5] The pandemic has greatly affected health in general and the way we live and work. The built environment's influence on health starts in the house. It is important to explore all aspects of housing with the goal of understanding and subsequently improving the living conditions. The well-being and productivity of the inhabitants depend on the quality of the spaces. Aspects such as access to sun and daylight, natural ventilation and acoustic and visual privacy, directly contribute to the health and well-being of the inhabitants, their ability to carry out normal household functions and feel safe and secure.

Course concept

Educational goals: Students develop the capability to critically evaluate results based on data, evaluate significant works of architecture in order to develop capacities for aesthetic and technical response. They also develop critical reading, thinking and writing and experiencing the architecture and reflecting on that experience.

Table 1: Teaching and learning methods for different learning aims [6].

	Learning aims	
	Develop the apability to use ideas and information	Develop the student's ability to test ideas and evidence
Teaching methods	Case studies Projects Problem-solving Demonstrations Discussion and debate Essay-writing	Seminar and tutorials Supervision Presentations Feedback on written work Literature reviewing Essays Critical assessment Self-assessment

Expected learning outcomes: By the end of the course, students comprehend methods needed to analyse and critically evaluate and interpret collected data, understand basic concepts of transformations and recognize the importance of international ideas and projects.

The seminar syllabus outlined two stages of the writing process for a seminar paper. Firstly, the research questions were asked for its own home: Are there any consequences after the earthquake? What are the advantages and disadvantages? What would be a large, medium or small transformation? Secondly, insight into the design of new buildings and renovated existing residential buildings from different construction periods were researched. The research was focused on the following parameters: basic parameters, construction (building technology and building envelope), energy parameters, indoor climate and comfort, waste and recycling. Learning from own experiences of occupation of different houses and apartments and assessing the overall energy savings and indoor thermal comfort of the building, students discussed advantages and disadvantages of existing buildings/apartments and possibilities of life quality improvement by using simple based solutions. Analysing international well-known examples of different housing architecture, this group also discussed methods, technical solutions, as well as architectural approaches for variety of interventions: from upgrading the existing facilities to basic architectural redesign designed in accordance with principles of sustainable development.

RESULTS

The analysed buildings included 10 multifamily housing types: 1 skyscraper and 9 large apartment blocks, 3 family houses and 2 rooms in dorms. The results are very interesting and unexpected. Students mostly live in new buildings so the earthquake did not cause larger damage. Some buildings have already undergone energy efficient retrofit with addition of thermal insulation and windows replacement. Students of architecture live in well-designed and constructed accommodation. In terms of view, street noise, natural lighting, the higher floors of an apartment are considered more desirable. Also, the view from a balcony is an important factor. A pleasant green environment can play a vital role in a daily well-being (fig. 1) Lack of sound and thermal insulation between apartments and thermal insulation of outer walls are the biggest disadvantages. When asked about the indoor climate and how they feel at home, they all feel very comfortable. Students are very responsible, they all separate waste and recycle (fig. 2).

Figure 1: Overall display of advantages and disadvantages for apartment. The group "Transformation", AT1 2020/2021. The graph gives the scores of a group of 15 students.

Figure 2: Overall results for 15 homes showing parameters for energy efficient and sustainable architecture. The group "Transformation", AT1 2020/2021. The graph gives the scores of a group of 15 students.

PRESENTED WORK

Through this course the general strategy of transformations is based on the choice of conserving the existing building without making important interventions on the structure. Attention is given to a healthier indoors (ventilation, air quality, thermal health, moisture, noise, sun and daylight, views, etc.). It is possible for buildings to be transformed into systems that can benefit our health. A number of issues were addressed and a set of practical and technical problems solved. Interior improvement interventions and restructuration of some rooms are planned (tab. 1). Flexibility (the potential to use the rooms of a home in a variety of ways) and adaptability (the potential to modify spaces) are key considerations in the layout design. This includes providing enough space to meet the needs of the residents (circulation and adequate storage space). The building envelope ensures a healthy and comfortable environment inside the building. Unfortunately, common mistakes in house construction are still identified in modern Croatian construction. The majority of interventions are dealing with poorly executed details (lack of proper thermal or sound insulation, thermal bridges (tab. 2), windows replacement and installation, etc.). Apartment layout considerations also include how the private outdoor space associated with an apartment relates to interior spaces. The transformation of balconies give the opportunity, for each apartment, to have more natural light and more fluidity of use (tab. 3). Some students also investigated the global performance of the building envelope, the reconfiguration of vertical circulations, access halls and possible activation of unused attics.

Three selected proposals for house transformations of different scales and with different levels of complexity are presented. The chosen examples show the possible transformation of inhabited apartment buildings, one built in the early 1990's and two in 2010's.

Table 2: Small-scale apartment transformation. The group "Interaction", AT1 2020/2021.

Student's flat transformation, apartment building, Dubrava, Zagreb, 1990	
Student: Ivana Amižić AT1 – 2019/2020	
 position of the apartment in the building, south orientation	 reinforced prefabricated building without thermal insulation, ground floor + 3 floors, flat = 42 m² on the first floor
advantages - periphery of the city - lower noise - available close public transport - view towards green areas - parking	
disadvantages - poor position for sleeping room - poor ventilation of kitchen - dilapidated exterior wooden windows - no thermal insulation of walls - cracking and separation of joints - poor sound insulation - overheating in summer - difficult warming in winter - lack of cabinets	
Proposed transformation The whole building energy efficient retrofit: outside thermal insulation + new windows and doors Partial retrofit of the flat: inside thermal insulation + new windows and doors New design: closing the loggia / partition walls expansion (bedroom) / closing kitchen towards the hall and merging kitchen with living room	

Table 3: Small-scale apartment transformation. The group "Transformation", AT12020/2021.

Transformation / details and interior improvement interventions, apartment building, Jaruščica, Zagreb, 2011/2012

Doris Šimunđija AT1 2020/2021

new construction
7 floors
reinforced building with ETICS façade
flat is on the 4th floor
47.6+1.8=49.3 m²
2 people

advantages
- large windows
- insulated wall towards corridor
- east daylight
- large bathroom
- the flat is retaining the accumulated heat for a long time

disadvantages
- thermal bridge in the sleeping room
- one-sided orientation
- difficult to ventilate the flat
- walls between flats are not insulated
- no privacy – too close balconies
- poor sound insulation

Proposed transformation due to a bad construction: solving thermal bridges / adding thermal and sound insulation between flats / separating living spaces from corridor

Table 4: Façade transformation. The group "Transformation", AT1 2020/2021.

Façade transformation / balcony makeover, apartment building, Srednjaci, Zagreb, 2010

Dora Moguš AT1 2020/2021

new construction, reinforced building, ETICS façade, 1+6 floors, corner flat 90 m^2, 5th floor

advantages
- good orientation, views and room layout

disadvantages
- 2 small balconies

LESSONS LEARNED

The owners of their apartments are increasingly closing their balconies and terraces, in order to increase the area or to have more flexible organization of space.
This often results in messy facades that do not correspond the building's original design.
While designing apartments, architects should pay attention to the ratio of the area of interior and exterior spaces, so as not to build unusable outer spaces. Balconies of awkward dimensions and poor floor plan very often end up as a storage space instead of a place to enjoy.

PROPOSED TRANSFORMATION

Each apartment has two smaller balconies. One is connected to the living room and the other to a smaller bedroom. Both balconies are too small for everyday life. It is proposed to increase the size of one balcony by reducing the area of the living room and closing the second balcony to design a larger bedroom. By transforming balconies, users will have greater possibility to use outdoor space, and thus a more comfortable life.

floor plan before transformation

floor plan after transformation

DISCUSSION OF TEACHING PROCESS

This relatively new technical course in the form of a seminar is still reshaping and changing every year. Each new topic presents new challenges and requires a lot of adaptation along the way. There are some challenges that need to be overcome in order to fully exploit this particular course unit.

- Concept of teacher autonomy: The course structure refers to the choice of topic. It offers a great deal of flexibility but formulating a good research question is very important. The initial idea about exploring the earthquake environmental effects had to be changed because student homes were not damaged by the earthquake.
- Individual work: A group of 15 is a very small number of students. Also, the diverse typology of buildings is not applicable for broad context or more explicit agenda. A survey of a broader collection of buildings is necessary. The course topic is technical and complex, so individual work requires high concentration and focus for every student. Every student had an opportunity to learn directly from mentor and individually to solve problems and finishing off tasks.

- Online course: After two weeks of a traditional classroom environment, the course was only online. It was a sudden and unexpected measure that completely changed the complex interactions between mentor and students. E-courses must be a part of curriculum in higher education but it requires longer preparation and all the technical requirements before starting an online course.

The course is evaluated on yearly basis, so the value of the course can be seen in the student final report. The knowledge transfer gained by participating in the mentored course 'Transformation' was rated 4.77 points out of 5. [7]

CONCLUSIONS

The purpose was to investigate the ability to make existing architectural and spatial design choices on different scale environmentally sustainable. Living quality is not only about buildings and the homes they contain, but also the experiences offered to residents by the development as a whole. In order to limit their environmental impact, existing buildings must define the way in which the people, who inhabit them, live not only in their own neighborhoods but in the entire city. Medium- scale and small-scale transformations are possible. Buildings come in a variety of sizes, shapes, functions and typologies. Each project demonstrates its own design environmental strategy in delivering the service of architecture. Sometimes the work may be diminutive in their dimensions and present generally known technical fact, but are definitely large when it comes to its users. Apartments are our main living unit and it has to be a pleasant space to live in. The paper shows the example of a basic and economic transformation that produces pleasant and performing dwellings that renew living conditions, comfort and pleasure.

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