

# GLOBAL VILLAGE 2



Conference proceedings  
**GLOBAL VILLAGE - SHELTER FOR RESILIENT LIVING 2**  
On-line version

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Conference proceedings  
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## **PREFACE: GLOBAL VILLAGE — UTOPIA OR REALITY?**

res. ass .dr Tatjana Mrdjenovic, Faculty of Architecture in Belgrade  
Conference conceper and Editor in chief

The discussion will start debates about the diverse paradigms of suburban, rural, and urban places in today's global society, and it will do so by comparing these three types of locations. The primary point of contention is whether a Global Village should be categorized as an idealistic utopia or a feasible possibility for the foreseeable future. This debate will explore the advantages and disadvantages of each type of location, considering factors such as population density, infrastructure, and access to resources. Additionally, it will delve into the social, economic, and environmental implications of striving towards a Global Village concept. In the conversation that will bridge hierarchical and network viewpoints, we will investigate the idea of needs. Let's investigate some alternative ways of living to the one we are now accustomed to, on the presumption that we ought to consider the requirements that have been produced. These alternative ways of living may include sustainable communities, eco-villages, and self-sufficient neighborhoods. By considering the requirements that have been produced, we can explore how these alternative living arrangements can address issues such as energy consumption, mobility, built environment, waste management, and food production more efficiently and environmentally friendly. Furthermore, examining the social and economic implications of these alternative ways of living can shed light on the potential benefits and challenges they may bring to individuals and society as a whole. The core beliefs and identities held by people all over the world help to foster the growth of a diversified socio-economic and cultural network that spans a variety of geographic regions. This network serves as the basis for a worldwide community that is referred to as the Global Village. Within the context of our increasingly interdependent global community, this idea stands as a singular example of new communalism. As a result, Global Village would like to draw your attention to the following topics, most of which are also being explored in the thematic sessions of the conference:

1. ARCHITECTURE OF GLOBAL VILLAGE: PATTERNS, FORMS, SYSTEMS
2. PLANNING AND ARRANGING THE GLOBAL VILLAGE: INSTRUMENTS AND MODELS
3. MODERN TECHNOLOGIES IN RISK MANAGEMENT OF TERRITORIES
4. FORMS OF MOVEMENT AND MOBILITY MANAGEMENT IN THE GLOBAL VILLAGE
5. THE ROLE OF URBAN PLANNERS IN MANAGING THE CLIMATE TRANSITION
6. NEW MODELS OF ARCHITECTURE IN TRANSITION
7. RESILIENT CITIES IN THE ERA OF GLOBALIZATION: URBAN INTERVENTIONS TOWARDS A SUSTAINABLE FUTURE
8. HEALTHY city HEALTHY people: designing future cities for "mind body and soul"
9. RESEARCH IN THE FIELD OF ARCHITECTURAL TECHNOLOGIES - IDEAS AND POSSIBILITIES

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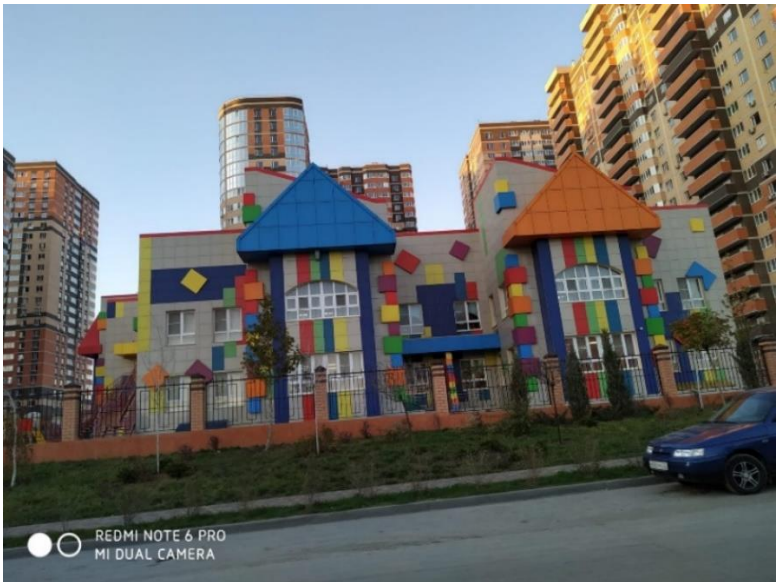


## **KEYNOTE LECTURES**

## PLANNING CONTEMPORARY CITIES: BETWEEN URBANISATION AND CLIMATE CHANGE

Pietro Elisei, ISOCARP President, ROMANIA

We are deeply immersed in the everyday life of the risk society, we all seek security and we project and plan choices for the future, but the problems for solving and managing the climate transition and getting out of increasingly socio-economically polarized and conflict-ridden cities must be found now, in the present. Certain issues such as investment in cultural or ecosystem services could change the economies of cities and even keep the depopulation of small and medium-sized cities in balance, but are planners and architects ready to change their tools and approach to contemporary city design?



# **CITIES - INCLUSIVENESS AND COMMUNITY PLANNING**

Rajendra Kumar, ISOCARP, INDIA

## **ABSTRACT**

An inclusive, accessible city is a place where everyone, independent of their economic circumstances, gender, ethnicity, disability, age, sexual identity, nationality or religion, can, and are allowed to, participate fully in the social, economic, cultural and political opportunities that cities offer. A new form of city planning is needed that promotes cities for everyone. For the architect and planner Jaime Lerner, inclusive planning involves recovering public spaces, rethinking mobility and creating cities where people have basic services at their disposal within 15 minutes. Planning that prioritizes inclusive, sustainable, diverse urban spaces that result in cities made for everyone and not only elites.

The community planning decision-making process should, first and foremost, be concerned with the long-term sustainability of our communities, environment and economy. The community planning process should involve a broad-based citizenry, including public and private sector leaders, community interest groups and multi-disciplinary professionals. A positive relationship between development and the making of community should be established through a citizen-based participatory planning and design process.

Talk will discuss few case studies of city examples of Inclusiveness and community planning'. Aim of talk is to connect the dots of design measures linked to the management of public space, mobility and the ecology of the city. From the perspective of urban development planning, the City Hall works to make life in the different quarters of the city more inclusive. The manual promotes districts that are fully equipped for daily living, such as shops, public transport stops, etc. It also emphasizes public space so that streets, squares, gardens and parks are seen to be safe for all to use with confidence.

# UNIVERSAL AND SPECIALIZED EXPOS THROUGH THE LENS OF ISIE - Towards Belgrade 2027

prof. dr Guido Cimadomo, Universidad de Malaga, SPAIN

## ABSTRACT

Expositions are not autonomous or homogeneous events, on the contrary, their development constitutes the plot of a discontinuous history, the mirror of a society in evolution that experiences its rules and its paradigms, showing them to the society. The Institute for the Study of International Expositions (ISIE) is a global interdisciplinary network of researchers interested in the design, promotion, reception, and consequence of the world's fairs and expositions held since 1851. Its work, rooted in the history of architecture, science, diplomacy, art, and technology, aims to better understand past events and key aspects relevant to contemporary Expos held globally.

The lecture will focus on understanding the role and effects that exhibition events have on the transformation of the city and the territory, in the framework of UN's Sustainable Development Goals.

*Keywords Expo, World Fair, urban transformations.*

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## ARCHITECTURE OF/FOR ICONIC NOMADS: PATTERNS, FORMS, SYSTEMS

The first session of the Balkan Architectural Biennale 2023 is titled *Architecture of global village: patterns, forms, systems*, it gathers four paper presentations and is moderated by prof. dr Aleksandra Stupar and dr Anđelka Bnin-Bninski. Two of four papers were presented: 1) *Global village in architectural theory and practice: softening liminal conditions* by Vanja Spasenović, Teaching Assistant, Department of Architecture, Faculty of Architecture, University of Belgrade, Serbia and Bojana Sićović, Associate, Department of Fine and Applied Arts, Academy of Arts, University of Novi Sad, Serbia; 2) *Sustainable urban form as an identifier of architectural space* by Tatjana Mrđenović and Pavle Vasev. Presentations were followed by fruitful discussion including multiple questions from the audience. The discussion had multiple perspectives on the presented matters. While the work of Mrđenović and Vasev is based on personal project design for the architectural competition in Montenegro, Spasenović and Sićović are dwelling questionnaire on an example of one façade system in the New Belgrade's Blok 23. Diverse discussion perspectives included: the notion of the facade in the context of resilient building, comparative analysis between modernist and present-day facade systems, questions on methodological approaches and suggestions on further steps and continuation of both research works.

Andelka Bnin-Bninski, moderator of the session



# GLOBAL VILLAGE IN ARCHITECTURAL THEORY AND PRACTICE: SOFTENING LIMINAL CONDITIONS

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## ABSTRACT

The term global village first appeared in literature around 1960s and continues to develop in various scientific disciplines as a spatial phenomenon that is not defined by borders, but by global culture and the development of contemporary techniques and technologies. Considering the presented concept, the principle of "disappearing borders" is problematized within architectural research through offering an alternative claim about the softening and layering of existing barriers. Barriers in architectural theory have not disappeared, but their existence is continuously transformed from a static element into a permeable and unstable barrier, following the complex needs of modern-day society. Taking into account the previous statement, it can be concluded that the border phenomenon develops typologically and semantically, introducing new classifications of border areas into the theory of architecture. Global culture development can be interpreted as almost dehumanizing through the diminished merit of individual identities, thus creating a specific need to modify the environment and make it personal through the establishment of architectural (physical) boundaries. The proposed hypothesis will be examined by the method of case study and graphic analysis of the meander building facade in New Belgrade's block 23. The facade is the subject of analysis because it represents a permanent, tangible and recognizable physical barrier between inside and outside, private and public, personal and collective. The paper presents an alternative view of the concept of global village borders, their manifestation and transformation in architectural theory and practice.

*Key words: border, barrier, globalization, New Belgrade, meander*



## **I. INTRODUCTION**

In the modern-day we are witnessing the intense connection of people, cultures, and concepts that represents the global village. This framework becomes a tangible reality that constitutes the McLuhan claim and the evolution of our perception and experience of the world (Federman, 2003). Although the global village concept was primarily related to the effects of mass media on the quality of social communication and the erasure of borders between people, nations, and cultures, we cannot ignore the impact of these rapid changes in the 21st century on architecture and the boundaries of physical space. The way we live and understand the world around us actively affects the physical space through the interventions we introduce in order to adapt our personal space to the needs of modern life.

This paper explores the meaning and character of built borders in architecture, transformed through contemporary concepts and principles of everyday life, influenced by the global village development. Examining the impact of our everyday life on physical space will be done through a case study of a residential building, more precisely its facade as a fixed, clear and striking physical boundary. The chosen meander building in block 23 in New Belgrade is considered suitable for researching the presented topic, because it is a representative of the residential architecture of the 20th century, built on the modernist principle of designing "from the inside out", which also challenges the character of boundary conditions.

Drawing upon the case study of block 23 in New Belgrade, we examine the meander facade overall development as the result of "local" and "global" forces. This assumption is elaborated along three lines of inquiry. We first acknowledge borders as a transformable, ephemeral, and complex phenomenon; in the second part of the paper, we recognize the diagram as a tool for mapping border conditions, while in the final segment of the paper we discuss the results of the graphic study. The theoretical discussion in parallel with the case study results in the definition of 12 concrete visual determinants that represent the "breaking" positions of the solid facade boundary, making it permeable and layered. The contribution of the research is in the understanding how the modern pace of life affects the residential architecture of the 21st century, as well as the affirmation of drawings as an important research tool for architects in understanding contemporary urban landscapes.

## **2. CONTEMPORARY BORDERS: SOFTENING LIMINAL CONDITIONS**

Following the development of modernism during the 20th century until today, a new conception of space is evolving relative to the relationship between different border conditions, which Siegfried Giedion defines as the idea of permeating space (Giedion, 2012). According to architecture theorists and sociologists of the second half of the 20th century, early modernism boundaries defined through principles of standardization, proportions, and modules begin to weaken becoming zones of negotiation woven from overlapping materials, programs, or functions. The observed zones of negotiation are further softened by the changing

pace of life in the 21st century. Architecture becomes a product of the interaction of spatial ideas and the movement of individuals or objects in space (Hays, 1998).

The subject of the case study are facades of the meander building in New Belgrade's block 23, facing to the street of Antifašističke Borbe and inside the block. The wall is one of the elementary forms of border manifestation in built space, as well as the only element that determines the border in the horizontal plane (as a vertical element). The boundaries of the built space are known as floor, wall, and ceiling (Noberg-Schultz, 2009). Wolfgang Zucker wrote about the importance of a boundary element, primarily one that determines the division between being inside and outside, emphasizing that raising the boundary line that divides the interior from the exterior is a primordial act of architecture (Arnheim, 1977). In the context of the analyzed meander building in block 23, the boundaries are determined by standardized semi-prefabricated elements, dimensional analysis of the man-centered living space, the construction and building systems, as well as the needs for increasing the quality of life (etc. light penetration, formation of atriums and additional open spaces). Facade wall not only creates a boundary on the inside-outside relationship at the object level, but also forms a clear border at the block level as a wider spatial instance. This is both the boundary of the block and the boundary of the object.

### **3. DIAGRAMMATIC REASONING: DRAWING AS A RESEARCH TOOL**

Diagrammatic reasoning is a research technique that uses drawings and visual tools to gain new knowledge. This principle of analog and/or digital representation allows the researcher to illustrate zones, elements, and states that are not visible in other research techniques and formats (Kulpa, 1994). The diagram is an important analytical tool for architects because it establishes an unambiguous connection between thought and space. Architect Peter Eisenman argues that we can observe the diagram as a tool through two basic modalities: (1) the diagram as an analytical tool and (2) the diagram as a generative tool (Eisenman, 1999). Generative diagrams allow the researcher to further abstract the analyzed problem by illustrating it in order to further interpret and verify the research question. In the process of research problem abstraction, we approached the use of a combination of two drawing techniques in order to adequately depict the factual state and interpret the facade that is the subject of the case study - a diagram and a map. The instrumentalization of mapping in the architectural discourse allows us to translate places, concepts, states, processes, or events into a spatial plan (Schoonderbeek, 2021).

The mapping process is carried out in the following order: (1) data collection, (2) cartographic abstraction, (3) map reading and analysis, and (4) map interpretation (Muehrcke et al., 2016). In the data collection phase, a realistic image of the analyzed facade was obtained through the use of a combination of research methods; the archival technical documentation obtained from the Historical Archives of Belgrade was supplemented by a tour of the location and the method of direct observation. Through the cartographic

abstraction (shown in Figure 2), the zones of interest and the positions of changes in the state of border conditions are illustrated, which become the subject of analysis in the discussion phase of the paper (Figure 1). By element abstraction, they become the legend of the map, which enables us to see the cause-and-effect relationship and interrelation between the recognized determinants. The result of the graphic analysis is the detection of 12 visual determinants that become places of change in the otherwise fixed border which build a defined rhythm and blur rigid boundary areas, changing the overall dynamics of the brutalist facade (also known as concrete baroque). The diagram (Figure 1) detects visual determinants that are key to softening facade boundaries. The observed determinants are: (1) changing the color of the existing joinery, (2) replacing the joinery, (3) presence/absence of sun protection (blinds), (4) changing the dimensions of the facade openings (transformation of the interior space), (5) painting the facade with keeping/changing the relief plastic of the primary facade, (6) replacing the fence on the balcony or loggia, (7) adding an air conditioning unit, (8) adding different antennas, (9) flowers, (10) partially/completely closing the loggia, (11) drying and hanging laundry, and (12) adding a canopy.

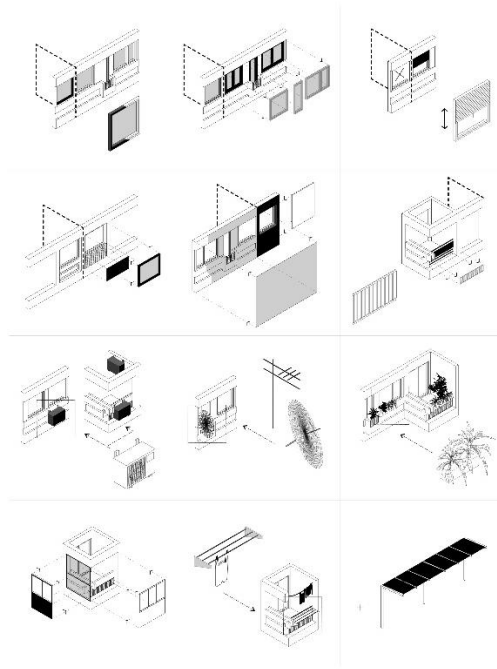


Figure 1: *Visual determinants of border transformation*

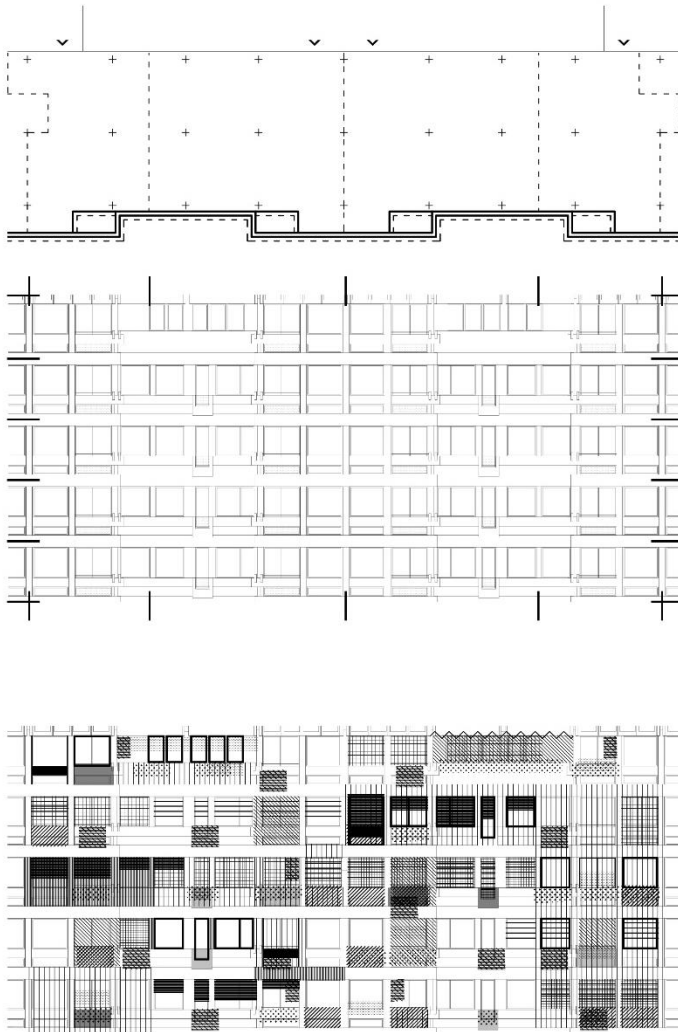


Figure 2: *Mapping border conditions*

## 4. DISCUSSION

As a result of the previously shown graphic analysis (Figures 1 and 2), 12 types of changes were observed on the facade of the meander building in block 23. The previously presented positions of border transformation can be divided into two groups according to the degree of modification they provide on the initial facade: (1) the first group of elements performs a partial or complete intervention on the existing facade elements, while (2) the second group introduces new elements to the facade membrane. Additional elements are most often arranged as single points, while the visual determinants of the first group appear in linear geometry, often following the area of one residential unit, leaving the possibility that this clear division of apartments can be read even with direct observation from the outside environment. The added elements are most often found in the loggia area. In addition to the previous conclusion, it is important to note that the observation of these changes offers an insight into a broader understanding of the sense of community and interpersonal relations; verticals that are uniformly painted can be observed, suggesting that it was an agreement at the level of one entrance community. Using the method of direct observation, we can distinguish that the most frequent alterations are the change of the joinery color, as well as the installation of windows with smaller openings (elimination of the second, floor window). The division between floors remain as the horizontal surfaces with the least change. This conclusion is very important, because it shows that the horizontal concrete elements, as one of the carriers of the concrete baroque, remain recognizable despite the major changes occurring in the facade area. Through a comparative analysis of archival drawings and direct observation, it can be concluded that smaller apartments are subject to larger changes and more radical transformations compared to two-and-a-half-room and larger residential units.

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Graphic analysis confirmed the initial hypothesis that modern man in the global village tends to personalize his living space as much as possible, which leads to the softening and layering of otherwise rigid boundaries. The global currents of "space without borders" influence architecture through the aspiration for the same change to appear at the local level. The outcome of the research is the formation of 12 visual determinants and their characterization with the aim of better understanding the impact of modern life on the built space.

## 5. REFERENCES

- Federman, M. (2003). The cultural paradox of the global village. In: *Panel on Digitization of Information and the Future of Culture at the EU-Japan Fest 10th Anniversary Symposium on The Role of Culture in an Age of Advancing Globalization*, held in Tokyo, Japan.
- Eisenman, P. (1999). *Diagram Diaries*. Thames & Hudson.
- Kulpa, Z. (1994). Diagrammatic representation and reasoning. *Machine Graphics and Vision*, 3(1-2), 77-103.
- Giedion, S. (2012). *Prostor, vreme i arhitektura: Razvoj nove tradicije*. Građevinska knjiga.
- Hays, M. (1998). *Architecture Theory since 1968*. MIT Press.
- Noberg-Schultz, C. (2009). Fenomen mesta. In: *Teorija arhitekture i urbanizma*, Arhitektonski fakultet Univerziteta u Beogradu, 260–273.
- Arnheim, R. (1977). *The dynamics of architectural form*. University of California Press.
- Schoonderbeek, M. (2021). *Mapping in Architectural Discourse: Place-time Discontinuities*. Routledge.
- Kimerling, A. J., Muehrcke, P. C., Muehrcke, J. O., & Muehrcke, P. M. (2016). *Map use: reading, analysis, interpretation*. ESRI Press Academic.

# ARCHITECTURAL MANIFESTATIONS OF PRIMARY PRODUCTION INDUSTRY IN URBANIZED TERRITORIES

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## ABSTRACT

Urban growth and development over the past decades have resulted in a natural merging of functional areas in urbanized territories. Living, working and leisure are intermingled to form a more complex environment capable of evolving in the dynamically changing reality for people.

In this complex environment, a specific phenomenon is observed - the emergence of primary production in the central parts of the city.

The report examines the architecture of modern buildings related to the farming and livestock located in landscaped areas. Examples with their situational and volume-spatial solutions are analyzed. Basic principles in their design are derived and their connections with the urban structure are described. The prospects for the development of primary production in the urbanized areas can shape and significantly improve the lives of city dwellers.

*Key words: urbanized territories, architecture, primary production*

## **1. INTRODUCTION**

The modern life of the urban man is very dynamic, and the movement away from the original source - the nature - is observed in all spheres [1]. People often buy their ready meals from large supermarkets. Modern children have rarely seen a domestic animal, they have no idea how the plants from which their food is obtained are grown.

In the more developed cities, a new phenomenon is beginning to be observed - the emergence of primary production in the urbanized territories. Work and leisure are merging to form a more complex environment capable of evolving in the dynamically changing reality for people.

## **2. SUBJECT, DEFINITION AND RELEVANCE OF THE TOPIC**

The subject of the report is the volume-spatial solutions of sites for primary production of food products in the city and their specifics related to the features of the built environment.

Primary production represents the first stage of processing in agriculture, animal husbandry, hunting or fishing.

In urbanized areas, it is associated with a short technological cycle in the management of a given resource and the achievement of a finished final product.

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## **3. HYPOTHESIS AND RESEARCH METHOD**

The understanding of modern urbanization is often characterized by a lack of sustainability. Through the analysis of examples of architectural objects of primary production in an urban environment and conclusions, it will be proven that they contribute to new opportunities for a clean environment and economic and social progress [2], which modern society will need more and more over time.

Five examples are investigated based on online research and a qualitative method, considering three factors of influence - ecological, economic and social.

## **4. ANALYSIS OF EXAMPLES**

The Fishery Terminal Lonja De Pescado, designed by Estudio Acta Architects in Almeria, Spain, is an example of a primary production building in an urban environment [3]. Its appearance reinforces the connection of the port with the settlement, creating a new synergy between visitors, workers and production, exposing the short production cycle in a volume-spatial structure. The fish handling took place on the first floor of the building - it is a direct reflection of the work process and functional flows, from the arrival of the fish on the dock to the sale on its departure on the trucks, and the second floor is occupied by a fish market, restaurant and commercial premises. The architecture of the fish terminal is distinctive in its design, while contrasting with the walls of the nearby Santa Ana Castle — Fig.1.

With its close proximity to an urbanized environment, the site contributes to reducing transport costs for both the raw material and the finished product, as well as workers and visitors. From an ecological point of view, this fact helps to reduce environmental pollution. The direct connection with the city creates an opportunity for quick movement to the robot places, social contacts in the site due to the presence of spaces with a public function, as well as introducing the smallest residents to fishing. The volume-spatial solution of the building helps to achieve a more diverse architectural appearance of the historical part of the city of Almería.



Figure1: *Fishery Terminal Lonja De Pescado - Almería, Spain*

In the port of Rotterdam, the Netherlands, in an area to support and stimulate experimental activities and innovations, there is a floating dairy farm. It consists of three floors - two above the water level and one below it. Its total square footage of 2,000 square meters is gathered in a compact, unifying structure cattle breeding, processing, production and storage of milk and dairy products, small fruit production and technical installations, as well as publicly accessible areas. The principle of the creation of the farm is simple - a livestock building designed as a float object [4]. The floor located at the lowest elevation is the floating element of the building. It has the most massive structure and houses the heaviest equipment, necessary for production, technical facilities, as well as growing rooms of small fruit on racks - type of vertical farm used for obtaining of fruit milks. At the intermediate level there are the actual dairy and visitor center. On the top one floor are the lightest load-bearing structures, the animals in the so-called "cow garden" as well as light mechanization.

The connection with land is made via drawbridges at middle and upper level. Logically the facade solutions of the building are a natural continuation of the sequence in the massiveness of the construction – from concrete in the lowest floor, through polycarbonate on the second level, to almost completely open space with movable enclosing walls in the highest part. The building fits harmoniously into the existing urban industrial environment, and its volume compared to the surrounding buildings is outstanding, not only because the simple orthogonal spatial solution, and also because of the fact that it is positioned off land. Cantilever floors and roof arches (Fig. 2) create the external appearance of the three-story livestock facility and articulate its architecture. The modular principle is advocated in its design.



The floating farm for dairy products creates a new model of urban animal husbandry, making it easily accessible to the end user, creating a learning environment for children, reducing logistics and the necessary financial resources to obtain the finished product, which also reflects on its price. It creates jobs in an urban environment, saving money and travel time compared to if the site is located in a non-urbanized environment. It makes it possible to move and enlarge modularly, which makes it very advantageous economically. From an ecological point of view, harmful emissions are reduced due to the optimization of transport, and the ecosystems in cultivated lands are given the opportunity to recover.



Figure 2: *Floating Dairy Farm - Rotterdam, architecture studio Goldsmith*

On the rooftop of Singapore's Funan Mall there is a Japanese restaurant Noka, which harvests many of its key ingredients — such as microgreens, oyster mushrooms and basil— directly from Funan's urban farm, providing perfect synergy and a very unique user experience. The urban farm has its own unique ecosystem. There is great interest in it, as it is an example of the newly emerging urban agriculture [5]. And for architects, it is a challenge and an opportunity how to creatively integrate these green public spaces in future master plans.

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Visitors pass through the attractive roof garden on a ladder or ramp where they see the herbs and mushrooms which they then consume in the restaurant located on the last level of the mall — Fig. 3.

The positive sanitary-hygienic effect, the retention of dust particles and the improvement of the microclimate, as a result of the construction of the roof garden, although on a small scale, contribute to the good ecological impact of the site on the environment [6]. Transport costs are reduced to a minimum, customers and workers also do not need to travel long distances by car to the site, as they are located in an urban environment, which makes it economically efficient, while at the same time not polluting the air.



Figure 3: *Urban Farm in the Funan Mall - Singapore*

Architecture studio Snøhetta designed wooden beehives for the roof of a food court in Oslo to attract and settle bees in the city - Fig. 4.

Two intersecting hexagonal volumes define the shape, which is remodeled in height and width to suit the needs of the beekeeper. "A pattern of distorted hexagons covers each hive, with six sides around the top that split into twelve sections around the bottom. [7]"

The Vulkan Beehive project creates small architectural volumes - sculptures visible from neighboring buildings and visually demonstrating the way bees are kept in urban conditions. The honey from them is packaged and sold in the food court below, which minimizes transport costs and loading-unloading areas. From a social point of view, beekeepers who would have difficulty finding work within the city are engaged in the work. The ecological aspect is related to the greater possibility of pollination of urban gardens and improvement of the ecological balance in the urbanized territory.



Figure 4: *The Vulkan Beehive project- installed at the Norwegian capital's Mathallen food and dance centre.*

*Photograph: Finn Ståle Felberg*

In the garden of the Triennale design museum in Milan is installed the Honey Factory that houses a traditional beehive and all the equipment needed to process the honey [8]. The wooden beehive is designed by Francesco Faccin and it is like a 4.5-metre chimney to keep its inhabitants away from children and vandals - Fig. 5.

Despite the limited access to the beehives, they have an educational role for the small inhabitants of the city. Transport for the delivery of copper is limited, since the primary production sites are located in the city, where the consumers are, which contributes to less harmful emissions in the environment and lower prices of the final product.



Figure 5: *The Honey Factory - Milan*

The examined examples, apart from being objects of primary production with an ecological, economic and social role for urban development, are analyzed in table I according to the following criteria: public purpose, sustainability of the architectural solution, attraction function, type of realization, possibility of moving to gain a more complete understanding of the possibilities of urban agriculture and animal husbandry.

Project	Public function		Sustainability		Attraction		Modularity, serial production		Mobility	
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Fishery Terminal	●		●		●			●		●
Floating Dairy Farm	●		●		●		●		●	
Urban Farm in the Funan Mall	●		●		●			●		●
The Vulkan Beehive project		●	●		●		●		●	
The Honey Factory		●	●		●		●		●	

Table I: *The examples examined by criteria*

The public function - restaurant, visitor center or shop - is represented in three of the examples - Fishery Terminal Lonja De Pescado, Floating dairy farm and Urban Farm in the Funan Mall.

Sustainability in the architecture of primary production is based on the reduction of consumption of energy, water, materials and waste generation, cheap maintenance and minimal operating costs, generation of a healthy environment, and several of the principles are advocated in all the objects presented in the text.

Each of the examples has an attractive function, and mass production and mobility are advocated by the hives and the floating dairy farm, of course under suitable conditions (temperature, air purity, latitude, etc.) to place the objects and raise cows and bees.

All the buildings analyzed in the report present a new model of mixed function of the sites of primary production in the city with an educational function [9].

## 5. CONCLUSIONS

Based on the study and in the context of the city, the sites of primary production provide a number of opportunities to achieve a better ecological, economic and social environment, making it more sustainable.

By partially removing primary production from rural areas and introducing urbanization, the former will be able to gradually regenerate, agro-ecology to recover, and biodiversity to improve.

“Due to urban pollution and local conditions, urban farm type, species, and technology should be selected based on spatial and environmental, and social analyses. [10]”

Volumetric-spatial forms housing primary production or part of it create a diverse and interesting urban environment, giving the opportunity to observe and study the process of urban agriculture or sustainable food production, especially for children and young people.

Urban manufacturing helps reduce the carbon footprint of urban areas by reducing transportation and emissions associated with traditional distribution systems. Most often, locally grown produce is organic – the plants are free of fertilizers and pesticides, and the animal products are free of antibiotics, making them better and more sustainable for the environment.

By producing on-site in the city, the necessary asphalt areas needed for loading and unloading activities at the production sites are also reduced, which helps to reduce the carbon footprint and heat the city's air.

The architecture of primary food production in urban spaces is a new approach to which consumers are aligned with food production and bringing back this way of life does not just improve communities: a close relationship with plants, greenery and animals and the exercise of caring for them, brings with it a host of measurable health benefits.

The focus is not only on the manifestations of the architecture of primary production as single objects in the urban environment, but as a tendency to change the urban tissue and mix it with new functions contributing to sustainable development.

It is time to ask whether food production should become a mandatory part of urban planning in the future.

## REFERENCES

- [1]Asparuhov, S., Contemporary Features of the Industrial Architecture in Agricultural Areas. ISBN 978-619-7194-55-5, 2020.
- [2]Nedyalkov, D., Sentova, Ek., The Building Design and Resource Saving as an Element of Sustainable Architectural Environment, International Conference UACEG2009: Science&Practice 2009.
- [3][https://www.archdaily.com/996345/fishery-terminal-lonja-de-pescado-estudio-acta?ad\\_medium=gallery](https://www.archdaily.com/996345/fishery-terminal-lonja-de-pescado-estudio-acta?ad_medium=gallery).
- [4]<https://hakaimagazine.com/news/dairy-farming-at-sea/>.
- [5]<https://worldlandscapearchitecture.com/urban-farming-will-intentional-landscapes-shape-the-future-of-food-production/?v=461b1990fe86>.
- [6] Pregyov, A., Rangelov, V., Efficiency and Need for the Realization of Landscaped Roofspaces, XXIII International Scientific Conference VSU'2023, ISSN: 1314-071X.
- [7]<https://www.dezeen.com/2014/08/27/snohetta-vulkan-beehives-wooden-hexagons-mathallen-oslo/>.
- [8] <https://www.dezeen.com/2015/07/01/francesco-faccin-honey-factory-urban-beehive-bees-triennale-museum-milan-expo-2015/>.
- [9]Hristov, J., The Architecture of Production Facilities and the Fourth Industrial Revolution. ISBN 978-619-91051-3-9, 2019.
- [10]Grochulska-Salak, M., Nowysz, A., Tofiluk, A., Sustainable Urban Agriculture as Functional Hybrid Unit-Issues of Urban Resilience, <https://doi.org/10.3390/buildings11100462>, 2021.

## SUSTAINABLE URBAN FORM AS AN IDENTIFIOR OF ARCHITECTURAL SPACE

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### ABSTRACT

The paper discusses the concept of architectural space, i.e. the process of its creation by separating it from the natural space and delimiting it with vertical artificial wall elements. The discussion is directed towards a sustainable urban form, i.e. defining a viable architectural (urban) space in the process of marking it, delimiting it, placing the basic principle of sustainability - what we take from nature we must return to it - in the focus of the formation of the architectural space. Furthermore, as Semper, in his thought about architecture and history, realizes temporal connections and as Giedion realizes the continuity of space, time and architecture, today nature is increasingly becoming a part of history due to the dominance of technology, and as such we protect it, mark it and return it to its space through communication in between nature and history. We can say that today we manage nature in a sustainable way and that as such it is already marked and becomes a signifier of further processes. As such, nature today can certainly be considered as a factor in the formation of a new ornamentation of the paradigm of sustainability, and its essential placement in the center of the architectural space is somewhat changed by Hans van der Laan the understanding of the architectural space as a limitation of the natural in realizing the connection and interweaving of the "historical lace" of natural and artificial. In the context of the above, the assumption of the research is that a sustainable urban form becomes a signifier of architectural space, and in that process a strong connection between natural, urban and architectural space is realized. It is considered that a sustainable urban form, created as a cast of nature's mold at the place of its creation, represents a fractal of natural-artificial combination through the process of urbanizing natural elements in a sustainable and resilient way. The paper will check its assumptions and attitudes on the example of the Competitive Solution of the General Hospital in Pljevlja, authored by T. Mrđenović and P. Vasev, through theoretical research and a survey.

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*Key words: sustainable urban form, architectural space, communicology*



# PROLEGOMENA FOR THE NEW THEORETICAL DESTINY OF 'STRUCTURE'

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## ABSTRACT

In the era of globalization, are there noticeable tendencies towards self-development or self-destruction of the structure due to its normativist, regulatory and repressive nature that stands in opposition and to the detriment of the regulatory nature of its technological, economic and organic properties as a whole? What is the role of the structure in the further historical evolution of the city and the fate of architecture? In order to answer questions about the possibilities of *stabilitas loci* as a primary aspect of the protection of the culture of space, it is concluded that a clear sense of some kind of structure, as an ever-existing substance of expressions of both old and new ontologies in contemporary architecture. On the basis of De Lande's critique of virtual philosophy, examples of *old structure ontologies* (iconic, utopian and public architecture) and *new structure ontologies* (digital, virtual and speculative architecture) are given comparatively with a vision of mutual permanence.

*Key words: architectural structure; architectural methodology; old ontology; new ontology.*

## I. INTRODUCTION

This paper focuses on phenomenology of structure, which is defined based on the categories of *main idea* as ontological and syntactic preferences of the architect, *idea pattern* as epistemological and semantic goal-oriented iconography, and *design methodology* as a procedural formulation that connects the main idea and idea pattern. *The new destiny of the structure* means the connection of epistemological prediction and ontological determinism - prediction is an epistemological term that derives its meaning from facts that are formed about data according to the *one-to-many* principle, while determinism is an ontological term that determines which events and elements are causally interdependent in a certain state things by pulling the principle of *one-to-one*.

## 2. THE OLD STRUCTURE ONTOLOGY

The old ontology of structure implies naturalistic and anthropocentric epistemologies, construction which since Vitruvius has been reducible to the pragmatic needs of society and intended for man, for which all objects are ontologically equivalent regardless of their scale, age, purpose, functional complexity and form of intellectual heritage.[1] There is no somekind super-object that would stand above the others in a hierarchical sense, that is, there is no ontological hierarchy, dialectical advantage or process specificity in these forms of architecture. The task of the architect was to make it possible to talk about architecture through partial elements of facades, individual buildings or a group of buildings that are planned in a certain semantic and syntactic unity. Based on ontological equivalence, Swiss architect and theoretician

Siegfried Giedion, in his seminal *Space, Time, Architecture* (orig.1941), systematizes three possible main ideas according to ontological structures: the first, the *Greek structure*, based on the labyrinthine grouping of architectural elements connected to the external space (concave principle); the second, the *Roman structure*, based on the meandering connection of built elements with the internal space (convex principle), and the third, *the modernist structure* based on the concept of overlapping previous structures by connecting the external and internal space in complex interactions, through the explicit or implicit reproduction of certain postulates of old ontologies. Contemporary metamodern architecture constructs an appropriate sense of atmosphere, nostalgia or semantics by structural combinations. [Fig. 1]

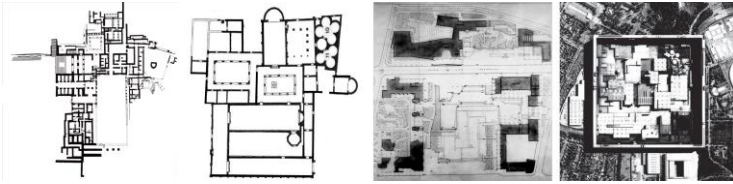


Figure 1: Phaistos (Greece, VIII BC), Gamzigrad (Serbia, III AD), Uzice (Serbia, 1959), Studio Dogma (Italy, 2002)

Iconic, utopian and public architectures are indicative of the understanding of classical ideas by the ontological relationship of the whole and its parts. The key characteristics of the iconic ontology were the aesthetically correct proportions through the canonical relationship and a certain syntactic unity of the elements of the structure individually and as a whole. The ideal worthy of being embodied in stone was found in man himself - the Renaissance comparison of the basilica temple with the harmony of the human body was metaphorically given by L. B. Alberti, and there was also an ever-present deliberate emphasis on anthropocentricity in the design of objects according to human proportions, and so in Le Corbusier's modernism is realized by an iconic architecture that is made possible not only by the power of man's work for man, but also by a literal return to Protagoras' ancient principle of man as the measure of all things. Architectural utopias in correlation with cognitively constructed goals subjected the objectively existing world to ideologies and fit beliefs into current reality. The most interesting thing about utopian projects is not that architecture might create a new personality, but that architecture must be created by an entirely new personality. Finally, the key point of reference in the creation of public architecture is represented by interactions that are not so much in the immediate vicinity of individuals as in the social complexity that mutually shares the influence on the same territory, place and space, whereby architecture articulates its connections with urbanism and spatial planning. [Fig. 2]

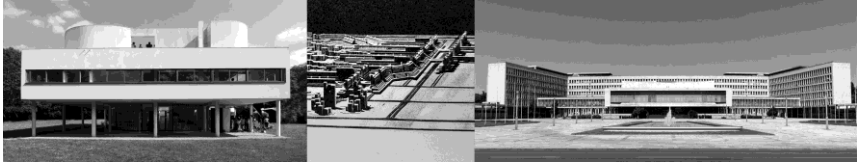


Figure 2: Iconic architecture (Villa Savoye, 1931), utopian architecture (Dunavgrad, 1968), public architecture (SIV, New Belgrade, 1952)

The contemporary architecture of the second half of the twentieth century, embodied by the creative experience of Le Corbusier, Mies Van der Rhoë and their's generation architects, developed structures that adhere to strong aesthetic principles (iconic architecture), which is intended for the new experience of modern man (utopian architecture) but at the same time it was designed to solve many utilitarian anthropogenic and andragogical problems that arise in the context of the urban reorganization of life in connection with spatial rationalization (social *islands* and *l'unite*). This brief recapitulation of the three types of architecture does not present a classification nor does it pretend to divide architectural models, but aims to highlight the brightest accents that can be found in the development history of architecture. The architect defines the structure of iconic architecture according to the postulates of his own experience; planning the structure of utopian architecture places the architect as a fundamentally new agent whose critical and pedagogical component begins to play an important role, while for public architecture, the architect becomes a collective, impersonal and conceptual actor, identified with a whole that can be worth more than its individual parts (modernism) or with individual parts that are greater than the whole they form (postmodernism).[2]

### 3. THE NEW STRUCTURE ONTOLOGY

The new ontologies of structure struck the biggest blow to anthropocentrism. The new ontologies of structure, which M. De Landa in his seminal work *Intensive Science and Virtual Philosophy* (2013) also calls *ontologies of flat structures*, challenge classical models of the relationship between part and whole, insisting that no object is ontological, neither as a whole nor in parts. The first thing that new or flat ontological structures impose on architecture is to enable it to be multiple - instead of one architecture, we can talk about different architectures and layers of architecture. In the language of new ontologies, architecture can be spoken of as a process order - in the singular, so that architecture turns out to be a complex object that is in a plural state, or plural, architecture that turns out to be a monolithic object and in a singular state.[3] No reductionist description which defines architecture as an entity cannot be considered definitive in the context of a flat ontology. The categories of whole and part are the result of applying a certain lens to the consideration of the relationship between objects - what at first glance looks like part of a larger whole in another context, it may itself be a whole composed of several component parts. [Fig. 3]



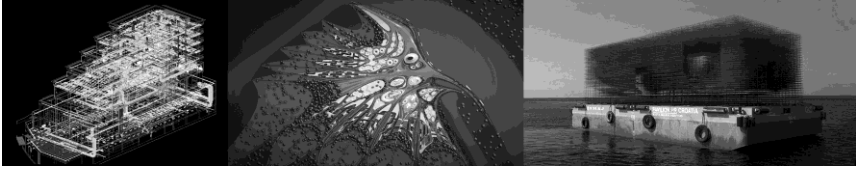


Figure 2: Digital architecture (BIM, Revit, 2022), virtual architecture (Liberverse, 2022), speculative architecture (Brod II, 2010)

Digital, virtual and speculative architectures draw direct analogies to old ontological structures. The digital space offers opportunities to make the best use of the separation of data and parameters, information and forms, a separation made possible by computer technology, which requires operational micro-hierarchies, discursive asymmetries, attendance and absence schedules [AutoCad, BIM Technologies, Revit, etc]. Computer-generated architecture as a platform for improved visualization, it enabled the creation of a completely new architecture of virtual worlds that can exist according to parametric laws completely similar to the laws of the ontologically understood world of old visions, which tends to be anthropocentric and takes place in a known historical and geographical context or construction detail, eg. stereotomy - parametricism. In the popular, but not universally recognized direction of speculative architecture, architects consider conceptual development, projections and visualizations of various types of object and spatial concepts. It is difficult to find a clear definition of speculative architecture since it is an open set of heterogeneous practices and tactics of goal-oriented design. Speculative trends in structure creation can be confused with futuristic fantasies, but as computer technologies significantly overpower and accelerate human abilities of creative autopoiesis, the attempt to speculatively predict the future does not seem entirely sustainable in the future.[4]

Speculative design prefers to use concepts of possible future worlds to better understand the *hic et nunc* current world. The speculative design of the structure is guided by the development possibilities of the present and the conventional potential. Visualizations of structures and landscapes that can appear phantasmagoric or performative, are designed to reveal the non-obvious possibilities of the situation. Instead of declaring a function as in public architecture or offering an ideological statement as in iconic and very often utopian architectures, speculative architecture contains a narrative of a possible future. In some cases, the objects of speculative architecture may seem utopian, but there is an important difference between utopian and speculative architecture - utopia is the architecture of the new man as an example of the old ontology with the modality of obligation and intention, while speculative architecture is part of the virtual world, made possible by virtual technologies and represents a conceptual reutilised space in which the *could-to-be* prevails over the utopian *should-to-be*. [4]

#### 4. CONCLUSIONS

New ontology of architectural structure did not lead to an essential turn that would make known architecture still invalid. The precedents identified in the three new structure ontologies can be found in the history and dialectics of the old structure ontologies. The conceptual focuses of the architecture of the old structure ontologies aimed to discover and articulate the ontology that are the basis of conservative practices of human scalarity, euclidean linearity, metrics, etc. In all of three old ontological structures there is anthropocentric optics, an essentialist way of conceptualizing the relationship between the whole and

parts, as well as the reproduction of the asymmetrical opposition of regularity and temporal actuality. In comparing the architecture of old and new ontological structures, the key is their relationship to anthropocentric space, human moderation, but also the economy of productivity and procedural complexity (documentationism in front of creative gesture) - the creative freedom of digital, speculative and virtual approaches is associated with relatively low costs of architectural activity and insignificant costs of resources for and a new language of description of traditional praxis diversities, while the architecture of old ontological structures is inevitably the most expensive art form since it is based on the consumable resource of space. The protection of architectural heritage can be maintained by maintaining an authentic relationship to human scale.

## 5. REFERENCES

- [1] Evans, R., Architectural Projection, in: Blau, E., Kaufman, E. (eds.), *Architecture and Its Image - Four Centuries of Architectural Representation*, Montreal: Canadian Centre for Architecture, 1989.
- [2] Jencks, C., *The New Paradigm in Architecture: The Language in Post-Modernism*, New Haven, London: Yale University Press, 2002.
- [3] De Landa, M., *Intensive Science and Virtual Philosophy*, London, New Delhi, Sydney: Bloomsbury, 2013.
- [4] De Landa, M., *A New Philosophy of Society: Assemblage Theory and Social Complexity*, London, New Delhi, New York, Sydney: Bloomsbury, 2013.



## HEALTHY City HEALTHY People: Designing Future Cities For “Mind Body And Soul”

Dr Jelena Marić

Main aim of the session was to discuss the health-related topics, regarding the contemporary conditions and hectic modern lifestyle, where public and individual health is becoming a most important resource. The first presented paper entitled “IMPACT OF NATURAL ELEMENTS IN URBAN PUBLIC SPACES ON MENTAL HEALTH” discussed the sensitive issues of mental health and the importance of spending time in open public spaces with the focus on the natural elements, such as greenery, fresh air, natural sounds and smells. Marija Stojkovic presented new insights into theories regarding the relations between people and nature. On the other hand, the second paper entitled “LEARNING THROUGH EXPERIENCE: RETHINKING SPACE AFTER THE PANDEMIC” approached the topic of health regarding the adaptiveness of the architecture in future cities to the possible pandemic conditions. Dr Ivana Rakonjac presented creative, colorful and innovative students works on the aforementioned topic. Finally, Iva Lokas presented the paper “ THE DISAPPEARANCE OF OPEN PUBLIC SPACE IN THE CONTEMPORARY ERA: INTERIOR SPACE AS SPACE OF PUBLIC INTERACTION” that in a certain way connected the previous two presentations and discussed the topic of transformation open public space usage in the future considering the health issues, urban architecture and pandemic conditions.

The discussion regarding the aforementioned scientific research presented was divided into two main aspects. The first one is based on the relations between the environment and both physical and mental health. One of the main questions was *how strong the influence of is the natural and built environment on the health and well-being of people*. The second aspect of discussion dealt with the question of transformation of open public space due to the COVID pandemics and tackled the topic of future living space and open space concepts.

The main conclusions of the discussion suggested the difference between urban and rural environments, more precisely that even a view towards natural environment can have significant beneficial influence on public health, in contrast to the densely built environments. Additionally, both outdoor and indoor spaces should be designed in regards to the possible need for quick adaptation and transformation, following the possible global village and virtual open public spaces.



# IMPACT OF NATURAL ELEMENTS IN URBAN PUBLIC SPACES ON MENTAL HEALTH

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## ABSTRACT

The subject of the paper is the analysis of the impact of natural elements in urban public spaces on the mental health of city residents. The problem that triggered the research is the fact that the majority of the world's population now live in metropolitan areas and the link between well-being and healthy public spaces has never been more clear. The analysis began with the hypothesis that exposure to green/blue spaces positively affects stress, changing moods, mental health, and overall well-being. Therefore, this paper aims to examine the subjective feeling, experience, and understanding of space related to the impact of being and using green and blue spaces in urban areas. Research objectives are to assess the relationship between mental health and existing nature in urban spaces, and to determine the effect natural elements in urban public spaces could have on mental well-being of citizens as a reminder for future projects. The focus was on field research, collecting, analyzing, and evaluating information and evidence of the impact of natural elements on mental health, as well as, presenting them in a systematic way. The results of this research pointed out the importance of natural elements in urban environments for citizens and established the complex relations between urban nature and mental health. These findings should help inform future research and practice on the impact of natural elements in urban spaces on public health, as well as make a contribution to the field of mental health, urban design, landscape architecture, urban planning, and management.

*Key words: natural elements, urban public space, public health, mental health*

## I. INTRODUCTION

The World Health Organization has pointed out that the Healthy Cities movement has become a pioneer in urban development and transformation, providing momentum for the creation of a healthier and friendlier urban environment as well as maintaining human mental health and well-being. A report by the World Health Organization (WHO) has enumerated that mental disorders account for nearly 12% of the global burden of disease (WHO Mental Health Context 2003).

Exposure to the natural environment has long been associated with a variety of positive physiological and psychological health outcomes. Given the increasing growth in urbanization and the estimation that 68% of the world population will be living in cities by 2050 (Nations, 2017), the contribution of cities to

psychological disorders has received more attention. As previous research has indicated mental health is a major need of citizens (Riyahi et al., 2010, as cited in Myers 2020), rapid urbanization, causes concern for the reduction of health benefits from nature exposure. While attention has been paid to nature in the design of hospitals, and other care facilities (Abdelaal and Soebarto 2019; Paraskevopoulou and Kamperi 2018; Ziegler 2015; Maric 2020) a gap has emerged in how to foster mental health enhancing nature connections in public space (Myers 2020).

This paper will further discuss the typology of natural elements in urban spaces, the effects of green and blue elements in cities, and human-nature relationships, including design as a tool that could better this interaction.

## 2. URBAN NATURE AND DESIGNING FOR MENTAL HEALTH

“A city, as a built place, is often seen as the antithesis of nature, since buildings and pavements displace forest and fields. Yet in most cities, the artificial human landscape includes elements of living nature selectively woven into its hard fabric” (Lawrence, 1993, p. 90).

Several studies which explored the active and passive experiences of trees and nature on mental health, combining physiological and validated self-report measures, found depression decreased and liveliness increased with forest immersion (Morita et al. 2007; Park B.-J. 2011; as cited in Wolf et al. 2020). A small number of studies, within the existing literature on the mental health benefits of nature, have focused on blue spaces. However, living in proximity to blue spaces has been associated with better mental health, including a lower prevalence of mood and anxiety disorders and schizophrenia (Wheeler et al., 2012; Dzhambov et al., 2018; de Vries et al., 2016; Engemann et al., 2020, as cited in Bergou et al. 2022).

Design principles and strategies that are currently being used in practice are not used for their direct impact on mental health. There is no design approach that explicitly incorporates an evidence-based framework to design for mental health, through nature, in urban open spaces. However, some of the measures in order to create a purposeful and integrated approach to designing for mental health and well-being through our nature interactions are: 1) (re)focusing on neighborhood streets as a primary site of engagement with the natural world (Thwaites et al. 2005, as cited in Myers, 2020). 2) Integrating smaller, natural areas along regular pathways between home and everyday community, offers a significant way to increase the incidental and incremental exposure to, and interaction with, nature (Flies et al. 2017, as cited in Myers, 2020). 3) designing for access and engagement with urban natural environments; making diverse mobilities and sensory perceptions the norm. Movement can be “an intensely embodied and emotional experience” (Andrews et al. 2012). 4) ‘temporal urban design’ (planting seasonal flowers,

vegetation, and food), providing spaces for reflecting on the passage of time (Bell et al. 2018, p. 14), all of which can enable positive mental health and connection.

Nature in urban spaces is at its most accessible and equitable state when it is immediate and/or incidental (right outside our door or window; wherever we may be in the city). In terms of urban design, this could mean that to cultivate the connection to nature that contributes to mental well-being regulations around nature in cities should be relaxed.

### **3. DISCUSSION — RETHINKING HUMAN — NATURE INTERACTION**

Human engagement with nature should be an interaction, dynamic, multisensory, accessible, and equitable interaction, which in turn can enable mental health and well-being. Attention to different elements of nature, water, light, sound, sun, and texture offers diverse and individual ways of interacting with nature. It is crucial that urban design draws on these studies to validate the need for nature interactions in our cities to accept the open-ended and fluid ways in which humans and nature influence each other (Myers, 2020).

It is important to say that currently there is no standardized approach to define the relationship between mental health and green/blue spaces. This is understandable considering differences in the heterogeneity of residents, green/blue space quality, and measures of mental health. The multitude of variables makes drawing generalizable conclusions from this interdisciplinary research almost impossible. Therefore, the restoration of mental health and well-being as an end goal of planning and design should recognize these complexities. However, future research could further investigate the psycho-social, socio-economic, and cultural aspects. Examining the ways to evoke dynamic engagement with space, creating a multisensory environment that could enhance neurological health and function.

### **4. CONCLUSIONS**

One of the most important challenges faced by modern cities is to maintain and improve the quality of life for citizens. As a global equity issue mental health and well-being is central to all lives, especially as health is not static in place or time, nor is it exclusive to certain people only (Patel et al. 2018). The impact of 'nature' in cities is undeniably present, however, it is important, not to overstate the current evidence of the effect on mental health. Many studies use non-objective or non-standard tools to assess both green/blue spaces and mental health conditions. The casual relationship between mental health, well-being, and green and blue spaces could be due to the inherent difficulties in quantifying non-physical health benefits.

The question of mental health is complex by itself, individually determined, therefore to appoint its connection to natural urban spaces requires the inclusion of lots of factors that influence the observed



associations. A particular challenge for urban planners and designers in addressing the multi-faceted confounding factors of the topic is that there is no standardized series of indicators or guidelines that would ensure mental health enhancement. However, that could be a sign that the approach should be less rigid, and more free in letting urban nature be what it is. Undesigning urban areas so that we can experience genuine and meaningful interaction, maybe even 'restoration' after all.

## 5. REFERENCES

- [1] Bergou, N., Hammoud, R., Smythe, M., Gibbons, J., Davidson, N., Tognin, S., Reeves, G., Shepherd, J., & Mechelli, A. (2022). The mental health benefits of visiting canals and rivers: An ecological momentary assessment study. *PLoS ONE*, 17(8). <https://doi.org/10.1371/journal.pone.0271306>
- [2] Chen, K., Zhang, T., Liu, F., Zhang, Y., & Song, Y. (2021). How Does Urban Green Space Impact Residents' Mental Health: A Literature Review of Mediators. *International Journal of Environmental Research and Public Health*, 18(22). <https://doi.org/10.3390/ijerph182211746>
- [3] Gascon, M., Triguero-Mas, M., Martínez, D., Davdand, P., Forn, J., Plasència, A., & Nieuwenhuijsen, M.J. (2015). Mental Health Benefits of Long-Term Exposure to Residential Green and Blue Spaces: A Systematic Review. *International Journal of Environmental Research and Public Health*, 12(4), 4354-4379. <https://doi.org/10.3390/ijerph120404354>
- [4] Hartig, T. (2007). Three steps to understanding restorative environments as health resources. In: C. W. Thompson & P. Travlou (Eds.), *Open space: People space*, London: Taylor & Francis, 163–179.
- [5] Hartig, T., Mang, M., & Evans, G. (1991). Restorative effects of natural environment experiences, *Environment and Behavior*, 23(1), 3–26. <https://doi.org/10.3390/ijerph20010188>
- [6] Hoyle, H. (2020). What Is Urban Nature and How Do We Perceive It? In: *Naturally Challenged: Contested Perceptions and Practices in Urban Green Spaces*, 9-36.
- [7] Ignatieva, M., & Mofrad, F. (2023). Understanding Urban Green Spaces Typology's Contribution to Comprehensive Green Infrastructure Planning: A Study of Canberra, the National Capital of Australia, *Land*, 12(5), 950. <https://doi.org/10.3390/land12050950>
- [8] Lee, A.C.K., & Maheswaran R. (2010). The health benefits of urban green spaces: A review of the evidence. *J. Public Health*, 33(2), 212–222. <https://doi.org/10.1093/pubmed/fdq068>
- [9] Li, J., Huang, Z., Zheng, D., Zhao, Y., Huang, P., Huang, S., Fang, W., Fu, W., & Zhu, Z. (2023). Effect of Landscape Elements on Public Psychology in Urban Park Waterfront Green Space: A Quantitative Study by Semantic Segmentation, *Forests*, 14(2), 244. <https://doi.org/10.3390/f14020244>
- [10] Maric, J. (2020). *Otvoreni prostori kao cinioci kvaliteta boravka u zdravstvenim ustanovama*, University of Belgrade, Faculty of Architecture.
- [11] Myers, Z. (2020). *Urban Nature and Designing for Mental Health*, In: *Wildness and Wellbeing*, Palgrave Pivot, Singapore, 111-144. [https://doi.org/10.1007/978-981-32-9923-8\\_4](https://doi.org/10.1007/978-981-32-9923-8_4)
- [12] Patel, V., Saxena, S., Lund, C., Thornicroft, G., Baingana, F., Bolton, P., Chisholm, D., Collins, P. Y., Cooper, J. L., Eaton, J., Herrman, H., Herzallah, M. M., Huang, Y., Jordans, M. J. D., Kleinman, A., Medina-Mora, M. E., Morgan, E., Niaz, U., Omigbodun, O., Prince, M., Rahman, A., Saraceno, B., Sarkar, B. K., De Silva, M., Singh, I., Stein, D. J., Sunkel, C., & Unützer, J. (2018). The Lancet Commission on global mental health and sustainable development. *Lancet*, 392(10157), 1553–1598. [https://doi.org/10.1016/S0140-6736\(18\)31612-X](https://doi.org/10.1016/S0140-6736(18)31612-X)
- [13] Riahi, M.E., Aliverdina, A., & Pourhossein, Z. (2010). Relationship between social support and mental health, *Social Welfare Quarterly*, 10(39), 85-121.
- [14] Wolf, K., Lam S., McKeen J., Richardson G., van den Bosch M., & Bardekjian A. (2020). Urban Trees and Human Health: A Scoping Review, *International Journal of Environmental Research and Public Health*, 17(12), 4371. <https://doi.org/10.3390/ijerph17124371>
- [15] World Health Organization, *The Mental Health Context, Mental Health Policy and Service Guidance Package*, ISBN 92 4 154594 1(NLM classification: WM 30), 2003.

# LEARNING THROUGH EXPERIENCE: RETHINKING SPACE AFTER THE PANDEMIC

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## ABSTRACT

The COVID-19 pandemic caused the transformation of the traditional learning environment by creating forms of distance education or mixed forms of education to meet the imposed restrictions. This period is characterized by the testing of different approaches to the educational process in the field of architectural design, as well as the need to adapt the educational model to a newly formed lifestyle in an urban environment and its reflections on space. The new forms of the Pandemic impact on the educational process in architectural design will be presented through the experimental research Post-Covid Architecture. This experiment represents a spontaneously formed flow of research through an architectural design that initiated specific considerations of space focused on the isolation experiences, and lifestyle during the Pandemic, as well as the consequences that changed the overall patterns of behavior. Testing of a design methodology based on David Kolb's Experiential learning model was carried out at the University of Belgrade – Faculty of Architecture at the Master's academic studies Interior Architecture as part of the Master's final thesis under the theme Contemporary Spectacle - Culture and Craftsmanship. This experiment is presented through the selected student projects. The paper aims to show the application of an educational model that transforms personal experiences into operational tools in the design process. Testing the different approaches and methodological models to the teaching process in the field of architectural design is reflected in the expansion of the potential of thinking about space. Sustainability, in the framework of architectural education, is determined by the openness of the methodology and process following the contemporary transformations of the needs and demands of users. These tendencies reflect the necessity of space changes creating new standards of architectural programming.

*Keywords: architectural concept, the future lifestyle, well-being, new urbanity, experiment in architectural education*

## **I. INTRODUCTION**

The COVID-19 pandemic caused the transformation of the traditional learning environment (Milošević et. al., 2023). Architectural education is determined by the openness of the methodology and process following the contemporary transformations of culture flows. The sustainability of architectural design is reflected in the necessity of space to keep track of new standards in space usage to create new concepts of architectural programming.

The lifestyle in an urban context and overall patterns of behavior during the Pandemic changed the perception of the environment. This experiment represents a spontaneously formed flow of research through an architectural design that initiated the isolation experiences and its reflection on space usage. The presented work aims to show the application of an educational model that transforms personal experiences into operational tools in the design process.

Improving the traditional learning environment in architectural design by introducing different approaches to the teaching process is reflected in the widening of the potential of thinking about space. Testing of a design methodology based on David Kolb's Experiential learning model was carried out at the University of Belgrade – Faculty of Architecture, the Master's academic studies Interior Architecture as part of the Master's final "Contemporary Spectacle - Culture and Craftsmanship", under the mentorship of assistant professor Dr. Ivana Rakonjac in 2021/2022 school year. The students presented and defended the results of their work in the presence of the committee, which, in addition to the mentor, consists of assistant professor Dr. Jelena Milošević and professor Dr. Milorad Mladenović. This experiment is presented through the selected student projects – Anastasija Glišović, Emilija Pantić, Sara Dragović, and Tamara Stupar.

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## **2. CONCEPTUAL FRAMEWORK: CONTEMPORARY SPECTACLE — CULTURE AND CRAFTSMANSHIP**

The research process is focused on understanding the cultural component of the everchanging urban lifestyle. The focus is on defining new layers as an upgrade of the existing activities of the contemporary city characterized by a process of constant transformation.

Through an analysis of the given spatial framework on the edge of Belgrade city center, a former industrial space and foundry "Sculpture" on the corner of Carigradska and Knez Miletina streets, emphasis is on the conceptualization of new architectural programs to answer the current social and cultural moment. Through creative "construction of situations", evoking the importance and role of old crafts in the development of society, the results of research through design aim to integrate various aspects of urban life into the continuity of hybrid functions (culture, education, crafts, tourism, recreation, etc.). By initiating individual research topics and addressing the isolation experience, students strived to form a new

(contemporary) identity of the space defined by a strong heritage and contemporary tendencies of urban development. The outcome of individual research conceptualizes a new architectural program solution in order to give an answer to the newly formed patterns of behavior and the transformation of space usage.

### 3. THEORETICAL FRAMEWORK AND METHODOLOGY: EXPERIENTIAL LEARNING MODEL

The teaching process is based on the Experiential Learning Model developed by David Kolb in the seventies of the last century (Kolb and Fry, 1975). Changes and growth are illustrated by an integrated four-step process that begins with (1) acquired experience followed by (2) data collecting and observations of the specific experience; (3) data analysis and conclusions; and finally (4) modification of behavioral patterns to form new experience and concepts to test (Figure 1). Kolb codified the ideals of experiential learning by articulating key abilities that contribute to effective learning: the ability to *engage in concrete experience*; *reflective observation* – looking at the experience from different perspectives; *conceptualization* – the ability to form concepts that organize experiential observations into a logically grounded theory; *active experimentalism* – the ability to apply theories to problem solving and decision making (Kolb, 1984).

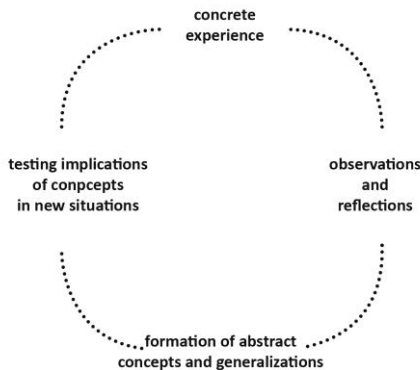


Figure 1: *The Experiential Learning Model (David Kolb)*

The teaching methodology is focused on finding a solution that transforms the specific isolation experience during COVID-19 into knowledge. The students alongside with mentor explored the potential of experienced situations in the form of reflective research at the individual level. The design process emphasizes the interpretation of different values and individual reflections based on various aspects: the cultural context, heritage, the experience of space, perception, identity, social interaction, and personal space. The research through design followed the abovementioned 4 stage process based on students' personal experiences (Figure 2).

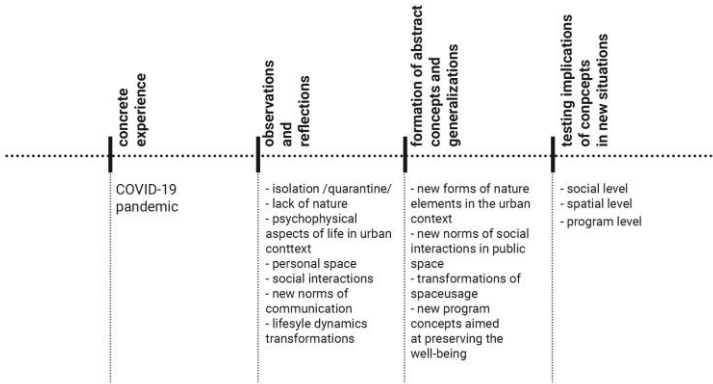


Figure2: *The Design Process*

#### 4. RESULTS

Pandemic experiences were associated with a period of isolation and a dominant stay indoors. The students' main focus was on limitations, both spatially and in interaction. The emphasis was on the need to solve the shortcomings with a focus on the psychophysical health of people living in an urban context. The presented examples of students' work deal with the topic of spatial-programmatic and contextual complexity as a consequence of the Pandemic period. The verification of new concepts resulted in an interior architecture project emphasizing the transformation of the old industrial complex following the newly-formed cultural values. The outcome of the thematization of individual experiences is presented through innovative concepts (Figure 3).













architectural concept	<p>ANASTASIJA GLIŠOVIĆ <b>A self-sustainable city</b> Anastasija Glišović</p>	<p>SARA DRAGOVIĆ <b>Center for Entertainment and Therapy</b> Sara Dragović</p>	<p>EMILIJAN PANTIĆ <b>Architecture as a reflection of the inner world - ALL-DAY HAB</b> Emilija Pantić</p>	<p>TAMARA STUPAR <b>A garden can do anything</b> Tamara Stupar</p>
concrete experience				
observations and reflections	<p>The impact of the pandemic on society and space - understanding the phenomenon of isolation - the impact of isolation on a sense of space - after quarantine - the impact of globalization on going back to the community - the sustainability community potentials - includes - a form of new normality</p>	<p>The impact of the pandemic on the psychological state of man - economic center for relaxation - preservation of identity - the architecture - therapeutic practice - Translational analysis - personal relationships in space - connectivity of personal type and appearance to social interaction</p>	<p>The impact of the pandemic on human psychological health - the importance being the pandemic work is dependent area during the pandemic - the influence of nature on human health - health preservation - healing - therapeutic garden - relate to a habit (order of the day / work / lifestyle)</p>	<p>The impact of the pandemic on the psychological state of man - lack of space for recreation - the importance of nature in the urban context - modern forms of recreation - recreation and recreation - gardening, activities preservation and modern forms of service activities</p>
formation of abstract concepts and generalizations				
testing implications of concepts in new situations				
<p>LABORATORY MODEL</p> <p>PROCESSED</p>	<p>LABORATORY MODEL</p> <p>PROCESSED</p>	<p>LABORATORY MODEL</p> <p>PROCESSED</p>	<p>LABORATORY MODEL</p> <p>PROCESSED</p>	<p>LABORATORY MODEL</p> <p>PROCESSED</p>

Figure3: The outcome of the individual Pandemic experiences (Rakonjac, 2023)

The concept of the *Self-sustainable city* (Anastasija Glišović) focuses on solving the problem of physical distances during the pandemic period and improving interaction in public space. The phenomenon of preserving people's psychological health in an urban context was addressed through the *Center for Entertainment and Therapy* (Sara Dragović). The solution to the problem of transforming the daily rhythm during the pandemic, as well as the transformation of space usage, was given through the innovative concept of the *All Day Hab* (Emilija Pantić). The experience of the lack of nature and recreation in the period of isolation in the urban environment was addressed in the *Garden Can Do Anything* (Tamara Stupar), by conceptualizing new forms of recreation through agriculture.

## 5. CONCLUSIONS

The presented paper gave a reflection on the current global situation, the post-pandemic period, and its influence on the educational methodology in architecture. Furthermore, the outcomes of the experimental research showed the impact of the pandemic on thinking about space and the overall design process. Individual students' isolation experiences are reflected on several levels — social, spatial, and program level.

The students identified problems and proposed solutions to comprehensive transformations of the context reflected on space usage. Although the focus of the research was on the architecture of the interior space and details, the transformations at the community and city level (urban scale) were examined. Newly formed concepts, tested through an architectural design process, indicate a strong influence of the context on the architecture of interior space.

## 6. REFERENCES

- [1] Milošević, J., Rakonjac, I., Josifovski, A. "Architectural Engineering Students' Experiences in a Hybrid Design Studio". *International Journal of Engineering Education*, 39 (4), 2023, 921–936.
- [2] Kolb, D., Fry, R. "Toward an applied theory of experiential learning". *Theories of group processes*. C. Cooper (ed.). N.Y: John Wiley & Sons, 1975.
- [3] Kolb, D. *Experiential learning: Experience as the source of human development*. NY: Prentice-Hall, Englewood Cliffs, 1984.
- [4] Rakonjac, I., *Post-Covid Architecture. Thinking of Space After Pandemic*. 45. *The Salon of Architecture – Salon of Dialogues*. B. Jotić (ed.), Serbia, Belgrade, MPU, 2023, p. 113.

# THE DISAPPEARANCE OF OPEN PUBLIC SPACE IN THE CONTEMPORARY ERA: INTERIOR SPACE AS SPACE OF PUBLIC INTERACTION

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## ABSTRACT

The COVID-19 pandemic represents a trigger that has led to social transformations whose consequences are yet to unfold. Noticeable changes can be observed in behavior patterns, as well as in communication, and space usage, particularly in public areas. The advancement of technology in the 21st century is rapidly altering communication patterns, while the built environment fails to support the spatial requirements of the newly formed lifestyle in the urban context. Increasingly, face-to-face encounters in physical environments are being replaced by interactions in virtual realms. Open public spaces, as places of interaction and public life in the city, are being replaced by the comfort of the user's personal space of indoor habitat. Human interaction with nature is diminished, thereby influencing low public health and well-being. The benefits of being in a natural environment are overshadowed by the need to fulfill social interactions that take place in virtual spaces within the contemporary context. The aim of this paper is to problematize the qualitative aspects of an interior space of a residential unit as a surrogate for open public space. These tendencies reflect the necessity of interior space changes creating new standards of architectural programming to create new forms of the natural environment to support the health and well-being of users.

*Keywords: urban context; contemporary lifestyle; health; well-being; build environment; virtual space*



## I. INTRODUCTION

The COVID-19 pandemic that has impacted humanity represents a turning point in the acceptance of technology as a new medium of human life. Two years of restricted movement and physical contact have been sufficient to tether people to the “warmth” of their homes and demonstrate that it is indeed possible to work from home or regularly chat with friends via video calls. Noticeable changes in lifestyle in urban environments and overall space usage can be observed through behavior patterns, as well as the transformation in communication (Languillon-Aussel, 2021). The consequences of the isolation period transformed the perception of social interaction and the meaning of open public spaces. Open public space, as a place of public life in the urban context, is being replaced by the comfort of the user’s personal space of indoor habitat. Previous research, based on the survey, showed that the overall state of the pandemic had the greatest effect on the frequency and duration of public open space utilization by all age groups of participants (Đukić et al. 2021).

The indoor space of the residential unit becomes a surrogate for open public space as a space for social interaction. However, the lack of benefits of being outdoors remains. This paper aims to emphasize lifestyle transformations in the newly formed situation and suggest the enhancement of qualitative aspects of indoor space. The behavioral patterns changes reflect the necessity to create new forms of the natural environment to support the health and well-being of users.

## 2. REAL VS. VIRTUAL REALM

The very essence of public space has undergone a profound transformation throughout the latter few decades of the 20th century, the idea of public space has become a fluid and elusive one (Prodanović & Krstić, 2011). Even the interpretation of public spaces carries certain semantic ambivalence. These spaces can be viewed from different perspectives: as Euclidean physical environments or, conversely, as public spheres wherein spatial networks are forged, creating the convergence of the public with the private and the virtual with the physical (e.g., social networks, conference rooms, shopping centers, cafes, etc.) (Languillon-Aussel, 2021). Contemporary perceptions of this type of space suggest its main objective has allegedly changed to being the simple satisfaction of individual (private) preferences. Public space transcended its role, as a place for the expression of civic freedoms and a backdrop for leisurely activities, and become an essential part of the working environment itself. Every act of work is situated *somewhere*, and that location's characteristics greatly influence the scope and nature of the action itself (Prodanović & Krstić, 2011). To fully realize the potential of public space as a hub for social interaction and civic participation it is necessary to rethink the contemporary meaning and purpose of public space through the dynamic relation between the public environment and human activity.

Nowadays, our work is increasingly conducted from home, so the nature of the aforementioned *somewhere* is the interior of our homes, while, in fact, we are simultaneously situated in a virtual space. After the pandemic in Serbia, there has been a noticeable increase in people's isolation and a decrease in the amount of time spent in physical, open spaces. Instead, individuals are allocating more of their time to virtual realms. From this point of view, what will be the shape and nature of our future cities if our conventional, tangible public spaces are replaced by virtual alternatives? (Đukić et al. 2021).

From the standpoint of technological development, the way humans communicate is in a state of continual enhancement. Consequently, the introduction of innovative technologies and the fusion of various new advancements have led to the development of Internet applications. On the user's side, there is a growing desire for greater freedom in the virtual realm, as well as an ongoing expansion in the range of internet content and interaction methods. (Ning et al. 2021). However, we cannot escape our physical reality. While we conduct tasks through avatars on various social networks, we still need a haven for our bodies on this Earth. What emerges as the main connection to the external world is the interaction between humans and nature. For the purpose of this paper, we aim to take a typical element associated with the exterior and consider its influence on the comfort of the interior space.

There is a close relationship between man and nature. Interaction with nature is important for enhancing the quality of life and providing people with a range of measurable benefits (Dijkstra et al. 2008; Pretty 2004), including psychological benefits and cognitive performance (Keniger et al. 2004). However, relatively little attention has been paid to the role of indoor natural environments compared to the number of studies on the role of outdoor spaces (Rakonjac et al. 2022). In an urban environment, the majority of inhabitants spend their time indoors and the public is increasingly aware of the risks posed by poor indoor climates (Deng, & Deng 2018). Therefore, a natural indoor climate is important for human health and well-being (Claudio, 2011). The behavioral patterns based on past experiences with COVID-19 imposed the necessity to re-examine physical space and consider the natural element of open spaces in indoor spaces to improve users' well-being.

### **3. SCENARIO OF THE NEW NORMAL: HOME ALONE**

The lifestyle of people before the pandemic, due to the busy daily schedule, and lack of time to spend in the home environment, led to the neglect of the comfort of the user's personal space of indoor habitat. All of this added to the shock we experienced when domestic isolation was inevitable. The spaces we inhabit fail to adapt to new lifestyles in an urban context.

Lifestyle transformation during and after the pandemic defined a new pattern of users' behavior creating the *Scenario of the New Normal: Home Alone*. Working from home initially seemed like a more relaxed solution, but today there is an increasing sense of confinement and isolation. Avoiding going outside and

leaving the house can lead to loneliness, stagnation, and lethargy. The central question that this work seeks to address is whether the transfer of certain elements from the outdoor environment into the indoor space in residential units could (to some extent) enhance our experience of our intimate living space.

If there is not enough time spent in nature or the opportunity to pursue hobbies in a garden, the idea that comes to mind is finding a way to transfer that experience into the indoor habitat. For the purposes of this work, we will refer to this hypothetical living unit as the *Green Room*. The conceptual framework of *Green Room* is based on Farago's (2007:95) statement – *Early interior painters already noticed that in order for the inside of a room to rid itself of a sense of confinement, alienation, and insecurity, it must carry within itself the concept of the external, a possible narrative of the outside*. The idea of a “green” character lies in spatial interventions aimed at creating a succession of environments, programs, and contents that all have the nature elements (plants) as a common thread, with the assumption that all these interventions should enhance mental and physical well-being due to the new circumstances. Combining users' daily activities – work, rest, recreation, entertainment – in one (indoor) space forms a New Normal daily rhythm in an urban environment. The multifunctional residential unit adopts the concept of implementation of external (outdoor) nature qualities into interior space ensuring users achieve physical well-being and engage socially in the virtual realm within the confines of indoor habitat.



Figure 1: *New Normal – Green Room Concept* (illustration: Petrović, R.)

#### 4. CONCLUSIONS

Even if the pandemic has long since receded, it is clear that society will not return to the norms it once established. In the face of sporadic global crises such as epidemics, pollution, or war, people tend to retreat into zones of comfort and safety, as the digital age allows them to engage socially within the confines of their indoor habitat. In other words, some aspects of public space are being migrated into our homes through technology. Beyond social discomfort, the emergence of virtual communication is also supported by practical benefits, such as the ability to multitask or increased accessibility to different content. The described societal aspirations lead us to the conclusion that the future will undoubtedly shape

hybrid solutions that combine virtual and physical spaces. Future research should explore possibilities of architectural design in the post-pandemic period to prevent the disappearance of open public space under the influence of the virtual realm.

## 5. REFERENCES

- [1] Claudio, L. (2011). Planting healthier indoor air.
- [2] Deng, L., Deng, Q. (2018) The basic roles of indoor plants in human health and comfort. *Environmental Science and Pollution Research*, 25, 36087–36101.
- [3] Dijkstra, K., Pieterse, ME., Pruyn, A. (2008) Stress-reducing effects of indoor plants in the built healthcare environment: the mediating role of perceived attractiveness. *Prev Med* 47:279–283
- [4] Đukić, A., Marić, J., Antonić, B., Golubović Matić, D. (2021) Virtual vs physical open public space in the era of pandemics - questioning the phenomenon of the global village In *Proceedings the Balkan Architectural Biennale 2023. International Conference: Global Village – Shelter for Resilient Living*. 8.12.-16.12.2021. Belgrade, Serbia.
- [5] Farago, K. (2007) *Dinamika prostora, kretanje mesta*, Novi Sad: Stylos.
- [6] Keniger, LE., Gaston, KJ, Irvine, KN., Fuller, RA. (2013) What are the benefits of interacting with nature? *Int J Environ Res Public Health* 10:913–935.
- [7] Languillon-Aussel, R. (2021) Digitalization of public spaces: The great urban change? *Articulo - Journal of Urban Research [Online]*, 22 | 2021, Online since 15 December 2021.
- [8] Ning, H., Wang, H., Lin, Y., Wang, W., Dhelim, S., Farha, F., Daneshmand, M. (2023). A Survey on the Metaverse: The State-of-the-Art, Technologies, Applications, and Challenges. *IEEE Internet of Things Journal*.
- [9] Pretty, J. (2004) How nature contributes to mental and physical health. *Spiritual Health Int* 5:68–78.
- [10] Prodanović, S. & Krstić, P. (2011). Javni prostor i slobodno delanje: Fuko vs. Lefevr. *Sociologija* 2012, 54 (3), 423-436.
- [11] Rakonjac, I., Zorić, A., Rakonjac, I., Milošević, J., Marić, J., Furundžić, D. (2022) Increasing the Livability of Open Public Spaces during Nighttime: The Importance of Lighting in Waterfront Areas, *Sustainability*, 14 (10), 2022, pp 6058.

# THE ELUSIVE CITY: MELANCHOLY, REVERIE AND THE CONTEMPORARY URBAN EXPERIENCE

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## ABSTRACT

Films, which are themselves part of the global flow of cultural products, in recent decades thematically and visually quite successfully accentuate various aspects and effects of globalization, that is, experiences of life in global cities in general: asymmetric power relations, inequality and great contrasts of all imaginable forms and types, as well as other ongoing urban themes such is the search for one's own place and identity, and, of course, the urban theme par excellence — alienation. In this regard, this paper will focus on the film “Her” (2013) directed by Spike Jonze, which is set in the urban landscape of tomorrow with an impressionable visual identity and presents a peculiar story about how people in the future could form meaningful relationships. Through consideration of the topics presented in the aforementioned film, it will be explored how the complexity of global urban phenomena, significantly shaped, it seems, by unstoppable technological process and the development of digital media, affects the mental and emotional life of an individual, as well the impact it has on the authenticity of urban culture in general. This thread will look back at urban imaginary of Jonze's film, as well as other references to well-known concepts such are The Overexposed City by Paul Virilio and The Generic City of Rem Koolhaas, among others.

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*Key words: global city, globalization, film, contemporary urban condition*

## I. INTRODUCTION

Films often depict various aspects of globalization: asymmetric power relations, inequality and great contrasts typical for global cities. The pursuit for one's own place and identity in global urban conglomerates generate impressive film stories. Films that take place in the world's largest urban centres fairly frequently pose new versions of age old (cinematic) questions related to cities such as in which direction society is going or what it means to be human. More often than not these films tackle numerous aspects of alienation in urban environment that people are experiencing now and may experience in the future.

Spike Jonze's film “Her” (2013), about lonely writer Theodore Twombly who (after a failed marriage) becomes involved with Samantha, an artificial intelligent computer operating system with a female voice and personality, simultaneously presents an idea how the urban environment of tomorrow may look like and what might be the predominant way in which human connection and interaction could be built in the not-so-distant future. “Her” offers glimpses into the possible, even probable, urban future which is reshaped under the influence of even more accelerated globalization and further development of the digital

media, that is, under the influence of ever-growing technological progress that will continue to radically change “the way we work, produce, consume, communicate, travel, think, enjoy, make war and peace, give birth and die” [1]. That is why, in order to illuminate the nuances of contemporary urban life, the urban imaginary of Jonze’s film will be threaded through the theoretical premises of Rem Koolhaas, Bruno Latour and Paul Virilio.

## 2. **“IF I COULD CATCH THE FEELING, I WOULD; THE FEELING OF THE SINGING OF THE REAL WORLD, AS ONE IS DRIVEN BY LONELINESS AND SILENCE FROM THE HABITABLE WORLD.” [2]**

The urban vision presented in the film “Her” is a reflection of the wishes of its authors regarding the future development of the largest Californian city. They cleaned up the city of Los Angeles by eliminating what was not of interest to them while keeping the facilities and architecture that they found to be valuable and collaged them with the specifically curated set of buildings from Shanghai that they liked. In this way, as creators say, a new densely built (but not claustrophobic) city was created that leaves impression of pleasantness, convenience and adaptability [3]. The characters seem to inhabit an urban world that is recognizably our own, albeit much nicer and more comfortable, but nevertheless a world characterized by a high degree of isolation and detachment. Even though physical environment of Los Angeles represented in film is very tactile and warm, even utopian-like by the words of its director [4], there is the prevailing impression that its residents are disconnected from that same physical space and from each other. It seems like all interaction is somewhat silent and turned inwards: “Her” very convincingly conveys “a tremor of loneliness, its uneasy combination of separation and exposure” [5].

The comparison oftentimes arises between the city showed in “Her” and the views Rem Koolhaas presented in his seminal essay “The Generic City”.





Figure1: “Her” (2013)

For Koolhaas generic city is defined by its specific aesthetics experience as much as the emotional one and he defines it as “what is left after large sections of urban life crossed over to cyberspace. It is a place of weak and distended sensations, few and far between emotions, discreet and mysterious [...] in the Generic City individual “moments” are spaced far apart to create a trance of almost unnoticeable aesthetic experiences this pervasive lack of urgency and insistence act like a potent drug; it induces a hallucination of the normal” [6]. This written description corresponds in discernible manner with what “Her” expressed visually: a simpler, more calming urban future in terms of the physical space of a city whose inhabitants are considerably plagued by melancholy and overall inner passivity. Together, these aspects of Jonze’s film produce conflicting impressions of something very relatable and in the same time unreachable, sorrowful as well hopeful, eerie at times, yet undeniably charming – something that is difficult to categorise.

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### 3. “THE CITY IS REDUNDANT: IT REPEATS ITSELF SO THAT SOMETHING WILL STICK IN THE MIND. MEMORY IS REDUNDANT: IT REPEATS SIGNS SO THAT THE CITY CAN BEGIN TO EXIST.” [7]

In the film “Her” fictional geography of the city is presented very successfully: shots from Los Angeles and Shanghai are assembled in a way that does not cast a shadow of doubt on the carefully crafted illusion that what is seen is only one, seemingly endless city. There are no traces of the historic urban landscape and even the iconic buildings and urban spaces are to a certain degree stripped away of their identity and perfectly blended, so what is seen can convincingly stand for each or any global metropolis. Quite interestingly this aligns with the comments made by Bruno Latour in his think piece “Paris, invisible city: The plasma” in which French philosopher stated the following: “The illusion of the zoom, in geography and sociology alike, has the drawback of making life in the city completely suffocating. There are *no more loci*, since everything is filled by the apparently smooth transition from the whole to the parts and from the parts to the whole, as if there were not a single gap, not a single breathing space” [8]. Numerous types

of screens allow for a myriad of information about urban spaces, while also allowing various options for immobile traveling and meeting, which falsely but effectively makes physical spaces seem progressively more irrelevant by the day (this is an unconscious process). Screens have suddenly become the dominant means through which the urban environment is experienced. Another French philosopher, Paul Virilio, also famously addressed this phenomenon of urbanization and dematerialization of cities under the influence of advanced technologies in his essay “The Overexposed City”: “Within this place of optical illusion [...] people occupy transportation and transmission time instead of inhabiting space [...] where once an entire “downtown” area indicated a long historical period, now only few monuments will do” [9].

#### 4. CONCLUSIONS

For the city depicted in film “Her” could be said that it is “nothing but a reflection of present need and present ability... It is equally exciting — or unexciting — everywhere” [6]. Much has been said about the process of homogenisation of (global) cities and the threat it poses to the individual character of a city, that is, to its specific atmosphere, as well as whether it is even possible to talk about keeping or creating something particular in a globalised culture of the 21st century. Both Koolhaas and Virilio stated in their theoretical concepts that in the contemporary world, cities are being more and more deprived of “physical substance... historical... context... the real” [6]. This raises and for now unfortunately leaves open several questions about whether it is possible for the city to find its own expression, how to achieve it and, after all, whose task it is. If not, what does this mean for people living in cities and for the future of urban life in general?

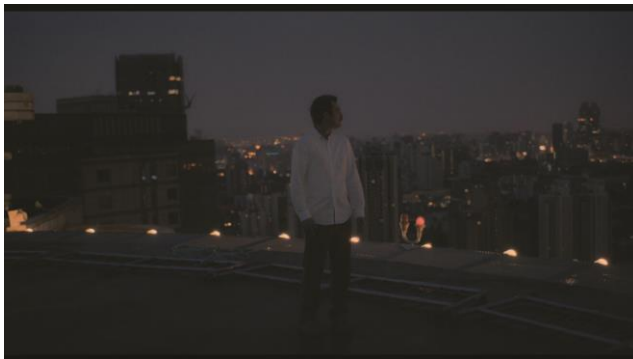






Figure 2: "Her" (2013)

## REFERENCES

- [1] Castells, M., *The Information Age: Economy, Society, and Culture, Volume 1: The Rise of The Network Society*. Oxford: Blackwell, pp. 122, 1996.
- [2] Woolf, V., ed. *Leonard Woolf, A Writer's Diary*. New York: A Harvest Book · Harcourt, Inc., pp. 144, 1982.
- [3] Curbed LA., *How the Her Filmmakers Created a Utopian Los Angeles of The Not-Too-Distant Future*, 2013, <https://la.curbed.com/2013/12/18/10166216>.
- [4] *Academy Conversations: Her*, 2013, [https://www.youtube.com/watch?v=6W719UP1z0Q&ab\\_channel=Oscars](https://www.youtube.com/watch?v=6W719UP1z0Q&ab_channel=Oscars).
- [5] Laing, O., *The Lonely City: Adventures in the Art of Being Alone*. Edinburgh: Canongate Books, pp. 11, 2016.
- [6] Koolhaas, R., Mau, B., et.al: *S, M, L, XL*. New York: The Monacelli Press, pp. 1248-1264, 1995.
- [7] Calvino, I., *Invisible Cities*. Orlando: Harcourt Brace & Company, pp. 19, 1974.
- [8] Latour, B., *Paris, Invisible City: The plasma. City, Culture and Society, Volume 3, Issue 2*, Amsterdam: Elsevier, pp. 91-93, 2012.
- [9] Virilio, P., *The Lost Dimension*. New York: Semiotext(e), pp. 14-15, 1991.

# LONG-TERM CARE LIVING ENVIRONMENTS FOR OLDER ADULTS: A COMPARISON OF TWO CONTEMPORARY CONCEPTS

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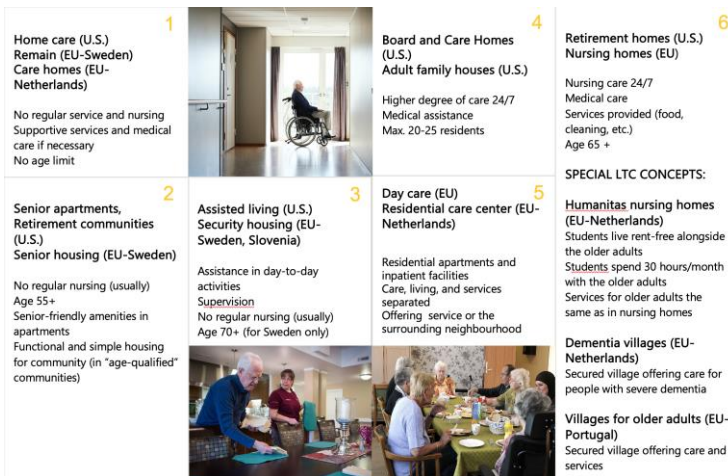
## ABSTRACT

Evidence shows that the quality of the living environment has a significant impact on the physical and mental health of residents. The latter is especially true for long-term care living environments that are appropriate for older adults who require a certain level of care and services. Above all, it is important that these living environments not only allow for the satisfaction of basic existential needs, but also provide decent living conditions. Concepts of living environments in long-term care vary from country to country and depend largely on the characteristics of the social and health care system in question. Among the various concepts of living environments for older adults, institutional settings accommodate a relatively large proportion of the world's population aged 65 years and older. The evolution of institutional care models has moved from traditional to alternative forms that offer residents a higher quality of life due to specific architectural features and functional adaptations. The aim of this paper is to present two different concepts of institutional living environments for older adults in Slovenia and Portugal and to compare their architectural design features that can strongly influence the residents' quality of life. The Slovenian case study is a relatively contemporary nursing home model, while the Portuguese case study is represented by a model of a retirement village. Through a simple evaluation, it is shown that a village model has numerous advantages over a nursing home model, although the Slovenian case observed is one of the most advantageous types in Slovenia.

*Key words: nursing home, retirement village, older adults, long-term care concepts*

## I. INTRODUCTION

Worldwide, many older adults who are no longer able to live independently due to a combination of various physical, mental, intellectual, or sensory impairments rely on a variety of long-term care services. Approaches to institutional care vary across countries and depend on national long-term care systems, policies, and social protection systems [1]. Long-term care (LTC) can be provided either as home and community-based care, adult day care, or in institutional settings such as nursing homes or retirement homes, long-term hospitals, etc. [2]. In some countries, such as Sweden, there is a very good elderly care system that allows a gradual transition from home care through various intermediate models of partially supported living in the community to institutional care in nursing homes. In contrast, in many countries around the world, there is only a choice between home care and institutional care. An overview of different LTC options available worldwide is shown in Fig. 1 [3].



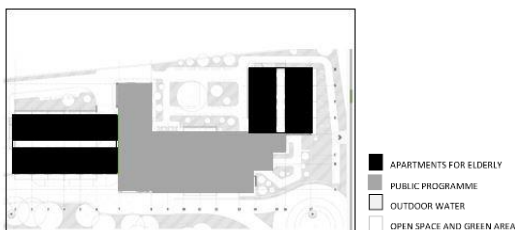
**Figure 1:** Overview of LTC living environment concepts with their basic features (adapted from [4-7])

As shown in Figure 1, different models support different degrees of autonomy for older adults. Despite the recent trend in many countries to favor home care over institutional care, institutional care settings (Group 6 in Fig. 1) still constitute a large share of the living environment of older adults [3]. While the initial models of institutional care focused on medical care, the new models aim to balance physical and mental well-being and integrate new ideas that focus on redefining the quality of life of older adults, their autonomy, and their integration into society. However, there are still many different models within institutional care, which is the most supported form of living for older adults in terms of care and service.

In this paper we compare a typical nursing home (NH) in Slovenia with one of the alternative forms of residential care in a retirement village (RV) in Portugal. one of the alternative forms of residential care in a retirement village (RV) in Portugal.

## 2. DESCRIPTION OF THE CASE-STUDY LIVING ENVIRONMENTS

The Slovenian case-study (Fig. 2) is a small-scale nursing home (NH-S) with a capacity of 60 residents and a building footprint of about 3,000 m<sup>2</sup> located in a rural surrounding – in the mountainous area of Bohinj. It was evaluated in previous publications [8] using the quality assessment tool Safe & Connected and received a high score in the group of considered Slovenian nursing homes.



**Figure 2:** *Nursing home Dom sv. Martina, Slovenia*

The Portuguese case study (Fig. 3), the Monte da Palhaguiera (RV-P) retirement village, is a medium-scale facility with a capacity of up to 99 residents, located in a rural area and covering a plot of 28,244 m<sup>2</sup>. The size of a built area is app. 4,049 m<sup>2</sup>.

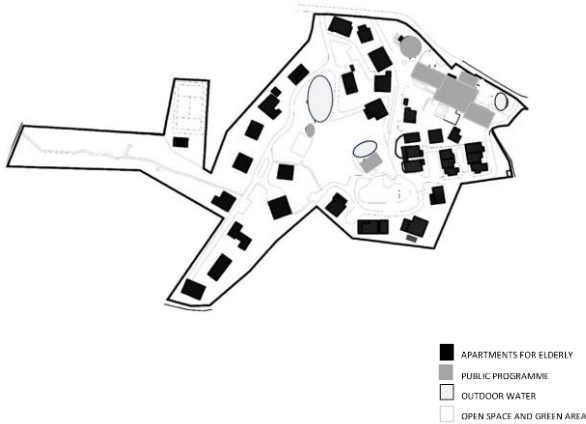


Figure 3: Retirement village Monte da Palhaguiera, Portugal

### 3. COMPARISON OF THE CASE-STUDY MAIN CHARACTERISTICS

The cases were selected to analyse the main characteristics that have been shown in several previous studies [3, 8, 9] to be influential for the quality of life of older adults. In Tab. 1, we show a simple assessment of five quality domains rated with 3-degree grades: (1) - fully met, (0.5) - partially met, and (0) – not met. Quality fields 1 to 4 focus on the quality of life of residents, while quality field 5 relates to the cost efficiency of such a facility.

**Table 1:** A detailed evaluation scheme

FIELDS	CRITERIA	MAX	RV-P	NH-S
1. BUBBLE CONCEPT (health safety – infection control & privacy)	Small household units	1	1	0.5
	Single bedrooms with private bathroom	1	0.5	0.5
	Common social spaces arrangement (density, design)	1	1	0.5
2. OUTDOOR SPACE (quality of life, infection control, social integration)	Open space and green areas/recreational outdoor areas	1	1	0.5
	Rooms with balconies or terraces	1	1	0.5
	Common social space with direct access to outdoors (balconies, terraces, outdoor ground)	1	1	0.5
3. MICROSCALE ARCHITECTURAL CONTEXT	Enabling identification with the home environment	1	1	0.5
	Air Quality (type of ventilation, limited traffic, green spaces)	1	1	0.5
	Overall facility layout and easy circulation for residents	1	0.5	1
4. ACCESSIBILITY & CONNECTIVITY (social integration)	Proximity to loved ones (proximity to public transport, easy access for visitors)	1	0.5	0.5
	Community involvement, Services or areas available for neighbouring population	1	0.5	0.5
	Proximity to urban centres (easy access to hospitals, health centres)	1	0.5	0.5
5. COST & ENVIRONMENTAL EFFICIENCY	Land usage efficiency	1	0.5	1
	Implementation and maintenance costs	1	0.5	1
	Energy efficiency & used building materials	1	1	1
SCORES TOTAL		15	11.5	9.5
ESTIMATED DEGREE (%)		100	77	63

According to Tab. 1, it can be seen that the RV-P has a higher score (77%) than the NH-S (63%), especially in the fields focused on quality of life. A retirement village has a better quality in terms of smaller housing units, accessibility to the outdoors, and also a more diverse programme range of open and green spaces. Through architectural design, the units provide a homelike atmosphere, while good accessibility to outdoor green spaces allows for better air quality, as in the case of NH-S, where not all rooms have balconies. In both cases, ventilation is provided exclusively by natural ventilation. In terms of accessibility and connectivity, both facilities have some drawbacks, as they are located relatively far from urban centres, have weak public transport connections, and have limited services available to neighbouring residents. On the other hand, it is also clear that a Portuguese case is a less efficient solution in terms of

cost efficiency. However, cost-effectiveness can also be considered much more broadly, as shown in this case. Considering how the quality of the living environment affects the health of the residents and how this consequently affects the costs of the national healthcare system, it would be interesting to find out whether it is also worthwhile from an economic point of view to invest in a higher quality of the living environment.

#### 4. CONCLUSIONS

Contemporary housing models for older adults focus on creating a quality living environment where residents can live healthy, safe, and socially inclusive lives. However, in many countries around the world, there are only a limited number of settlement types for institutional care. In Slovenia, nursing homes are still usually located in a single building with many rooms and relatively poor architectural design in terms of privacy, accessibility to green and open spaces, although there are some examples of relatively good architectural design emerging. On the other hand, in this paper we have presented a model of retirement village, which is emerging in the European area and allows elderly people to live in exceptional quality of life. Despite the concern about the costs associated with the investment and maintenance of such models of living environments for the elderly, it is necessary to consider the situation in a broader and more complex framework. It is important to introduce different models of living environments for older adults that provide a gradual transition from home care to fully institutionalised care, as well as to promote, in the last phase, living environment concepts that allow a higher level of quality of life.

#### Acknowledgement

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#### 5. REFERENCES

- [1] Eskildsen, M. Price, T., Nursing home care in the USA. *Geriatrics & Gerontology International*, 9: 1-6. 2009.
- [2] Brodsky, J., Habib, J. Hirschfeld, M., Long-term care strategies in industrialized countries: Case studies of insurance-based and non-insurance-based long-term care systems. Myers-JDC-Brookdale Institute and WHO, 2003.
- [3] Žegarac Leskovar, V., Skalicky Klemenčič, V., Inclusive design: comparing models of living environments for older adults, Design for inclusion: proceedings of the 14th International Conference on Applied Human Factors and Ergonomics and the Affiliated Conferences, San Francisco, AHFE international, vol. 75. USA, New York: AHFE Open Access, 2023.
- [4] Mohammadi M., Dominicus M., van Buuren L., Hamers K., Hammink C., Yegenoglu H., The Evolution of Housing Typologies for Older Adults in The Netherlands From 1945 to 2016: An Analysis in the Context of Policy, Societal, and Technological Developments, *Journal of Housing For the Elderly*, 33:3, 205-226, 2019.
- [5] Lehning A.J., Austin M.J., Long-Term Care in the United States: Policy Themes and Promising Practices, *Journal of Gerontological Social Work*, 53:1, 43-63, 2010.
- [6] Seniorval, Housing for senior, <https://seniorval.se/bra-att-veta/boende>, accessed 07.06.2022)
- [7] Hogeweyk, <https://hogeweyk.dementiavillage.com> (accessed 04.08.2022)
- [8] Žegarac Leskovar, V., Skalicky Klemenčič, V., The Role of Nursing Homes Architectural Design in Mitigating the Risk of COVID-19 Pandemics: The Case of Slovenia. *ATHENS JOURNAL OF ARCHITECTURE*, 8(1), 51-66., 2022.
- [9] Bordalo A., Structures of Community Life in Portuguese Home-Villages: Two Case Studies, 5th International Conference of Contemporary Affairs in Architecture and Urbanism (ICCAUA), 2022.

## NEW MODELS OF ARCHITECTURE IN TRANSITION

Prof. dr Mihajlo Zinoski

During the moderation of third thematic session: “New Models of Architecture in Transition” and focused discussion with authors and the audience, I draw these following conclusions.

Research paper with title: “The influence of building physics between formal and material elements of the public library buildings” develops critical approach upon building physics as a discipline and hermeneutics. This research investigates the technical detail of a tool which unfold development process of an architectural idea named “building skin”. Environmental components such as heat, light, sound, humidity as aspects of building physics are an integral part in the development process of architectural language. Through the facade as part of architectural syntax presented through volume, materialization and tectonics, this research emphasizes multidisciplinary approach toward social and environmental sustainability.

The porpoise of the paper entitled: “Urban planning regulation as a generator of new housing typologies not typical for the city of Skopje” determine the factors which influence the emerging of new typologies and create a new model in real estate market. Research interest opens questions about the model of sustainable economy in correlation with built environment. Since they are economic and social factors from the environment that trigger the production of new reality, it is obvious that theoretical background of this research belongs to social system theory and architectural autopoietic of self-reproduction.

There is no clear methodology about physical reconstruction of former architecture. The paper with title: “Transformations of the social modernist buildings during the transition in terms of their renovations for better energy efficiency” analyze different types and magnitude of physical reconstruction which usually leads toward identity lost. In front of this research the transformation of socialist modern architecture is ethical question, where sustainable preservation beside physical introduce social significance: memory, identity and heritage.

There is well known problem statement about the healthcare facilities where it becomes overcome the same moment when the hospital is built. This problem in reality is solved with lack of planning and poor design proposals. Through the mapping of patients flow, research with title: “Healthcare facilities as a generator of architectural models” detects certain functional disruptions caused by the physical transformation of present buildings in Clinical Center in Skopje, Macedonia.





# INTERNAL AND EXTERNAL INFLUENCES IN THE DESIGN DEVELOPMENT PROCESS OF THE BUILDING SKIN

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## ABSTRACT

The proposed research adopts a thematic approach to identify the factors influencing the building skin, both internally and externally. External factors encompass climatic conditions and physical context, while internal factors pertain to human activities and the form-material language of the interior space. This study seeks to uncover the interconnectedness between the interior and exterior factors within the building physics perspective, shedding light on the diverse challenges shaping architecture. Therefore, the thematic approach serves as the foundation for examining the aspects of heat, sound, and air quality. This research aims to elucidate the thermal aspects pertaining to both internal and external influences by applying the methodology of isothermal lines. The findings of this study outline the importance of adopting a multi-perspective approach in the development process of building skin. Consequently, these results address disciplinary challenges based on the variability and applicability aspects of sustainability.

*Key words: architecture, building physics, form, materiality, isothermal lines, building skin*

## I. INTRODUCTION

Building physics as a discipline is vital in defining the formal, technical [1], and technological [2] aspects in the development of the building skin. Therefore, this study focusses on a thematic approach. Following the initial approach, the methodology employed further involves materiality, and the theoretical approach. Materiality refers to the technological, technical and materialization aspects of the architectural envelope [3], whereas the theoretical approach engages in investigation and critical reflection on spatial values in the field of architecture [4]. Moreover, this research outlines the internal and external factors, by delving into the technical and technological aspects of the development process of the building skin. The external factors are related to climatic and influences in the physical context, while the internal factors represent the people and the form-material language of the interior space. Based on the thermal aspects, through both internal and external factors, this study presents an integrated methodology applying isothermal and heat flow lines. The isothermal and heat flow lines serve as the methodological tool for analyzing the influences of the both case-studies: double-shell masonry and double-glazed timber skin. This method is well suited as it employs analytical techniques, enabling for a broader understanding on how air and temperature travel through the building skin. As a result, this research aims to portray the dynamic interplay of the internal and external factors and their impact on the development process of the building skin. In conclusion, based on the factors and the formal and material language of interior architecture this study puts forth a framework for developing an integrated approach within building physics. Hence, the research hypothesis embodies the developing process of the architectural envelope as a means of discovering the core values and quality of the architecture through resistance to internal and external influences.

## 2. INFLUENCES: INTERNAL AND EXTERNAL

The thematic framework adopted in this proposed research is intrinsically linked to the multifaceted impact of the factors on the architectural envelope. To understand resistance and permeability, one needs to understand the means in which they occur. Both permeability and resistance entail cyclicity, periodicity and intensity of impacts. Accordingly, the question that needs to be addressed is how these characteristics appear together with the influences. The aforementioned characteristics are expressed to a different extend within different influences, and therefore the influences can be seen in two different approaches. One approach is to treat them as a single entity while another approach involves treating them integrally. For instance, the influence of sunlight, which enters the interior through the transparent elements of the building skin is considered an individual impact, whereas, the reduction of heat and the increase in air humidity are a considered integrally. In the process of delineating the impacts, it is necessary to take into consideration the tectonics of the building skin [5]. It's important to note that there are internal and external factors that affect the process. External or environmental influences are expressed through the climatic context, but also through the following parameters: topography, sun, heat, light, sound, air humidity, and horizontal loads. These factors bring upon consequences such as thermal expansions, resistance to precipitation and air humidity. In addition to environmental influences, the nature of external influences derives from the physical and urban context of the built environment. These impacts have a

close correlation in a physical context to stereotomy and materialization. Moreover, there are internal influences and they are presented through volume, materialization and tectonics. It's crucial to note that internal influences are predominantly driven by human activities. For example, people bring upon a notably elevated heat load in sports centers than in public libraries. Consequently, the transfer of heat, sound, light and air humidity causes a load within the interior. Taking everything into account, it is crucial to prioritize human as well as physical influences in the developmental process of the building skin.

### **3. BUILDING SKIN**

The building skin characterizes the material, functional, and structural aspects in architecture. First of all, building skin rests on functional grounds. According to functionality, the following types can be distinguished: passive, active, cooling, and ventilated [6]. Based on Knaack and Koenders's research [7], the building skin entails two functions: protective and regulatory. The protective function in other words is the resistance to the effects of weather conditions, while the regulatory function refers to the regulation of the internal climatic conditions. The structural narrative on the other hand is associated with the technical and technological characteristics. It specifies the gradation in structure in the building skin by separating the primary, and secondary. At that stage, the development of the architectural detail plays a crucial part in the performativity of the building. Connections and joints are also significant in the detail development process of building skin [8]. Besides the functional, and structural narrative materialization is also considered an integral part in the process. Therefore, the following types of materialization can be found: wood [9], steel [10], concrete [11], and brick [12]. Building physics as a discipline and architectural detail as a tool combined represent a unified approach in the development process. Accordingly, heat, light, sound, humidity as aspects of building physics are an integral part in the development process.

### **4. THE REFLECTION OF THE INFLUENCES: CASE-STUDY OF THE ISTOHERMAL AND AIR FLOW LINES**

The relationship between internal and external influences is seen directly through the applicability and variability of the two case studies. The first case (Fig. II) study presents double-shell load-bearing masonry wall, separated by the thermal insulation between the masonry units (Fig. II-A,B). The second example (Fig.III) presents double-glazing timber skin (Fig. III-A,B). Following the components of both examples, diagram has been generated using the simulation method of the building skin elements through the expansive tool of the isothermal and air flow lines. Throughout the course of the research, the Physibel computer software was effectively leveraged, along with the implementation of the Trisco 2D plugin. The proposed case study indicates the temperature and flow between the interior and exterior elements of the building skin (Fig. II-C,D) (Fig. III-C,D). Such diagrams indicate the internal and external thermal influences on the elements of the building skin. Given the limitations in both material volume and brevity, the exposition of the mutual influences, both internal and external, is primarily unraveled through the lens of thermal aspects (Fig. II-E,F) (Fig. III-E,F).

## 5. CONCLUSION

Progress toward sustainability, and performance is fundamental in architecture. Understanding how internal and external factors influence the architecture is paramount to the development of the building skin. In conclusion, this research outlines the methodological tool of isothermal and air flow lines in the development process of the building skin. In future studies, it is recommended to work wider spectrum of the architectural physics aspects, including those associated with humidity, sound, and light, alongside a more comprehensive perspective on the aforementioned methodology and thermal aspects. The applicability of the study serves as a call to explore the multifaceted impacts, effects, and subtleties, and to embrace a more comprehensive approach to sustainability.

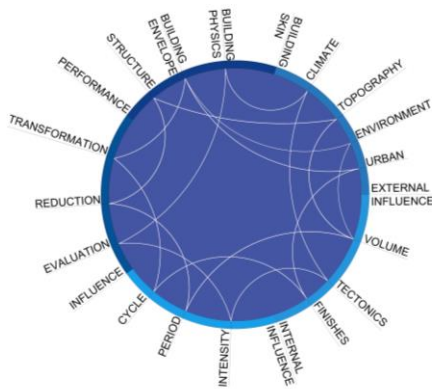
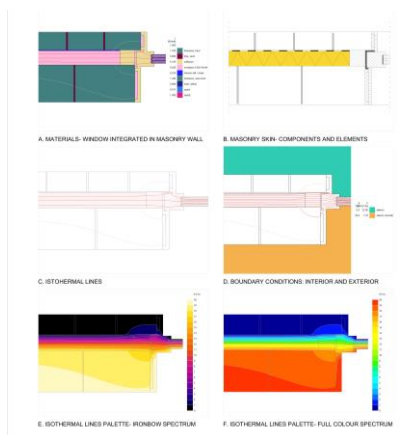


Figure 1: *Visual mapping of the research: influences (internal, external), building skin and performance.*





## REFERENCES

- [1] Yu, M. *Skins, envelopes, and enclosures: concepts for designing building exteriors*. New York: Routledge, 2014.
- [2] Schittich, C. L. *Building skins*. Birkhäuser Edition Detail . Yu, M. (2014). *Skins, envelopes, and enclosures: concepts for designing building exteriors*. New York: Routledge, 2006.
- [3] Knaack, U., Klein, T., Bilow, M., & Auer, T. *Façades Principles of Construction*. Basel : Birkhäuser Verlag AG, 2017.
- [4] Ingels, B. *HOT TO COLD. An Odyssey of Architectural Adaptation*. Koln : Taschen GmbH, 2017.
- [5] Aksamija, A. *Sustainable facades- design methods for high-performance building envelopes*. New Jersey: Wiley, 2013.
- [6] Herzog , T., Krippner , R., & Lang, W. *Facade construction manual* . Munich: Detail, 2017.
- [7] Knaack, U., & Koenders, E. *Building Physics of the Envelope: Principles of Construction*. Basel: Birkhäuser Verlag GmbH, 2018.
- [8] Meijs, M., & Knaack, U. *Components and Connections — Principles of Construction*. Basel : Birkhäuser, 2009.
- [9] Herzog, T., Natterer , J., Schweitzer, R., Volz , M., & Winter , W. *Timber construction manual*. Munich : Detail- Intitut fur internationale Architecture-Dokumentation GmbH & Co. KG, 2004
- [10] Schultz, H. C., Sobek, W., & Habermann, K. J. *Steel construction manual*. Munich: Institut für Internationale Architektur-Dokumentation GmbH, Munich, 2000
- [11] Kind-Barauskas, F., Kauhsen, B., Polonyi, S., & Brandt, J. *Concrete Construction Manual*. Basel: Birkhauser, 2002
- [12] Pfeifer G. Ramcke, R., & Achtziger, J. *Masonry Construction Manual*. Munich: Institut für internationale Architektur-Dokumentation GmbH, 2002.

# URBAN PLANNING REGULATION AS A GENERATOR OF NEW HOUSING TYPOLOGIES NOT TYPICAL FOR THE CITY OF SKOPJE: THE IMPACT OF TYPOLOGY ON LAND PRICES

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## ABSTRACT

In the past three years, the real estate market has transformed the built environment drastically in Skopje. Lack of land, rising land prices, and urban planning regulations have contributed to the development of new housing concepts. As evidence of transformations, the emergence of new housing typologies must be studied as a phenomenology of built space. This research's problem is the redefinition of the role of architectural practice on the housing market, where a building is a product used expressly for real estate business.

In the Republic of North Macedonia, the destination of land use is regulated by urban plans that specify how and what can be built. The category of housing is divided in subcategories. Among other subcategories, there are single-family houses (A1 - Housing accommodation in houses). By recent changes in The Rulebook on Urban Planning in 2020 regarding the number of dwelling units per building and per attic, new single-family house types emerge. The purpose of this paper is to identify the model of new typologies and to determine the factors that contribute to such a model through an examination of recently emerging housing architectural concepts in Skopje.

The research process will investigate and observe market flows in land real estate destined for single-family houses. This research will identify models for a sustainable economy in the constructed environment by analyzing the statistical data of particular stakeholders.

The expected findings of the research will identify the economic and social factors that trigger the development of new housing typologies.

This research re-presents architecture as contemporary paradigms of the built environment on the premise that new housing typologies provide opportunities for a sustainable market economy.

*Key words: housing, architectural concepts, typologies, single-family houses*



## **I. INTRODUCTION**

Urban law refers to a comprehensive framework encompassing policies, regulations, decisions, and practices that regulate the administration and advancement of the urban environment. In accordance with the Law on Urban Planning, the Rulebook for urban planning is mandated.

The Rulebook on Urban Planning has the force of a bylaw and was adopted by the Ministry of Transport and Communications and was published in the Official Gazette of RN Macedonia No. 225 of 18.09.2020. Contrary to the 2015 Rulebook, the revised edition of 2020 does not include a defined restriction on the maximum number of housing units permitted in single-family homes, which was four units, nor on the number of levels permitted in the attic, which was one. Changes to the regulations have resulted in the emergence of novel typologies that do not conform to the established categorization of single-family houses (A1), but instead exhibit characteristics that are closer to the Housing in Buildings category (A2).

This paper focuses on single-family homes with multiple dwelling units that were built after 2020, in terms of the land value where they were constructed. Predating the year 2020 a small number of single-family dwellings can be observed to incorporate at least six housing units that have been constructed in violation of the mandated regulations. The urban regulations consistently lag behind the prevailing urban realities. As apartment sizes continue to shrink (Zinoski, Fazliu, Dalipi, 2023), new typologies have become the dominant architectural practice in single-family residential lots after 2020.

Methods of determining the value of lot for single-family houses are modified as a result of the introduction of new housing types. These methods will be discussed in this paper.

## **2. MATERIALS AND RESEARCH METHOD**

In order to determine the impact of a new typology on land value and to explain the rise in prices, we will apply quantitative comparative methods to the values of single-family residential lots before and after the year 2020. This study's data originated from two different sources: landowners and construction companies. The primary focus of this research will be an examination in terms of the land value of three single-family houses in Skopje that have numerous housing units. These buildings were constructed after the year 2020, and the analysis will be based on the materials that have been collected.

## **3. METHODS OF DETERMINING THE VALUE OF A SINGLE-FAMILY HOME'S LOT**

In terms of urbanized plot value, beside others, there are two main informal forms of evaluations, one used before 2020 and the other after. Despite location, shape, size and other factors, in Skopje the main factor on determining the plot value is Detailed Urban Plan. Prior 2020 single-family home's lot were offered to market in price per m<sup>2</sup> lot regardless their location. After 2020, the lot prices were calculated differently. Now, the price is determined based on the permitted built area specified in the urban plan.

Till the beginning of fourth quarter of 2020 price per m<sup>2</sup> of lot's land destined for single-family house varied from 200-400 €/m<sup>2</sup> depending on location. After the adaptation of the Rulebook on Urban Planning in 2020 the price is calculated as 20 – 30% of net-built area depending on location. Following the introduction of a new typology, investors have begun purchasing those lots, which was not the prevailing trend previous to the year 2020.

#### 4. CASE STUDY

This study does a comparative examination of the lot prices of single-family homes, examining their respective values prior to and subsequent to the year 2020 at the time of sale.

The data used for analysis refer to 3 lots, two in Street Prashka in Skopje and one in Street Hristijan Todorovski Karposh in Skopje. The lots are named Building A, Building B and Building C.



Figure 1: View of Street Prashka, Skopje (from the authors)



Figure 2: Apartment from Building A (documented by the authors)



Figure 3: Apartment from Building B (documented by the authors)



Figure 4: Apartment from Building C (documented by the authors)

Building A is built in a lot of 388 m<sup>2</sup>. The structure comprises nine residential units in four levels (P+2+Attic), with a total net space of 428 square meters. Despite the third floor's projected three living units, there are two living units on each level. Building B is built in a lot of 397 m<sup>2</sup>. The structure comprises ten residential units in five levels (P+2+2 levels in Attic), with a total net space of 542 square meters. In each floor are planned two living units. Building C is built in a lot of 495 m<sup>2</sup>. The structure comprises 14 residential units in five levels (P+2+2 levels in Attic), with a total net space of 642 square meters. There are three living apartments on each floor, and two more are planned in the upper attic level. The apartments in size in all buildings vary from 40 – 66 m<sup>2</sup>. Many of the units possess two bedrooms, yet only a few have a single bedroom. The units are smaller than prior apartment typologies, although having two bedrooms, a living room, a kitchen, and a bathroom as its primary contents.

	Lot square area	Price before 2020	Price after 2020
Building A	388	120 000 €	179 500 €
Building B	397	127 000 €	189 000 €
Building C	495	148 500 €	192 000 €

Figure 5. Tabular comparison of lot prices before and after 2020

From the tabular statistics (Figure 5), it can be seen that the price of lot becomes more expensive after 2020 regarding the changes in The Rulebook on Urban Planning, respectively new methodology of evaluation.

## 5. CONCLUSIONS

Upon examining the tabulated statistical data regarding lot prices following to the year 2020 inside the urban location of Skopje, it becomes evident that the emergence of a novel typology, among other influential elements, significantly contributes to the rise of plot costs. The strong and inescapable relationship between the demand for housing and residential developers implies that the architectural practices that initiate the entire process will persistently be influenced by these factors. Consequently, this will result in the ongoing creation of novel architectural typologies and projects that effectively meet the needs and desires of all parties involved. In this paper characteristics of new typology like quality of living, apartment types, impact on neighborhood and city are not discussed and will be discussed in further research.

## 6. REFERENCES

Munneke, Henry & Sirmans, C. & Slade, Barrett. Land Prices and the Development Process. *The Journal of Real Estate Finance and Economics*. 1-25. 10.1007/s11146-023-09959-8. 2023

Glumac, Brano & Herrera-Gómez, Marcos & Licheron, Julien. A hedonic urban land price index. *Land Use Policy*. 81. 802-812. 10.1016/j.landusepol.2018.11.032. 2018

Zinoski, M., Fazliu V., Brsakoska, J., Dalipi, V. New models of architecture in the real estate market (36-46), 7th Conference of interdisciplinary research on real estate Ankara, Turkey, 2022, Institute of Real Estate Studies, Ljubljana, Slovenia. 2022

Zinoski, M., Fazliu V., Dalipi, V. higher prices, smaller spaces: Correlation between apartment prices and architectural practices in Skopje (7), 8th Conference of interdisciplinary research on real estate, Belgrade, Serbia, Institute of Real Estate Studies, Ljubljana, Slovenia. 2023

Gjorgjieva, A. S., Taseva, S. Analysis of the legal framework in spatial planning, urban planning and construction with possible risks of corruption and the methodology for following recommendations 2021

Official Gazette of RN Macedonia No. 225 of 18.09.2020

<https://urbanpolicyplatform.org/legislation/>

# TRANSFORMATIONS OF THE SOCIAL MODERNIST BUILDINGS DURING THE TRANSITION IN TERMS OF THEIR RENOVATIONS FOR BETTER ENERGY EFFICIENCY

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## ABSTRACT

The catastrophic earthquake in 1963 caused over 1000 human losses, more than 80% building stock's destruction and irreversible degradation of the cultural heritage, that changed the image of Skopje forever. The post-earthquake period brought an expansion of the building sector, rapid housing construction in order to house as many people as possible, as well as intensive construction of public institutions. At that time, the country was under a socialist political economic system, and most of the buildings were built and financed by the State Budget and belonged to the State. The ideological drive for faster renewal of Skopje, allied with rapid industrial development and accompanying migration from the countryside to the city, created radical and modern architecture. On the other hand, in terms of energy efficiency aspect, the social modernist buildings were built without thermal insulation materials and they have poor thermal properties and thermal comfort. The transition from socialist to capitalist society brought new standards, norms and created a big transformation in architecture. The purpose of this paper is to investigate the transformations that happened to the social modernist architecture in Skopje during the transition to capitalist society from the perspective of energy efficiency renovation measures. For this purpose, through a critical selection of 30 case study buildings, documentation and analysis of the current state of the selected buildings were carried out. The buildings were analyzed according to their typology, construction, building materials, thermal properties, function, cultural heritage protection, degradation, preservation and retrofit measures. It can be concluded that in order to improve their energy efficiency, inadequate retrofit interventions are constantly being implemented and their authentic appearance have been changed. Solutions should be found for appropriate renovation of these buildings, whereby their energy efficiency and sustainability would be improved, while their authentic appearance would be preserved as much as possible.

*Key words: social modernist architecture, transformation, transition, energy efficiency*

## **I. INTRODUCTION**

As a consequence of the political changes, economic flows and social relations, Skopje experienced dramatic spatial transformations during the 20<sup>th</sup> century. The architecture that was created as a product of the successive modernization cycles during that period, especially after the earthquake in 1963, has a special value (Deskova, 2015). After 1963, with the support of the UN, the Yugoslavian government adopted Tange's reconstruction plan and Skopje started to develop as modern, utopian metropolis, whose style was predominantly brutalist architecture. When Macedonia gained independence in 1991, national politics changed the identity of Skopje's architecture. The socialist international architecture could not represent Skopje identity any more (Positano, 2016). This period of transition brought many changes in architecture, not only through the construction of new buildings, but also through changes in the existing modernist buildings, which are important cultural heritage.

On the other hand, the social modernist buildings are facing serious environmental issues in terms of energy consumption, emissions and thermal comfort, because according to the standards of their time, they were built in lack of thermal insulation materials (Stratton, 1997). The transition from socialist to capitalist society brought new standards and norms especially in terms of sustainability and energy efficiency, which led to building new energy efficient buildings but also renovation of the existing ones for improving their energy efficiency.

This paper is investigating the changes that occur in social modernist buildings during the transition period, especially in terms of their energy efficiency, with particular emphasis of the renovation measures, i.e. how correctly they are implemented and whether they have repercussions in terms of the buildings' authentic appearance.

## **2. SELECTION CRITERIA AND METHODOLOGY**

In order to see the impact that the transition has on the social modernist buildings in Skopje in terms of renovation procedures for better energy efficiency, comparative analysis of selected buildings are carried out, documenting their authentic and current condition. 30 modernist buildings estimated as cultural heritage, built in the post-earthquake period, are selected for the research. In order to see the impact of the transition interventions in different building's typologies related to function, form, value, construction, etc., the buildings' selection is according to the following criteria: architectural and cultural values, function, construction and façade design. The methodological approaches are used for the research are documentation of the buildings' existing condition and renovated condition through detailed data review of

the architectural projects, standards, norms, legislation and situ visits. Some of the social modernist buildings selected for the analysis are shown in the Figure 1.



Figure 1: *Skopje social modern buildings – case studies a) Historical Archive of Skopje; b) Student dormitory "Goce Delchev" c) National Hydrometeorological Institute d) University Campus "Ss.Cyril and Methodius" e) Macedonian National Bank f) Macedonian Academy of Sciences and Arts*

### 3. RESULTS

According to the criteria for selection based on their function, the analyzed buildings have different functions: residential, commercial, educational, cultural, religious, health, infrastructural, public administration etc. The biggest part of the analyzed buildings are public administration and education, each with 23%, then culture with 20% and residential with 17% (Fig.1). Commercial buildings have a smaller percentage (7%), followed by health (4%), religion (3%) and infrastructure (1%). This leads to the conclusion that transition changes occurred in different types of buildings, however, mostly in buildings where people live and work most of their time, such as residential, public, educational and office buildings, which have a bad thermal comfort due to the lack of thermal insulation and they are in a great need of improving their energy efficiency. Results are shown on Fig.2.

To better understand the processes that happened during the transition renovation measures due to new energy efficiency standards, the interventions are categorized in four types, based on two aspects such as level of intervention (smaller or larger) and the degree of improvement of building's thermal properties: Type 1. Buildings that remain in their authentic condition with low thermal properties (no insulation added); Type 2. Buildings with minor interventions (interior renovation, carpentry or roof repair) with slight thermal properties improvement; Type 3. Buildings with major interventions (envelope renovation) with significant thermal properties improvement; Type 4. Buildings with major interventions but without thermal properties improvement, i.e. no insulation added; Type 5. Demolished buildings.

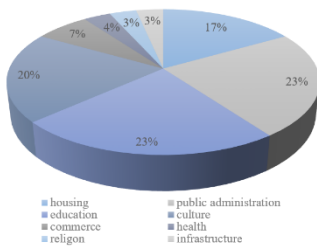


Figure 2: Types of building's function

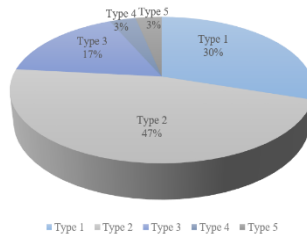


Figure 3: Types of implemented interventions

Results show that buildings with minor interventions and slight improvement of the energy efficiency are the most common (47%). 30% of the buildings remain in the original state without undergoing any interventions, but also without improving the energy efficiency. 17% are buildings with major interventions, (façade, roof and carpentry renovation) and there is a significant improvement of their thermal properties. However, there are also renovated buildings without energy improvements, since no insulation is used in renovation (3%). This is often a case where, due to the preservation of authenticity, energy efficiency is neglected. The demolished buildings share the same percent. More than 80% of the buildings have low thermal properties and not corresponding to nowadays standards. Results are shown on Fig.3 When implementing renovation measures to cultural heritage buildings, it is always difficult to fully respect the building's original appearance (Lembo, 2014). Improving the energy efficiency of cultural heritage is a complex process, which is even more complicated for daily functioning buildings. For this purpose, analyses of the above-mentioned renovation procedures impact on buildings' authenticity are carried out and results are shown in Fig.4. According to the authenticity impact, the buildings are divided into 7 types: Type 1. Unchanged authenticity; Type 2. Partially impaired authenticity; Type 3. Endangered authenticity; Type 4. Authentic appearance imitation; Type 5. Completely changed authenticity to an unrecognizable condition; Type 6. Preserved authenticity through restoration with identical materials.



50% are with partially impaired authentic appearance. 37% are in their authentic condition. 7% have endangered authenticity. 3% have implemented imitation as measure, by preserving the authenticity and improving the efficiency with new materials. 3% are with inappropriate interventions with completely changed looks to unrecognizable condition. There are no properly preserved buildings through restoration with identical materials.

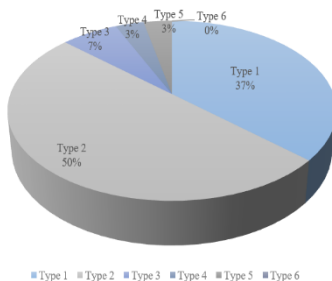


Figure 4: *Authentic appearance condition*

#### 4. CONCLUSIONS

Social modernist buildings have undergone many changes during a period of transition until today. In order to improve their thermal comfort and energy consumption, interventions have been implemented which, according to this research, have proven to be inappropriate and degrading. According to the obtained results, more than 80% of the buildings still have low thermal properties, despite the implemented interventions. 60% of the renovated buildings have at least partially impaired authenticity, which leads to the conclusion that during the transition no appropriate methodology for renovation of modernist buildings has been established and the implemented measures negatively affect their architectural appearance.

#### 5. REFERENCES

Deskova. (2015). Post - earthquake Skopje architecture - values and condition in contemporary context. Skopje [Unpublished doctoral dissertation]. Ss. Cyril and Methodius University, Skopje.

Skopje in transition. (2016, October 4). DOMUS: Scopri la Storica Rivista di Architettura, Design e Arte. [https://www.domusweb.it/en/photo-essays/2016/10/04/skopje\\_a\\_transitional\\_model.html](https://www.domusweb.it/en/photo-essays/2016/10/04/skopje_a_transitional_model.html)

Stratton, M. (1997). Structure and style: Conserving twentieth century buildings. Taylor & Francis.

Lembo, F. (2014). Transforming a brutalist monument into an energy efficient building without destroying the formal appealing: The example of the Mediterranean bank in Potenza (Italy). Springer Proceedings in Physics, 83-90. [https://doi.org/10.1007/978-3-319-05521-3\\_11](https://doi.org/10.1007/978-3-319-05521-3_11)

# REMOTE WORK FOR COORDINATION OF ARCHITECTURAL AND INVESTMENT PROJECTS

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## ABSTRACT

Computer, information, and communication technologies are increasingly entering the modern world as part of the overall globalization process. Remote work provides several opportunities and perspectives, saving time and economic resources. Coordination of architectural and investment projects, as part of this dynamic work process, is an invariable condition for efficiency and quality of the final product, realized in a new global and digital environment.

The report presents a study of the practical application of remote working and more specifically for the coordination of architectural and investment projects, both between members of the design team, and review and approval by contractors and employers.

Examples of completed investment projects, realized with a remote form of architectural design and coordination between the cast specialists and contractors, have been analyzed.

As an integral part of the study, the existing specific software products of BIM technology, allowing significant optimization in the implementation of work from a distance - Graphisoft ArchiCAD, Autodesk Revit, Nemetschek Allplan and others were examined. As a supplement for completeness and efficiency of the remote coordination of architectural and investment projects the possibilities of the platforms for video-conference connections MS TEAMS, ZOOM, WEBEX, INTERMEDIA ANYMEETING, GOOGLE MEET, RING CENTRAL and others, social networks, and communication channels - FACEBOOK, VIBER, WHATSAPP, MESSENGER and others, as well as program products are also presented for remote access like TEAMVIEWER, ANYDESK, REMOTE PC and others.

*Key words: Remote work, BIM technology, Architectural design, Coordination of Investment projects, Globalization*

## **I. INTRODUCTION**

The dynamism and intensity of the modern way of life in recent years has increasingly emphasized the extreme importance and significance of time as a priceless resource. It is for this reason that remote and electronic services occupy an increasingly significant and large share in most spheres of life. Work in architectural design and coordination of investment projects are no exception, and their absent form is becoming more and more popular and often used.

Future global settlements providing a sustainable way of life will inevitably need all kinds of absentee forms of work, remote services, etc. In this regard, the report presents a study of the practical application of the remote work of designers and investors involved in the process of architectural and investment design using BIM technology, which has established itself as a leader in architecture and construction on a global scale in the last 30 years.

## **2. RELEVANCE OF THE TOPIC**

The topicality of the topic is related both to the above-described trends in the modern world and to the COVID 19 pandemic, which unequivocally showed the need for more effective and more adequate absentee forms of work in general and related to architectural design and coordination of investment projects.

The pandemic of COVID 19 in 2020-2022 forced the governments of many countries around the world to introduce restrictive measures and close offices and administrations to limit the spread of the infection. 83

To get out of the ensuing unprecedented crisis in the world economy, governments, municipalities, and private companies joined their efforts to move to various forms of absentee work quickly and efficiently, making it possible not to interrupt the work process, with participants in the investment design to work productively without leaving their homes.

## **3. FEATURES AND APPLICATION OF BIM TECHNOLOGY IN ARCHITECTURE AND INVESTMENT DESIGN**

Digital technologies are actively used in the most diverse spheres of the economy and BIM technology represents digitization in architecture and construction. BIM stands for Building Information Modelling, Model, Management. With the help of BIM technology, the design of an object is carried out in the format of a complex three-dimensional model, which contains information about the architectural appearance of the building, structural elements, engineering networks and their interaction with each other [1].

A brief but clear definition of BIM technology is given in [2]: "(BIM) is a modern concept of building design, evolved from the traditional two-dimensional (2D) and three-dimensional (3D) techniques for applying CAD systems." [Asen Pisarski, 2014].

The advantages of BIM in architectural design compared to traditional two-dimensional (2D) and three-dimensional (3D) techniques are mostly related to the comprehensive interconnected three-dimensional

model containing additional (meta) information about the inserted materials, equipment, and products (4D). Being interactive and connected, this model makes it possible to extract from it the necessary two-dimensional (2D) projections - distributions, sections, facades, and details, as well as to generate three-dimensional photorealistic visualizations, videos, virtual realities, and other advertising materials. In conclusion, it can be summarized that BIM technology is fundamental for effective remote work in the architectural design and coordination of investment projects.

#### 4. TERMS AND CONDITIONS OF APPLICATION AND PRACTICE

In the research, the author examines in more detail the possibilities and application of - Graphisoft ArchiCAD, as he uses this BIM software in his practice, and he also leads exercises in the discipline "Informatics in Architecture - Part II" for students of architecture in the second year of UASG -Sofia, where Graphisoft ArchiCAD is the program product included in the curriculum. BIM Cloud is GRAPHISOFT's cloud technology that replaces BIM Server technology, combining GRAPHISOFT's patented "Delta" BIM Server technology with the benefits of the CLOUD, thus providing a scalable solution for teams and projects of any size and scope. [3] — Figure 1.

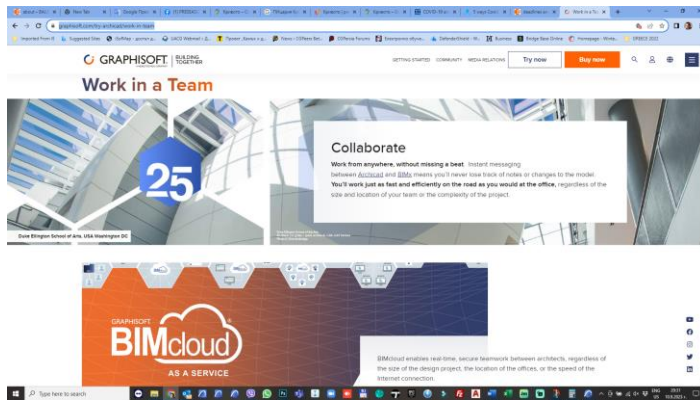


Figure 1: BIMcloud - <https://graphisoft.com/try-archicad/work-in-team>

As for the coordination of the project between all participants in it - both from the architect and from all other designers in the engineering specialties, BIM technology again gives a huge advantage, allowing all project parts to be combined into a common aggregate three-dimensional model, such as in this way, potential conflict points are easily, quickly and effectively detected and, accordingly, removed in time during the design process, and not during construction. — Figure 2.



Figure 2: Summary 3D model with installations – author’s archive

The BIM technology also offers the opportunity to present the above-described interactive three-dimensional model, containing the necessary information and as drawings, to the contracting authority or investor for review and agreement, by means of additional applications to the relevant software products, allowing its easy and intuitive viewing from all mobile devices (mobile phones and tablets or laptops and desktops [4].

- Figure 3

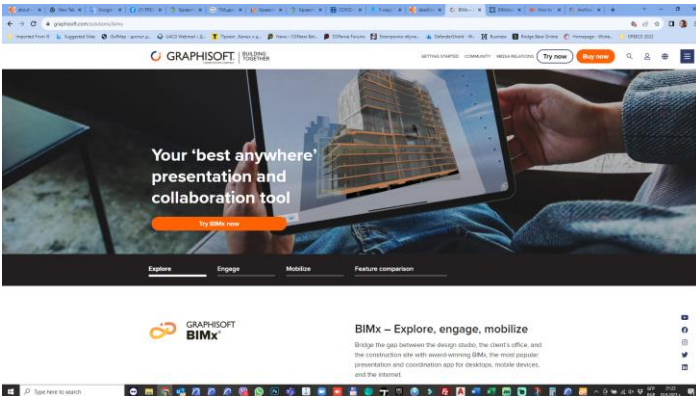


Figure 3: BIMx product for presentation – <https://graphisoft.com/solutions/bimx>

For better and timely communication between the participants in the design process during remote work on architectural design, social networks such as FACEBOOK, VIBER, WHATSAPP and others are also used, as well as a remote access application TEAMVIEWER, ANYDESK, REMOTE PC. and other. By means of ANYDESK

[5], the designers and the contracting authority could review the work done at the given stage and to directly ask questions or comments in the online communication mode - Figure 4.

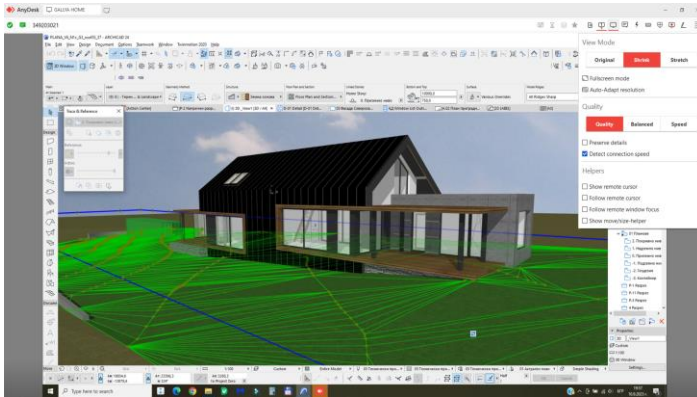


Figure 4: ANYDESK remote access session — author's archive

## 5. PRACTICE RESULTS

As a result of the practice of remote work in architectural design and coordination of investment projects, completed projects from the author's practice before and during the COVID 19 pandemic are presented and analyzed. The graphic and textual materials are provided by the author's personal archive.

Example 1: Multi-family residential building - Figure 5, Figure 6, and Figure 7

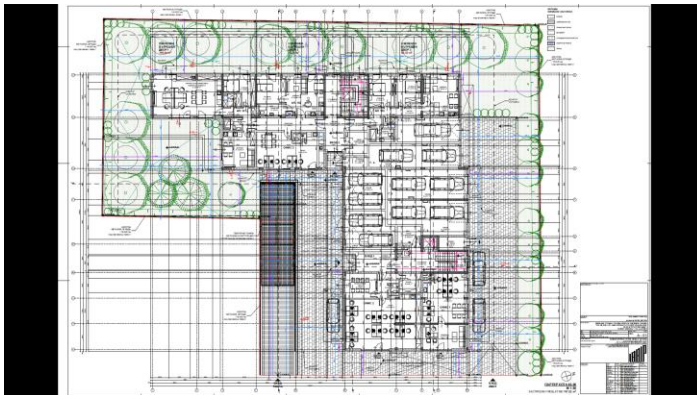


Figure 5: Multi-family residential building, floorplan — author's archive



Figure 6: Multi-family residential building, facades — author's archive



Figure 7: Multi-family residential building, 3D visualizations — author's archive

The presented example was made on Graphisoft ArchiCAD, and its completeness and content illustrate the possibilities of BIM technology, namely the creation of three-dimensional models, both project in the architectural and engineering specialties. The same 3D models are reconciled, and all conflicting points are removed via BIM cloud, which allowed unnecessary delays and inaccuracies to be avoided subsequently during construction.

The BIMx presentation application was used to coordinate the project with the client. Also, in the design process, numerous online absentee meetings were held using the capabilities of MS TEAMS video conferencing platforms, as well as communication through social networks and channels - FACEBOOK, VIBER, WHATSAPP, MESSENGER and others.

Even though the design was entirely carried out during the COVID 19 pandemic, with the entire investment design process being carried out remotely, the results show that thanks to BIM technology and information technology, the quality of the presented project remained high and fully satisfied the client's requirements and his future clients.

Example 2: Interior design of a store - Figure 8, Figure 9, and Figure 10

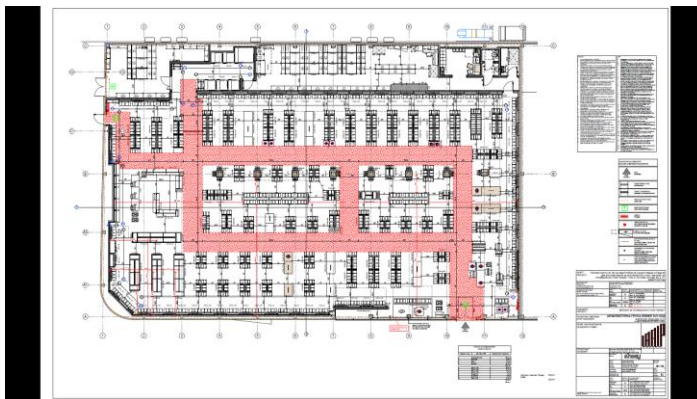


Figure 8: Interior design of a store, arrangement plan — author's archive

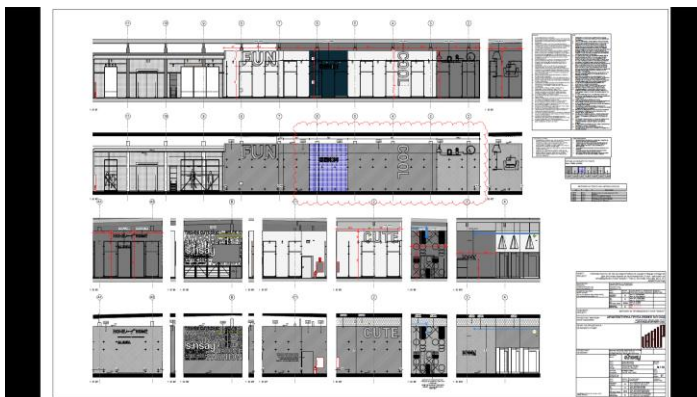


Figure 9: Interior design of a store, views — author's archive

The presented example was made using traditional two-dimensional (2D) CAD techniques, and its completeness and content in detail demonstrate the qualities of the design team, and the thoroughness



and attitude to the project. The lack of 3D models made it difficult to effectively agree and anticipate all the points of conflict, subsequently inaccuracies and omissions appeared during construction, which led to delays and problems on the site.

Standard face-to-face meetings were used to coordinate the project with the contractor and the other participants, where the drawings for the relevant parts were printed and the necessary corrections and reconciliations were discussed.

Regardless of the fact that the design was fully implemented before the COVID 19 pandemic, and the entire investment design process was conducted as standard with face-to-face meetings, the results clearly show that despite the extremely thorough and detailed development of all project parts, the lack of BIM technology and the ability to effectively and quality coordination, the quality of the project suffered and the gaps and delays that appeared left a negative impression on the contracting authority and the client.

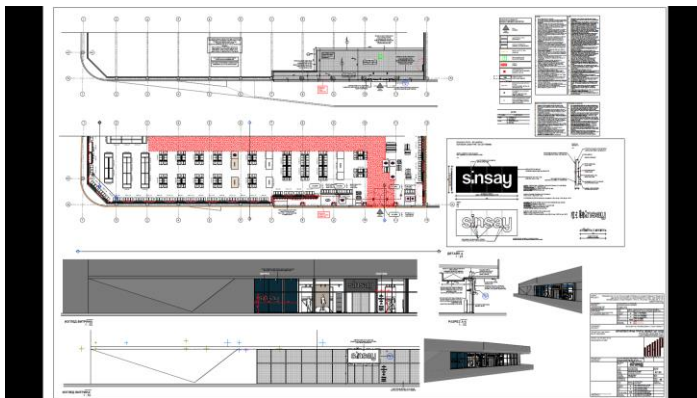


Figure 10: Interior design of a store, shopfront — author’s archive

## 6. ADVANTAGES AND DISADVANTAGES

The advantages and disadvantages of remote work in architectural design and coordination of investment projects are presented in tabular form for a clearer view.

Table I. Advantages and disadvantages of working remotely in architectural design.

Category	Advantages	Disadvantages
I. Perception		
Software	Use of different types of software products enabling a huge range of presentation formats. Launch of BIM software,	The impossibility of expression of graphic and artistic culture

	including the creation of interactive three-dimensional models and virtual reality	
Editing	Quick edit	
2. Time resource	Travel time to the workplace is eliminated	
3. Conducting time	Flexibility in scheduling and meetings and presentations	
4. Feedback	Availability of online archive and recordings of absentee video conferences and conversations	The absence of personal contact and moreover, direct and fruitful communication with all participants in the architectural design
6. Accessibility	Extremely great freedom, without restrictions regarding the location of the participants in the architectural design, the only necessary condition being the presence of an electronic device for communication (Computer, tablet, smartphone)	The presence of electronic is mandatory. communication device (personal computer, tablet, mobile smart phone) and access to the INTERNET
7. Re-examination	Possibility to record the relevant meeting and review it again	Lack of overall attention during the design process due to the possibility of subsequent familiarization with the materials or comments on the tasks
8. Variation	The virtual environment of the specialized software enables multiple solution options	

## 7. CONCLUSIONS

The ease of perception, the economic benefits, the saving of time resources, the possibility of all specialists involved in the processes to work on different projects regardless of where they are , the possibility of quick editing, the duration, the implementation from a convenient place for all participants in the investment process, control, accessibility, the possibility of subsequent reviews and options are the main advantages of remote work, they also determine the positive framework of non-present communication in the architectural and investment design.

In the last 30 years, BIM technology has been established as a standard in architectural and investment design in leading countries of the world such as the European Union, England, USA, etc. [6-7]. It can be expected that BIM technology will soon be established as a standard on a global scale. Being fundamental for remote work in architectural design and coordination of investment projects, the author believes that together with the development of BIM technologies, this will inevitably increase the share of absentee forms of work in architectural and investment design.

In conclusion, according to the author's opinion, indicate that despite the shortcomings and the natural objective contradictory reaction of some of the participants in the process of architectural and investment design, the accelerated adaptation and proactive application of absentee forms of work and coordination of investment projects, are a prerequisite and a mandatory condition for the sustainable development of the investment and design process in the future.

## 8. REFERENCES

- [1] Nedyalkov Danail, Stefan Asparuhov, University of Architecture, Civil Engineering and Geodesy — Sofia (UACEG), APPLICATION OF INFORMATION TECHNOLOGY TO INTEGRATE THE PROJECTS OF ALL DISCIPLINES IN A SINGLE BUILDING INFORMATION MODEL, XVI INTERNATIONAL SCIENTIFIC CONFERENCE VSU\*2016 pp. 345-349, 2016.
- [2] Nedyalkov Danail, Stefan Asparuhov, University of Architecture, Civil Engineering and Geodesy — Sofia (UACEG), PRACTICAL GUIDELINES FOR APPLICATION OF ADVANCED INFORMATION TECHNOLOGIES IN THE DESIGN PROCESS, ANNUAL OF THE UNIVERSITY OF ARCHITECTURE, CIVIL ENGINEERING AND GEODESY — SOFIA, pp. 1-7, 2014.
- [3] <https://graphisoft.com/try-archicad/work-in-team>
- [4] <https://graphisoft.com/solutions/bimx>
- [5] <https://blog.anydesk.com/how-to-remotely-access-a-desktop-a-step-by-step-guide-to-anydesk/>
- [6] Sibenik, Goran Mizumoto, Juliana Bosche, Frederic Méda, Pedro Puust, Raido Akbarieh, Arghavan Bolpagni, Marzia. Adoption of BIM-related international standards across Europe. European Conference on Computing in Construction 40th International CIB W78 Conference Heraklion, Crete Greece, July 10-12, 2023.
- [7] Leal G., A. Ganah1, J. Goulding1, N. Ainsworth2. Identification and analysis of UK and US BIM standards to aid collaboration. Building Information Modelling (BIM) in Design, Construction and Operations Conference, September 2015, p-p. 505-517

# HEALTHCARE STRATEGIES AS A GENERATOR OF ARCHITECTURAL MODELS IN UNIVERSITY CLINICAL CENTER SKOPJE

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## Abstract

While the world argues about the trends in healthcare architecture, the Macedonian healthcare system is in a constant struggle to meet up with medical and technological development. This is most obvious in the attempt to improve the existing healthcare facilities. Therefore, adapted architectural models in the already existing healthcare buildings are evidence of architecture in transition. The architectural practice has tried to respond by attempting to establish contemporary paradigms in these models. The interventions in the existing hospitals represent a generator of various spatial organizations, which integrate social and political layers and are closely related to the state's strategies and plans for improving the healthcare system.

Through an analytical approach, the paper aims to research the generated models within the healthcare facilities, in the period of Yugoslavia and the past 30 years, as well as closely elaborate on the influential factors that drove these transformations. The research is based on a case study, focusing on the architectural models in the clinical hospitals within the University Clinical Center in Skopje. The upgraded hospitals are researched in different aspects, starting from historical chronology regarding the development of the strategies that affected their basic architecture, and giving an overview of their spatial transformation.

The expected results of the research will demonstrate that these models, aim to adapt and thereby improve the standard of health care in clinical hospitals. According to the developed strategies and by following the current norms, the adapted architectural models should meet the necessary spatial capacities, as well as the patient's needs, while being in line with the economic capital. Moreover, the research will present that such strategy conditions of facility upgrading are difficult to implement fully and flawlessly, and it will determine that new approaches are needed.

**Keywords:** *healthcare facilities; healthcare strategies; architecture in transition; transformation; generated architectural models.*

## **I. INTRODUCTION**

This paper focuses on the strategies that generate adapted models within the hospitals of the University Clinical Center in Skopje (UCCS), that aim at improving the healthcare system in Macedonia in the last 60 years. The paper interprets the implemented architectural models by analyzing chronologically the strategies that affected the spatial appearances of the clinical hospitals. It will demonstrate through analysis that such strategies of facility upgrading are difficult to implement fully and flawlessly and will conclude on the need for new approaches in the design of the new Clinical center in Skopje.

The paper presents the abovementioned issues in three chapters. The conclusion is the last part, in which the final observations are given.

## **2. PROBLEM STATEMENT IN HEALTHCARE STRATEGIES**

Healthcare strategies in North Macedonia are aimed at healthcare facilities that are part of the general and highest healthcare system, to significantly improve the health and well-being of the population, strengthen public health, and provide a sustainable focus on patient health (Strategy, 2021-2030). Adapted architectural models are evidence of the transition of Macedonian healthcare architecture. The healthcare system strategies over the past 60 years are leaning toward generating models that will easily adapt and integrate into the built hospitals. These approaches tend to respond to contemporary challenges, such as easing the function of the healthcare system by providing patient care, and access to resources while being in line with the economic capital.

As part of the general strategies, there are specific strategies aimed at the University Clinical Center in Skopje (Strategy, 2021-2030). The UCCS represents a complex hospital center that provides the highest level of healthcare in the Republic. These strategies generate architectural models as temporary solutions, through adaptation of the external and internal structure of the Clinical Center. These solutions affect the formal system of the facilities and the circulation aspects. The generated models are designed as collectors of multiple disciplines and individual departments, which contributes to limited collaboration between medical and teaching staff. Moreover, patients are in constant movement between different places, which reduces the patient flow in the facilities and is detrimental to patient experience, overall efficiency, and capacity. This is because healthcare facilities are characterized by a complex program with a movement organization containing many users. The user's circulation in healthcare facilities implies the dynamic processes in hospital buildings, that realize relations and shape the social patterns of the space (Wagenaar, 2019).

Problem areas refer to the economic model, partial strategies and solutions, lack of discipline in their implementation, flow of patients and staff, overall efficiency, and capacity.

### **3. IMPLEMENTED HEALTHCARE STRATEGIES IN UCCS**

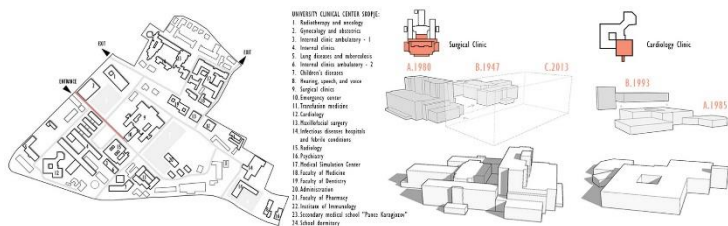
In Yugoslavia, health care planning is determined through the needs concerning demographic characteristics, the type of health condition, geographical position and infrastructure, as well as the population diseases (Kliska, 1965). In the 1960s, with the rise of investment buildings and to strengthen plans and strategies for health care, newly created facilities were interpolated in the Clinical Center in Skopje. Chronologically, in the next 40 years, the University Clinical Center was constantly upgraded depending on the needs, where the biggest construction activities took place during the 1970s and 1980s. The interpolations and interventions were dependent on the capacities and needs of the clinical hospitals, and faculties, which increase the density of construction on the site and directly affect the internal infrastructure (History – Faculty of Medicine, 2018).

After the disintegration of the former Yugoslav federation, the Macedonian government developed several Health Care Strategies considering the University Clinical Center. In 2008, the Ministry of Health launched a program, aiming at improving the accessibility, quality, and effectiveness of health care, through the plan for the renewal of the University Clinical Center in Skopje. The biggest strategy changes began in the 2010s, influenced by political aspiration and shifts in governmental structure. The first idea for "greenfield" investment began in 2009, and 2011 the government announced the construction of a new clinical center in Skopje periphery (Strategy, 2021-2030). This idea would come back later in 2018, with the government shift, followed by only a few studies, and it will vanish soon enough. The furthestmost progress was in 2013 with the announcement of the construction of a new integrated clinical center in the location of UCCS. An architectural project designed by Italian experts was promoted, and several local firms were working on the main project. This was never realized due to unsustainable program, financial, and political aspects (Radio Free Europe, 2013, 2017, 2018, 2020, 2021). Nowadays the strategies are remaining on further interventions in the hospital facilities in UCCS. The future strategies are divided into three familiar options – two main approaches and one alternative. The first approach is focused on the existing location of the UCCS and interventions or development phases within the clinics. The second approach is inclined towards the development of UCCS as a "Greenfield" investment, and the third alternative approach is to develop a new integrated hospital on the existing site (Strategy, 2021-2030).

#### **3.1. Generated architectural models in UCCS**

The Skopje University Clinical Center is a complex hospital network that is continuously developing. Transformations are taking place in the clinical hospitals, through adaptation, extension, and upgrading of existing facilities. Figure 1 is an overview of the generated models in UCCS, with a specific focus on the Surgical Clinic (SC) and Cardiac Surgery Clinic (CSC) (City Skopje Archives, 2023). Through the analytical approach of chronological decomposition of the structural aspects of these hospitals, some of the problematic areas are becoming evident.

Figure 1: University Clinical Center Skopje —chronological



#### 4. NEW APPROACHES

As a consequence of the aforementioned strategic processes it is evident that constant interventions such as these, affect the formal system (Eisenman, 2006) and movement organization in the existing clinical hospitals. These implemented models, affect the building's internal and external conditions, putting them in a conflict that distorts the formal system and disrupts the internal and external functional and movement relations, the homogeneity of spatial-program characteristics, and their function. However, there must be an attempt to understand the application of a new formal system in the designing system, and system control should be enabled by establishing a relationship with the specific requirements of a specific program or site.

Therefore, new strategies in healthcare design are needed, that will be more of a shift and not a change, and therefore should not be considered as a threat to the existing formula. The new approaches refer to interdisciplinarity -an integrated approach and the necessity of combining disciplines, which requires different kinds of data gathering and multidisciplinary analytical approaches, as well as the ability to visualize and communicate research findings to all stakeholders. Assisting design with rigorous analytical methods reduces the risk of failure (Cama, 2009; Peavey and Vander Wyst, 2017).

#### 5. CONCLUSION

In Macedonian healthcare strategies, the layering of influential factors in the process of generating architectural models of hospital buildings is evident. At this point, the Clinical Center in Macedonia is faced with major and urgent challenges. In the previous experience, the ongoing healthcare strategies have shown the need for constant transformation of hospital buildings to respond to these challenges, and by that generating architectural models under the pressures of their complexity and urgency. The study shows that new approaches to determining better healthcare strategies are needed, where architectural design is called to respond to such challenges and create conditions that enable high-quality healthcare.

## 5. REFERENCES

- Cama, R. (2009). *Evidence-based healthcare design*. John Wiley & Sons.
- City Skopje Archiv. (2023). *Архивски фондови и збирки во Државниот архив на Република Македонија*.
- Eisenman, P. (2006). *The formal basis of modern architecture*. Lars Müller Publishers.
- History of Medical Faculty. (n.d.). *Историјат – Медицински факултет*. Медицински факултет – Универзитет „Св. Кирил и Методиј“ – Скопје. <https://medf.ukim.edu.mk>
- Kliska, S. (1965). *Bolnice* (2nd ed.). Gradevinska knjiga, Beograd.
- Ministry of Health the Republic of North Macedonia. (2022). Health strategy 2021-2030. <https://zdravstvo.gov.mk/wp-content/uploads/2021/12/19.11.-SZ-posledna-Konechna-Natsrt-Strategija-MKD.pdf>
- Peavey, E., & Vander Wyst, K. B. (2017). Evidence-based design and research-informed design: What's the difference? Conceptual definitions and comparative analysis. *HERD: Health Environments Research & Design Journal*, 10(5), 143-156. <https://doi.org/10.1177/1937586717697683>
- Radio Free Europe. (2013, August 6). *За три години - Нов клинички центар*. Радио Слободна Европа. <https://www.slobodnaevropa.mk/a/25067881.html>
- Radio Free Europe. (2018, January 25). *Ќе добие ли Македонија конечно нов Клинички центар?* Радио Слободна Европа. <https://www.slobodnaevropa.mk/a/28997831.html>
- Radio Free Europe. (2020, July 8). *Нов клинички центар вечно политичко ветување пред избори*. Радио Слободна Европа. <https://www.slobodnaevropa.mk>
- Radio Free Europe. (2021, May 18). *Сите си тераат свој проект, нов Клинички центар нема*. Радио Слободна Европа. <https://www.slobodnaevropa.mk>
- RFE/RL. (2017, May 19). *Тодоров потпиша договор за нов клинички центар, СДСМ најави ревизија*. Радио Слободна Европа. <https://www.slobodnaevropa.mk/a/28497962.html>
- Wagenaar, C., Mens, N., Manja, G., Niemeijer, C., & Guthknecht, T. (2019). *Hospitals: A design manual*. Birkhauser.



# HYBRID TIMBER CITY: LIFE-CYCLE ASSESSMENT OF MASS-TIMBER, STEEL, AND CONCRETE STRUCTURAL PROTOTYPES FOR CLIMATE-RESPONSIVE PERI-URBAN DENSIFICATION IN THE HUDSON VALLEY'S URBAN FRINGE

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## ABSTRACT

The current fossil-fuel based urbanization pattern and the estimated human population growth are increasing the environmental footprint on our planet's precious resources. To mitigate the estimated skyrocketing in greenhouse gas emissions associated with the construction of new cities and infrastructure over the next 50 years, we need a radical rethink in our approach to construction to deliver a net zero built environment.

This paper assesses the carbon footprint of a mass-timber, a steel, and a concrete structural alternative for peri-urban densification in the Hudson Valley's urban fringe along with examining the updated policy and the building code adjustments that support synergies between timber construction in city making and sustainable management of timber forests. By quantifying the carbon footprint of a structural prototype for four different material assemblies—a concrete (post-tensioned), a mass timber, a steel (composite) and a hybrid (timber/steel/concrete) assembly applicable to the three new building typologies of the IBC 2021 (Type IV-A, Type IV-B, Type IV-C) that range between a nine to eighteen-story structure alternative—and scaling-up that structural prototype to the size of a neighborhood district, the paper presents a quantitative and a qualitative approach for a forest-based construction economy as well as a resilient and a more just supply chain framework that ensures the wellbeing of both the forest and its inhabitants.

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*Key words: mass-timber innovation, concrete structure, carbon footprint, densification, LCA*

**THEMATIC SESSION IV**

**PLANNING AND ARRANGING THE GLOBAL VILLAGE TOWARDS RESILIENT SETTLEMENTS**



# **BUILDING URBAN RESILIENCE IN THE BALKANS: THE CASE OF 'MULTITUDINOUS' BUCHAREST**

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## **ABSTRACT**

This paper attempts to explore the context of urban resilience through the reference example of a Balkan city, Bucharest, the capital of Romania.

Urban resilience is a term used to define the ability of an urban system to preserve its structure through spatial, socio-economic and environmental changes. In the case of the Balkan space, the process to adapt to emerging urban challenges has become more crucial than ever, due to ongoing spatial transitions in the area.

Bucharest is a characteristic example of a Balkan urban center with a multitude of architectural and cultural trends; rural houses with folk elements and traditional references, eclectic and classicist buildings, Neo-Romanian National Style, artistic movements of modernism and Art-Deco. Especially, during the period when Romania was under a totalitarian dictatorship, the urban landscape of Bucharest was radically changed. The demolition of many historically significant buildings, the construction of the "People's Palace" monument and block-type apartments strongly affected the city's architectural and cultural image.

Under that framework, questions arise whether, to what extent and in what way Bucharest's architectural and cultural heritage is highlighted and promoted today, in terms of facilitating urban sustainability and enhancing resilient practices.

Methodological approach is based on literature review and qualitative research conducted on the field, consisting of questionnaires and interviews with local experts in the area of urban planning and cultural heritage.

*Key words: Balkans, Bucharest, Urban Resilience, Architectural Image, Cultural Heritage*

## 1. INTRODUCTION

Urban space in the Balkans has undergone a number of transformations due to various factors that have shaped contemporary urban image. The co-existence of different historical, political, socio-economic and cultural assets has affected the formation of Balkan cities.

In the above context, urban resilience could be conceived as the ongoing transitioning process, in order to adapt to environmental, demographic, socioeconomic and spatial changes (Meerow et al. 2016).<sup>1</sup>

This paper focuses on Bucharest's architectural image and cultural heritage as the key aspects in building urban resilience.

## 2. BUCHAREST'S URBAN TIMELAPSE

Bucharest is the administrative, economic, cultural and industrial center of Romania, a densely populated city with around 1.8 million inhabitants based on the recent census of 2011.<sup>2</sup> The city's vision is to achieve polycentric development through urban networks and regional cooperation under the umbrella of EU sustainable programs.<sup>3</sup>

The capital is located in the southeast of the country, on the banks of River Dambovită. The urban center of Bucharest consists of the east west axis of Calea Victoriei Street, and the north south axis of Bulevardul Ion C. Brătianu street

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(Boia, 2001) (fig. 1).



Figure 1: Historic center map

<sup>1</sup> Further reference: <https://urbact.eu/resilient-europe> (accessed September 12, 2020).

<sup>2</sup> "Date geografice București," Primăriei Capitalei, available at: <http://www.pmb.ro/> (in romanian); (accessed November 10th, 2020); "Populația," Direcția Regională de Statistică a Municipiului BUCUREȘTI, available at: <http://www.bucuresti.insse.ro/> (in romanian); (accessed November 10th, 2020).

<sup>3</sup> "Regional Programs," București Ilfov Regional Development Agency, available at: <https://www.adrbi.ro/regional-programs/rop-2014-2020/> (accessed November 10th, 2020).

A major issue in Romanian history is that of the “National Union”. The hegemony of Wallachia, Transylvania and Moldavia until the 17th century were under a regime of servitude to the Ottoman Empire. At that period, there was a need to highlight the national identity of Romania, hence, a new architectural style, the so-called “Neo-Romanian National Architecture Style” arose (Ioan, 1999; Dabija, 2006). The architect Ion Mincu and the Brâncovenesc style were the precursors of this style.



Figures 2, 3: Art-Deco versus Modernism

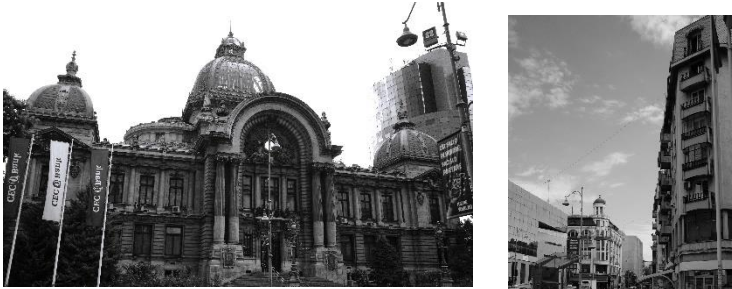
In the 20th century, both the Art-Deco artistic movement and modernism appeared in Romanian architecture (Criticos, 2009; Ioan, 1999). Central buildings in Bucharest, such as the hotel Negoiu, have Art-Deco elements (fig. 2) (Criticos, 2009). Furthermore, modern, minimal and functional buildings are built in the same century (fig. 3) (Ioan, 1999).

After the earthquake of March 1977, a quite great number of historical buildings were demolished (Derer, 2014). Due to the Romanian dictatorship of Nicolae Ceausescu, the urban landscape of the city changed radically. State commission (Zahariade, 2011) controlled the city’s architecture. In addition, new architectural styles prevailed, such as block of flats and socialist buildings (Petrisor, 2010).

### **3. IN SEARCH OF AN ARCHITECTURAL AND CULTURAL IMAGE**

Bucharest’s architectural and cultural image is analyzed through a combined methodological approach that includes, among others, literary review of urban issues, empirical field work on selected areas of the city’s center and semi-conducted interviews and questionnaires with Romanian architects, planners, cultural heritage experts and local stakeholders.

The summary of findings displays differentiations in urban development and thus in the urban image. Especially, the socialist period left its traces in the contemporary architecture and defined the city's cultural heritage.



Figures 4, 5: Eclectic historical buildings nearby contemporary ones

Nowadays, Bucharest's architecture is characterized by many architectural movements and buildings, such as rural houses with folk elements, Art-Deco, Neo-Romanian style, socialism, block of flats, eclectic structures and contemporary skyscrapers, located nearby older historical buildings (fig. 4, 5).

#### 4. CONCLUSIONS

Overall, numerous architectural styles characterize the city's image and consist its cultural heritage.

The preservation of architectural and cultural heritage is considered a matter of national priority, whereas key measures concern active participation, social awareness and strategic planning (Gavra and Gkioufi, 2021).

A number of resilient practices include but are not limited to the below:

Proper mapping of architectural and cultural reserve, state of conservation and restoration, perspectives of enhancement and promotion; community and stakeholders' commitment in defining a sustainable framework regarding cultural heritage protection and management; smart technologies integration and exchange of resilient practices among other cities -'role models'; redefinition of cultural practices in alignment with urban policies and city's vision; promotion of cultural tourism based mostly on the architectural image of the city's socialist past; diversity and inclusion tools in order to embrace different groups and facilitate accessibility to architectural monuments and cultural sites (Gkioufi, 2020; Kiourou, 2023).

In conclusion, it is important to identify and enhance local architectural and cultural features, through strategic planning that would enable the city of Bucharest to build a resilient profile.

After all, global challenges require for a holistic urban approach focused on contemporary urban policies that embed the importance of protection and promotion of architectural and cultural heritage.

## 5. REFERENCES

- [1] Boia, L. (2001). *Romania: borderland of Europe*. London: Reaktion.
- [2] Bucuresti Ilfov Regional Development Agency. "Regional Programs," <https://www.adrbi.ro/regional-programs/rop-2014-2020/> (accessed November 10, 2020).
- [3] Criticos, M. (2009). *Art Deco sau Modernismul bine temperat*. Bucharest: Simetria (in romanian).
- [4] Dabija, A.-M. (2006). Tradition and innovation in contemporary Romanian architecture. *23rd Conference on Passive and Low Energy Architecture, 6-8 September 2006*. Geneva, Switzerland.
- [5] Direcția Regională de Statistică a Municipiului BUCUREȘTI. "Populația," <http://www.bucuresti.inse.ro/> (in romanian) (accessed November 10, 2020).
- [6] Derer, H. (2014). Space and Cultural Heritage in the Balkans. Practices and opportunities under Horizon 2020 Framework Program. *Culture and Space in the Balkans: 17th-20th century, 21-22 November 2014* (595-636). Thessaloniki: University of Macedonia.
- [7] Gavra, E. G., & Gkioufi, K. (2021). Economic, social and environmental aspects for the promotion of cultural heritage in the Balkans. *European Journal of Economics and Business Studies*, 7(1), 204-212.
- [8] Gkioufi, K. (2020). *Urban space and strategic planning in the Balkans: Pristina, Sofia, Bucharest* (Phd Thesis). Thessaloniki: University of Macedonia. Retrieved from <https://www.didaktorika.gr/eadd/handle/10442/48475> (in greek) (accessed July 21, 2023).
- [9] Ioan, A. (1999). *Power, Play and National Identity*. Bucharest: The Romanian Cultural Foundation Publishing House.
- [10] Kiourou, E. (2023). *The architectural heritage of the 19th-20th centuries in Bucharest: current situation and prospects for promotion* (Master Thesis). Thessaloniki: University of Macedonia. Retrieved from <http://dspace.lib.uom.gr/handle/2159/28393> (in greek) (accessed June 11, 2023).
- [11] Meerow, S., Newell, Joshua P. and Stults, M. (2016). *Defining urban resilience: A review*. Retrieved from [https://www.researchgate.net/publication/288932192\\_Defining\\_urban\\_resilience\\_A\\_review](https://www.researchgate.net/publication/288932192_Defining_urban_resilience_A_review) (accessed March 11, 2020).
- [12] Petrisor, A. I. (2010). The theory and practice of urban and spatial planning in Romania: education, laws, actors, procedures, documents, plans, and spatial organization. A multiscale analysis, *Serbian Architectural Journal*, 2, 139-154. Retrieved from [https://www.researchgate.net/publication/284802182\\_The\\_theory\\_and\\_practice\\_of\\_urban\\_and\\_spatial\\_planning\\_in\\_Romania\\_education\\_laws\\_actors\\_procedures\\_documents\\_plans\\_and\\_spatial\\_organization\\_A\\_multiscale\\_analysis](https://www.researchgate.net/publication/284802182_The_theory_and_practice_of_urban_and_spatial_planning_in_Romania_education_laws_actors_procedures_documents_plans_and_spatial_organization_A_multiscale_analysis) (accessed November 22, 2020).
- [13] Primăriei Capitalei. "Date geografice București," <http://www.pmb.ro/> (in romanian); (accessed November 10, 2020).
- [14] URBACT 2014-2020. "Resilient Europe." <https://urbact.eu/resilient-europe> (accessed September 12, 2021).
- [15] Zahariade, A. (2011). *Arhitectura În Proiectul Comunist: România 1944-1989*. Bucharest: Simetria (in romanian).



# THE NEXUS BETWEEN GREEN TRANSITION TO AFFORDABLE CLEAN ENERGY AND THE GLOBAL VILLAGE PARADIGM IN ARCHITECTURE AND SUSTAINABLE CITIES

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## ABSTRACT

The 21st century has been characterized by a global push for sustainable cities, exemplified by the transition to affordable and clean energy, as central to achieving global sustainability goals. These aspirations align with the concept of the 'Global Village', a term coined to illustrate the interconnectedness of the world, facilitated by advanced technology and communication. This paper scrutinizes the nexus between the green energy transition in urban settings and the broader concept of a Global Village, investigating the mutual benefits and challenges of this dynamic relationship. The green transition, characterized by the adoption of renewable energy sources such as wind, solar, and hydro, contributes significantly to reducing greenhouse gas emissions and mitigating climate change, central goals for the global community.

This transition is not without challenge: from technical hurdles and economic costs to socio-political implications, the green energy transition faces several impediments that could impede progress towards the Global Village paradigm. An understanding of these challenges is critical, for they can potentially disrupt the symbiotic relationship between sustainable cities and the Global Village. The paper proposes a methodology that is based on the comparison between the independent and the collaborative approach through the prism of advantages and disadvantages of correlating the objectives of the green transition with those of the Global Village concept, in the field of architecture and urban planning.

Herein, the role of international cooperation, technology sharing, and professional knowledge transfer become pivotal, framing the 'Global Village' concept in action. The paper shows how the green transition in sustainable cities aligns with the ethos of a Global Village, fostering a universal and collective approach to energy usage and environmental preservation. By consolidating these ideas in the benefit of education, we can accelerate the journey towards global sustainability, with clean, affordable energy at its core.

*Key words: green knowledge, transfer, international cooperation, architecture*

## **I. INTRODUCTION**

This paper starts with an inquiry deemed appropriate in the light of the profound human impact on the environment due to globalization in recent decades: how can we continue to promote the *global* green transition while simultaneously mitigating the risk of exacerbating detrimental and ecologically hostile processes tied to *globalization*? Alongside this, the notion of 'Global Village' instantly evokes the well-established paradigm of "Think globally, act locally", a mantra which underscores the necessity of comprehending community needs more acutely, as well as the importance of solutions which adopt the best technologies and innovations, emphasizing the value of sharing experiences.

Through the prism of a comparison between the most used parameters in affirming the concepts of Global Village and the Green Energy Transition, we discuss how they are relevant for architecture education. Correlating the objectives and relevant parameters of the Green Transition with those of the Global Village concept brings the advantage of integration into a network of knowledge and education on sustainability of the built environment and urban culture, opened for the exchange of best practices, increased visibility, and access to extensive resources.

## **2. THE GREEN ENERGY TRANSITION AS ATTITUDE IN ARCHITECTURE AND URBAN CULTURE**

Cities, hubs of economic activity and population density, contribute significantly to global greenhouse gas emissions (Creutzig et al., 2016) and transitioning towards renewable energy sources is an essential aspect of urban sustainability efforts. Copenhagen and Singapore are global examples, having successfully incorporated renewable energy into their urban fabric, thus demonstrating the viability and benefits of this shift (Jacobsson and Bergek, 2016).

Taking the environmental impact at every stage of the architectural process - from the attitude about the site itself, the natural characteristics, materials and construction methods, to the design of the building itself - architects need to consider factors such as energy efficiency, waste reduction, and the integration of renewable energy sources into their designs. This shift requires a rethinking of the architect's role within the local community: rather than acting as solitary creators, they should see themselves as facilitators, working alongside community members, understanding the local conditions, and respond to local ecological and cultural contexts, while also considering the global environmental implications of their work.



Figure 1. Extract from the <https://www.brasov.eco/climate-change-mitigation/>, presenting the city of Brasov, Romania, chosen to be the green capital within The Green Cities Forum (GCF), the most significant environmental core event, which will take place in Brasov, from September 4-10, 2023.

The worldwide community of architectural education already embodies, and must continue to uphold, a collaborative attitude with constant exchange of the most current and applicable skills needed in the job market. The urgent need to accentuate the distinctiveness of this creative and cooperative profession, heavily reliant on teamwork and shared expertise among specialists, has never been more evident. This urgency is particularly heightened considering the potential erosion of certain unique qualities of this profession owing to the advent of AI. The concept of Global Village is useful to combat the atomization and clustering of urban life produced by the action of social networks and AI, and also deal with the changing reference values, which become the cause of many misconceptions and dangerous notions, fake news-type information, and absurd criticism.

The next generation of architects needs to be trained not just in design and construction, based on global regulations and techniques, but also in environmental science, community engagement, social justice, cultural values, social empathy and capacity of perceiving the poetry of each place. Only with this broad, holistic education can architects truly contribute to a more sustainable and equitable future.

### 3. GLOBAL VILLAGE — GREEN ENERGY TRANSITION: THE COMPATIBILITY MATRIX IN ARCHITECTURE FIELD

The term "village" as it was initially used symbolized simplicity, immediacy, and interconnectedness, a metaphor to describe a kind of proximity due to the technology and the instantaneous movement of information. When applied to the global scale, the concept of village reflects the interconnectedness of the world through modern communication and transportation technologies which have shrunk the distances and boundaries that previously separated societies. However, the "Global Village" is not just about technological connectivity, but also about mutual interdependence and shared responsibilities at the community level, a concept that underscores the need for an enhanced solidarity, cooperation, and shared norms and values in managing the challenges. In an interconnected world, the success of green energy transitions depends largely on global cooperation and mutual support, reinforcing the Global Village concept (Hargreaves et al., 2013).

Global Village parametres v		Cultural Sensitivity	Shared responsibilities	Social Inclusion	Community involvement	Technology Iconnectivity	Environmental Adaptability	Global Standards Compliance	Score of compatibility
Green Energy Transition	Site compatibility	+	+	+	0	0	+	-	3
	Urban local integration	+	+	+	+	0	-	-	2
	Energy Efficiency	0	0	0	0	+	+	+	3
	Use of Renewable Energy	0	+	0	+	+	+	+	5
	Water Efficiency	+	+	0	-	+	+	+	4
	Sustainable Materials	+	0	0	0	+	-	-	0
	Indoor Environmental Quality	+	-	0	-	+	0	+	1
	Waste Management	+	+	0	+	-	+	+	3

Table 1. Green Transition and Global Village - the compatibility matrix of the most common parameters used in architecture and urban planning, local vs. global aspects. Source: author

The compatibility matrix below shows the "good vicinity" of the most common parameters used in architecture and urban planning from the Green Transition perspective and from the Global Village angle, taking into account the local aspects vs. the global ones. The result shows us that for the Green Transition the most relevant and easily compatible parameters are *Use of Renewable Energy* and *Water Efficiency* and the most problematic ones are *Sustainable Materials* and *Indoor Environmental Quality*.

Between the two approaches there is still a lot of space to build compatibility through architectural and urban solutions that target not only local but also global aspects. By pooling knowledge, skills, and resources globally to tackle environmental challenges, architecture fosters resilience and sustainability by encouraging the sharing and adoption of sustainable designs and technologies. This cooperation strengthens interdependencies within the Global Village, creating a collective responsibility that drives the adoption of more sustainable practices, and thereby promoting a more resilient built environment (Guy & Moore, 2005).

#### 4. THE ROLE OF ARCHITECTURAL EDUCATION IN THE AFFORDABLE CLEAN ENERGY IN SUSTAINABLE CITIES

Architectural education plays a crucial role in promoting affordable clean energy in sustainable cities, even the green energy transition is not without hurdles, as technical impediments, economic constraints, and socio-political barriers constantly need to be addressed (Sovacool, 2016). In turn, the Global Village paradigm could be misunderstood by scholars as contraction, isolation, strengthening of borders and lack of cultural openness. Architecture, as both an academic discipline and a professional practice, needs to

better integrate the concept of the Global Village, by understanding how design impacts and is influenced by socio-cultural, environmental, and economic factors at both the local and global levels (Roudavski, 2010).

By focusing on specific knowledge and skills development and interdisciplinary learning, architectural education can significantly contribute to the promotion of affordable clean energy in sustainable cities, shaping generations of architects capable of meeting the challenges of urban sustainability. Moreover, universities and colleges should provide practical training opportunities, such as internships or project work, and foster innovation by encouraging research projects, participating in design competitions, and facilitating collaboration with industries and research institutions.

Finally, is the aspect of ethics and responsibility, as architectural education plays an important role in instilling a sense of ethical responsibility towards sustainable development and affordable clean energy. This can drive architects to prioritize energy-efficient and sustainable solutions in their professional practice.

## 5. CONCLUSION

The transition to green energy in sustainable cities underpins the ethos of the Global Village, encouraging a collective, collaborative approach to energy usage and environmental preservation. A more ecologically responsible approach to architecture involves a shift towards sustainability, inclusivity, ethics and holistic education. It requires architects to think globally while developing solution locally, recognizing their critical role in both their local communities and the global effort to combat climate change.

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## 6. REFERENCES

- [1] Creutzig, F. et al., 2016. Urban energy systems. In: Grubler, A., Wilson, C. (Eds.), *Energy Technology Innovation*. Cambridge University Press, Cambridge.
- [2] Hargreaves, T., Nye, M., Burgess, J., 2013. Keeping energy visible? Exploring how householders interact with feedback from smart energy monitors in the longer term. *Energy Policy* 52, 126–134.
- [3] Jacobsson, S., Bergek, A., 2016. Innovation system analyses and sustainability transitions: Contributions and suggestions for research. *Environmental Innovation and Societal Transitions*, 1-25.
- [4] McLuhan, M., 1964. *Understanding Media: The Extensions of Man*. McGraw Hill, New York.
- [5] Sovacool, B. K., 2016. How long will it take? Conceptualizing the temporal dynamics of energy transitions. *Energy Research & Social Science*, 13, 202–215.
- [6] Guy, S., & Moore, S. A. (2005). *Sustainable Architectures: Cultures and Natures in Europe and North America*. Spon Press.
- [7] Kvan, T. (2000). Collaborative design: what is it? *Automation in Construction*, 9(4), 409–415.
- [8] Kvan, T. (2001). The pedagogy of virtual design studios. *Automation in Construction*, 10(3), 345–353.
- [9] Roudavski, S. (2010). Towards a pluralistic understanding of landscape: Introducing an alternative approach to representing landscape in architecture. *Landscape Review*, 14(2).
- [10] Salama, A. (1995). *New trends in architectural education: designing the design studio*. Tailored Text & Unlimited Potential Publishing.
- [11] Till, J. (2009). *Architecture Depends*. MIT Press.

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# BUILDING RESILIENT CITIES WHILE TRAINING FUTURE COMMUNITY ARCHITECTS: THE CASE OF THE SMALL CENTER IN NEW ORLEANS

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## ABSTRACT

Contemporary community architecture and disaster resilience scholarship have shed light on the work of community architects, highlighting the features, merits and limitations of their practice in building disaster resilience through participatory design processes. However, a knowledge gap not yet bridged is how these community architects are academically trained to practice community-oriented work and how Schools of Architecture – through such training – catalyze community development and disaster resilience in the cities in which they are located.

The aim of this paper is to fill this knowledge lacuna by outlining a pedagogical model for educating community architects drawing from theories of community architecture and relying on empirical evidence from the USA, a place where much of this pedagogy is being developed. The article specifically explores the Albert and Tina Small Center for Collaborative Design, the community design center of the Tulane School of Architecture, reviewing their pedagogical approach and how their work contributes to more resilient communities in New Orleans. During a one-month ethnographic research with the Small Center, empirical data was harvested through review of project materials, semi-structured interviews with (former) students and teachers and project visits.

The paper argues that through community-based live project pedagogy, Schools of Architecture can foster tangible local community development and sensitize architecture students about the potential socio-spatial impact of their profession's community engagement. It also offers critical reflections relevant to Schools of Architecture as they prepare the next generation of architects to promote and co-realize a more socially just post-disaster built environment.

This paper relates to the thematic session of 'Resilient Cities in the Era of Globalization: Urban Interventions Towards a Sustainable Future'.

*Key words: community architecture | Public Interest Design | resilience | architectural education | design studio pedagogy | community design center | live project | collaborative process | community engagement*

## 1. INTRODUCTION

Community architecture is a movement that focuses on including people in the design and production of their own built environment. Nowadays, community architecture - also commonly referred to as Public Interest Design - is frequently applied in post-disaster contexts and has been found to be effective in building resilient communities. In the current era of climate change and given the disastrous consequences of unequal post-disaster recovery and redevelopment processes, it is critical to train community architects who are able to cope with this new reality. Therefore, it is important to gain knowledge on how Schools of Architecture can embrace their responsibility in society by teaching community architecture and, in turn, contribute to a future generation of socially conscious architects.

## 2. COMMUNITY ARCHITECTURE – RESILIENCE NEXUS

Community architecture emerged as a movement in the 1960s-70s with a fundamental focus on recognizing the unique needs of each community and giving people a voice in the design of the built environment. Community architects advocated in favor of working *with* communities, rather than *for* them as well as promoting interdisciplinary knowledge exchange [1]–[5]. Table 1 presents the differences between the community design approach and the traditional one [4].

Community Architecture Approach	Traditional Approach
Democratic: Considers the architect as facilitator and/or advocate Considers clients and users in the decision-making process	Autocratic: Considers the architect as egoist or pragmatist Considers the architect and his/her consultants as the only decision makers in the process
Involves small-scale projects	Involves large-scale projects
Local: utilizes community resources and appropriate technology	National/international: exploits resources and utilizes high technology
Human-oriented practice	Institution-oriented practice
Client is redefined to include non-paying clients (users)	Single-client-oriented
Concerned with meaning and context	Concerned with style and ornament
Concerned with right and wrong decisions	Concerned with good and bad design decisions
Inclusive	Exclusive
Process- and product-oriented	Product-oriented

Table 1: *Comparison of the community design approach and the traditional design approach [4].*

Community architecture<sup>4</sup> is commonly applied in post-disaster contexts, challenging conventional recovery strategies that are typically managed top-down, involve outside experts and focus only on physical reconstruction, often leading to socio-spatial inequalities, affordable housing crises, gentrification, and disruption of social networks [1], [6]–[9]. By contrast, a community architecture-based approach gives equal importance to the physical and social reconstruction of devastated communities and understands resilience as an ever-changing, socially transformative process with multidirectional ‘bounce forward’ trajectories in which the unique needs and characteristics of different communities are recognized [9]–[11].

Using techniques like participatory design, community mapping and collective building, community architects address design problems together with the community and build mutual trust [1], [3], [7], [8]. Design is seen as a long-term, transdisciplinary and collaborative process that focuses on developing capacity in the communities, building on existing strengths and empowering people, while also addressing underlying problems such as poverty and social inequalities [1], [3], [7], [8]. Recent research [1] mapped out the different multifaceted roles of community architects in resilience-building processes (see Table 2). The extent to which architects can fulfill these roles depends largely on the architect’s respect and insight into the specific economic, cultural and political situation and the projects’ governance structure [1]. The main limitations of practicing community architecture are the greater investment of time and effort, the lack of sufficient funding, and the limited social and physical impact of small-scale projects [1], [7]. However, results are proven to be much more successful in the long run, especially for the most vulnerable and disadvantaged communities [3], [8].

Role of the architect	Description
The genius designer	These professionals design autonomously, without considering the interdisciplinary character of the post-disaster context or the pre-existing political conditions [12]. These architects seldom include community participation in the design. They, however, sometimes attempt to make a socially appropriate design through their own research initiatives
The building teacher	These architects strive for long-term sustainable solutions through knowledge transfers with the involved community in an easily understandable language. At the same time, these architects use locally available materials so that local people can easily purchase them in their future construction additions

<sup>4</sup> In the literature, community architects working in reconstruction and recovery projects are also often referred to as ‘humanitarian’ architects [1], [7].



The attentive student	These professionals know that local communities have often designed their houses for generations [8]. As a result, they are open to learn from the local community through participatory processes that establish exchanges and incorporate such local knowledge into the design
The compassionate friend	These architects wish to bridge the professional-people gap by cultivating a comfortable environment within the community. Once a bond is built between inhabitants and professionals, conflicts that exist in the heterogeneous community can be efficiently tackled throughout the design phase [13]
The involved facilitator	These professionals combine aspects of the attentive student and the building teacher to design together with the community, establishing a two-way knowledge exchange (community-professional and the other way round) through participatory processes. Considering the community as the most important actor in the post-disaster context, the involved facilitator helps to envision their possible futures
The interfering mediator	These professionals negotiate between the affected community and other possibly involved stakeholders (e.g., government agencies, donors, NGOs). Using the reconstruction project to bring conflictive parties to the table, these architects serve as intermediaries in their effort to solve controversial views in tangible ways [14]
The radical reformer	In this role, architects encourage the community to oppose current dominant powers, instigating changes toward a more equal society. Rather than including the excluded, they attempt to render current hegemonic powers inoperative [15] and strive toward an urban reality based on equity. Radical reformers are politically involved and engage in critical urban issues [14], striving for a reinvention of current architectural-design practices through their creativity [16]
The assisting architect	When the community is considered the architect of a reconstruction project, the roles of professionally trained architects are limited to providing trauma-healing projects (e.g., community mapping, cash-for-work initiatives) and technical assistance, empowering the community to strive for more inclusion into the wider society and creating networks in multilevel governance structures

Table 2: Overview of community architects' multifaceted roles in post-disaster resilience-building processes [1, pp. 134–136].

### 3. TEACHING COMMUNITY ARCHITECTURE AT THE SMALL CENTER

The Albert and Tina Small Center for Collaborative Design<sup>5</sup>, the Small Center for short, is the community design center of the Tulane University School of Architecture (TSA) in New Orleans. Founded in early 2005, their initial mission was to teach students through real-world applied design projects. After Hurricane Katrina destroyed the city in August 2005, this post-disaster context clarified the Small Center's mission, informed by the belief that "*all residents should have the right to shape the city in which they live, work, and play*" [17]. Over the past 18 years, they contributed significantly to the recovery of New Orleans with over 140 local projects [18].

Today, the Small Center is run by a team of four, drawing also on the knowledge and skills of the TSA faculty and students. Their pedagogical approach is the engagement of students in live (real-world) pro bono projects in partnership with local organizations and nonprofits. Projects are primarily selected through an annual 'Request for Proposals' process where potential beneficiaries are invited to submit project ideas that are small-scale and can vary widely (from pavilions and skateparks to playgrounds). In this way, the Small Center ensures they respond to real needs identified by communities themselves, rather than imposing their ideas or giving unwanted advice [19] (E. Taylor Welty, personal communication, February 2, 2022; A. Morris, personal communication, May 5, 2022). One type of service offered is design/build, which concerns small/medium-scale projects that can be designed and built within an academic semester [20].

The Small Center works through collaborative design processes with strong community engagement, aiming to include as many voices as possible to produce thoughtful outcomes that are well-integrated into the context [21], [22]. An essential step is the preparatory work by the staff with the community partner, resulting in a clear project definition and setting realistic expectations [22] (A. Yoachim, personal communication, February 7, 2022; E. Taylor Welty, personal communication, February 2, 2022). When the academic semester begins, a team of 10-20 students take the lead on the project, supported by staff members. First, the context is explored through readings and discussions, design exercises, and conversations with partners. Next, the students organize community engagement with stakeholders to generate initial design concepts. In the following phase, ideas are refined and checked with the partners to finalize the design direction. Finally, the students build the project, which is usually their first experience in construction [20].

One of the Small Center's recent projects is the design/build studio (fall 2021-2022) in partnership with Sugar Roots Farm, a local farm with the mission to connect people to food system. The students had to design an outdoor teaching kitchen for and develop a water management strategy. Several engagement moments with the staff, visitors, volunteers and visiting school groups were organized on site, as shown in Fig.1. The continuous feedback between the design team and the farm staff shaped the final design, which was then built by the students, Fig.2-3.

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<sup>5</sup> The Small Center was formerly called the Tulane City Center.



Figure1: *Engagement session on the Sugar Roots Farm to discuss the final design options (Small Center).*



Figure2: *Students working on the construction of the outdoor teaching space at Sugar Roots Farm (lifting beams with a material crank lift) (Small Center).*



Figure3: *The final result of the outdoor teaching space at Sugar Roots Farm (Small Center).*

The successful implementation of community-based live project pedagogy does not come easily; it is intensive work, including fundraising, maintaining relationships with community partners and adhering to a strict academic calendar, which is why the Small Center has permanent staff. They also have to balance a responsibility for educating students with a responsibility to its partner organizations, ensuring both parties benefit [19]. Therefore, critical self-evaluation is key to constantly improve their work and pedagogy.

#### 4. CONCLUSIONS

The case of the Small Center shows that fostering resilient communities while educating architecture students is possible and effective. Using the pedagogical model of live community-based projects, the center is able to create tangible results that are meaningful to the community members involved and train students in the basic principles of community architecture. Through these various small-scale projects, the Small Center contributes incrementally to building a resilient city. The paper shows that Schools of Architecture can take up their responsibility in society and educate students as community architects who promote a more socially just built environment.

#### 5. REFERENCES

- [1] A. Andriessen, A. Paidakaki, C. Susilo, and P. van den Broeck, "Architects' multifaceted roles in enhancing resilience after disasters," in *Enhancing Disaster Preparedness*, Elsevier, 2021, pp. 129–148. doi: 10.1016/b978-0-12-819078-4.00007-1.
- [2] A. Paidakaki, R. De Becker, Y. De Reu, F. Viaene, S. Elnaschie, and P. Van den Broeck, "How can community architects build socially resilient refugee camps? Lessons from the Office of Displaced Designers in Lesvos, Greece," *Archnet-IJAR*, vol. 15, no. 3, pp. 800–822, Oct. 2021, doi: 10.1108/ARCH-11-2020-0276.

- [3] M. Petal, R. Green, I. Kelman, R. Shaw, and A. Dixit, "Community-based construction for disaster risk reduction," in *Hazards and the Built Environment*, L. Boshier, Ed., Routledge, 2008, pp. 191–217. doi: 10.4324/9780203938720.
- [4] A. M. Salama, *Spatial Design Education - New Directions for Pedagogy in Architecture and Beyond*. New York: Routledge, 2015.
- [5] N. Wates and C. Kneivitt, *Community Architecture. How People Are Creating Their Own Environment*. Penguin Books, 1987.
- [6] C. Boano and M. García, "Lost in translation? the challenges of an equitable post-disaster reconstruction process: Lessons from Chile," *Environmental Hazards*, vol. 10, no. 3, pp. 293–309, 2011, doi: 10.1080/17477891.2011.594493.
- [7] E. Charlesworth, *Humanitarian Architecture: 15 stories of architects working after disaster*. Routledge, 2014.
- [8] C. Luansang, S. Boonmahathanakorn, and M. L. Domingo-Price, "The role of community architects in upgrading: reflecting on the experience in Asia," *Environ Urban*, vol. 24, no. 2, pp. 497–512, Oct. 2012, doi: 10.1177/0956247812456125.
- [9] A. Paidakaki and F. Moolaert, "Disaster Resilience into Which Direction(s)? Competing Discursive and Material Practices in Post-Katrina New Orleans," *Housing, Theory and Society*, vol. 35, no. 4, pp. 432–454, Oct. 2018, doi: 10.1080/14036096.2017.1308434.
- [10] S. Davoudi *et al.*, "Resilience: A Bridging Concept or a Dead End? 'Reframing' Resilience: Challenges for Planning Theory and Practice Interacting Traps: Resilience Assessment of a Pasture Management System in Northern Afghanistan Urban Resilience: What Does it Mean in Planning Practice? Resilience as a Useful Concept for Climate Change Adaptation? The Politics of Resilience for Planning: A Cautionary Note," *Planning Theory & Practice*, vol. 13, no. 2, pp. 299–333, Jun. 2012, doi: 10.1080/14649357.2012.677124.
- [11] A. Paidakaki, "Uncovering the Housing-Resilience Nexus. Social Resilience Cells, Governance Hybridities and (Hetero-) Production of Post-Disaster 'Egalitarian' Urbanities. The Case Study of Post-Katrina New Orleans," 2017.
- [12] C. Boano and W. Hunter, "Architecture at Risk (?): The Ambivalent Nature of Post-disaster Practice," *Architectoni.ca*, vol. 1, no. 1, pp. 1–13, Jan. 2012, doi: 10.5618/arch.2012.v1.n1.1.
- [13] R. Zetter and C. Boano, "Space and place after natural disasters and forced displacement," in *Rebuilding After Disasters*, Routledge, 2009, pp. 216–240.
- [14] E. Charlesworth, *Architects Without Frontiers*. Routledge, 2007. doi: 10.4324/9780080465449.
- [15] C. Boano and G. Talocci, "Inoperative design: 'Not doing' and the experience of the Community Architects Network," *City*, vol. 21, no. 6, pp. 860–871, Nov. 2017, doi: 10.1080/13604813.2017.1412649.
- [16] M. J. Aquilino, *Beyond shelter: architecture for crisis*. London: Thames and Hudson, 2011.
- [17] A. Yoachim, E. T. Welty, and N. Jenisch, "Public Interest Design, Pragmatism, and Potentials in a Postdiluvian City," *Journal of Architectural Education*, vol. 74, no. 1, pp. 110–118, Jan. 2020, doi: 10.1080/10464883.2020.1693834.
- [18] Small Center, "Small Projects, Big Impact. Our 2022 Wavestarter Campaign is Live!," Apr. 27, 2022. <https://small.tulane.edu/news/wavestarter/> (accessed Jul. 18, 2022).
- [19] E. T. Welty, M. Hansen, and S.-J. Mobley, "Designers, Citizens, and Citizen-Designers," in *ACSA Annual Meeting*, 2016.
- [20] Small Center RFP, "Request For Proposals." 2022.
- [21] D. Etheridge and E. Taylor, "Radical Incrementalism: An Open Letter in Defense of the Small," *Oz*, vol. 35, no. 1, Jan. 2013, doi: 10.4148/2378-5853.1512.
- [22] E. T. Welty, "Refining Process, Expanding Practice: Public Interest Design Fieldnotes from the South," in *ACSA Annual Meeting Conference*, 2018, pp. 37–42.

# SUSTAINBLE PRESERVATION OF COMMUNAL LIVING: Case study Share Yaraicho, Tokyo: Satoko Shinohara

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## ABSTRACT

To intentionally build *Yaraicho* share house in Tokyo becomes contemporary response to new tendencies in residential structure. They are globally common in roots of their change and can be elsewhere applied. After Second World War Japanese family relied on extended communal relations between new industrial settlements and inherited and still existing rural hometowns. Meanwhile GHQ Allied Occupation reform changed land policies, local communities disappeared, Modernism dismantled extended families with 70es and 80es peak of individualization, average number of children per woman decreased to 1.3 and in 2023<sup>rd</sup> around 20 from 22 million of households in Japan is with single residents.

That makes single resident mature representative of those previous and present collective and personal identities leading to new socio-architectural networking. Thus Yaraicho is built to severe lost and new communal relations between residents where many have issues with basic human communication.

Architectural design replied with culturally sustainably invoke of Japanese farmhouse *doma* gathering ground. It serves to reconnect with near urban environment while bringing together neighbors, visitors and residents. Nonetheless, seven elevated rooms still maintain atmosphere of condominium apartment privacy. Overall common and hidden spaces between rooms involve novelties where resident can change interior according to their personal needs approved by others. That brings strange blend of private ownership and family simulation.

Individual inevitably stays unit of measurement but its behavior in space is conditioned with community immaterial rules supported by architectural material design.

Succinctly, architectural cohousing with its material and spatial response tends to promote new kind of 'urban family' due to decadence of bloodline family and direct human communication.

*Key words:* cohousing, doma, sustainable, family, share, single;

## I. LAND ROOTS OF RESIDENTIAL AREA: YARAICHO AREA FROM EDO PERIOD TO GHQ LAND REFORM

“It is easy to divide people with walls,  
but to meaningfully connect them with architecture is not easy to implement.”  
[Satoko Shinohara]

Share house is located in Yaraicho area in Tokyo with street front it belongs characterized by well-manicured and idiosyncratic dwellings. Yaraicho is residential area since Edo period [1603-1828] when it was dominantly occupied with *daimyo* residence of landlord Sakai Tadakatsu built in 1628. Residence was surrounded with working labor smaller lots and temporary bamboo fence [*takes yara*] that made neighborhood known as *Yarai-shita* – meaning ‘below the palisade’. In Meiji period [1868-1912] Yaraicho started gradually developing into commercial district, which in 1915 made part of *daimyo* to be eradicated for construction of Ushigome Chuodori Street.

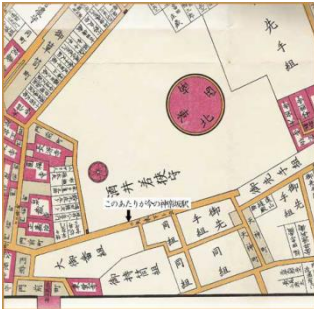


Figure 1: 17th century *Daimyo* residence of landlord Sakai Tadakatsu surrounded with working labor smaller lots and *Yarai-shita* neighborhood; [Greve, 2017]

Unfortunately, entire area was destroyed by WWII Allies air raid in 1945. It led to formal Land Reform led by Allied Occupation carried out in Japan between 1945 and 1950. GHQ [General Headquarters for Allied Powers] supervised complete process that affected land lot sizes and ownership. Main content was government compulsory purchase of the land in excess of landlord holding of 1 hectare in possession. It was further resold to former tenants making them into owner farmers. That made tenant farmers who had accounted for nearly 35% before the war to be accounted for 5% by 1950. Owner farmers, who before war accounted for 30%, increased to 62% by 1950. These statistics resulted in Yaraicho smaller dwelling parcels with increasingly higher land prices.

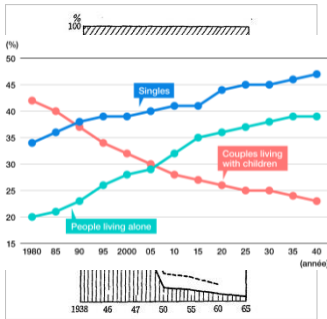


Figure 2: Graph presenting decreasing number of tenant farmers and increasing number of owner farmers after Land Reform that was followed with making smaller land lots with higher values; [Ouchi, 1966]



Figure 3: Present satellite map outline of Yaraicho area with Uchigamo chuodori street in the middle and clear land dissipation into smaller lots due to trend of increasingly higher land prices; [Author, 2023]

## 2. RESEARCH SOCIAL BACKGROUND: FAMILY DISSIPATING INTO LIFETIME SINGLES

Raising number of singles made architect to design experimental dwelling for seven ‘singles’ covering two groups: singles and people living alone. National Institute of Population and Social Security Research of Japan in 2019 declared that by 2040 single people will make 50% of population.

In the main, reason for these anomalies is notion of lifetime non-marriage rate for those above 50. Hence, by 2040 it is estimated that around 35% of man and 25% of women will remain unmarried.

First family dissipating occurs after Land Reform followed by industrialization and individualization reaching its peak in 70es/80es. These tendencies resulted in break of relations between farmer families and their children in three phases:



Figure 4: Past tendencies and future projections on number of singles that are not married and people living alone along with one child couples estimated in period 1980-2040; [Arakawa, 2020]

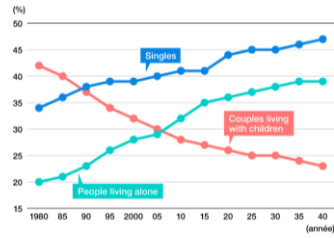
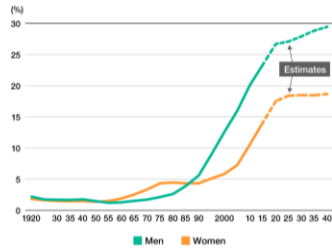
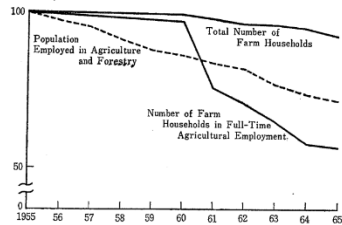


Figure 5: People unmarried at age of 50 [men and women] with past results and estimated values derived in according percentages; [Arakawa, 2020]



1. Commuting children commuting from farmhouse to their new place of work;
  2. Leavers completely moved to new places of living with extended family meaning they regularly visited their parents and relatives;
  3. Definite deteriorating leavers that engage in complete detachment from family and relatives being main pool for present lifetime singles;
- Hence, besides this kind of physical detachment, single life results in introversion and avoidance of communication. Therefore, Yaraicho single tenants with those issues self willingly engage with share house environment knowing they have to adapt.

Figure 6: Sources of farmer and extended families dissipation: declining rates of farm household number, full-time farm employees and population employed in agriculture and forestry from 1955-65; [Uchi, 1966]



### 3. ANALYSIS OF HOUSE SUSTAINABLE INTERIORITY

#### 3.1 COMMUNAL SUSTAINABILITY BASED IN *DOMA*

Yaraicho house sets back three meters creating welcoming front for social activities. What stands before one is choreographed cube asymmetrically weighted by window in bottom left corner and another positioned diagonally at top right corner. Major part of the façade is semi-transparent polymer membrane breached by two unzipped triangular openings. One is main entry and other above left window.



Figures 7,8:  
*House idiosyncratic view with 3m set back, two asymmetrical window positions, two unzipped openings at front façade polymer membrane and gathering atmosphere at private / public house front area;*  
[Moroney, 2012]

Stepping through main entry, one steps in interior atrium awash with light emitted through membrane. Continuation of concrete floor from outside suggests you have entered contemporary *doma*. In past this was tempted earth floored entrance area in traditional *minka* house. It was one stair lower then elevated *tatami* living area paired with wood burning stove kitchen *kamado*.



Figure 9: *Unzipped membrane entrance and doma area with continuation of outer concrete floor to interior flooring;*  
[Hirano, 2012]



Figures 10: *Traditional minka house ground floor entrance area connected with outer environment: lower doma room and kamado kitchen floor surface with elevated tatami living room;*  
[Hishikawa, 1680]

Contemporary Yaraicho *doma* kept its utilitarian variability with liveliness it brings to the outer area and *vice versa* while literally meaning inner area being outside. At the main, *doma* becomes an intermediate area: spatially between city and private interior, and socially between tenants and guests.



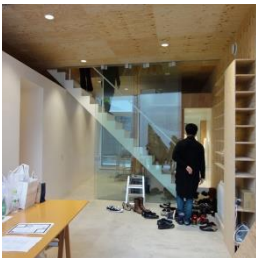
Figures 11,12:  
*Doma interior floor area continuation to outside and vice versa hosting public/private activities, workshops and events;*  
 [Yamada, 2012] [Hirano, 2012]

Standing in center of *doma* one notices polycarbonate windows of first floor room nr.3 and second floor area and perceives various kinds of tenants' presences and senses. Equivocally, room nr.3 and common area offer visual insight of tenants at *doma* area.



Figures 13,14:  
*View from common area toward doma and room terrace [left] and opposite view from doma room to windows of common area and nr.3 room [right];*  
 [Moroney, 2012]

As one advances further, *doma* becomes separated from ground floor private part with glazed stairwell. Right to the staircase is entrance to bathroom, while to the left is entrance to sitting arrangement.



Figures 15,16:  
*View to the glazed stairwell separating doma into private/public from private compartment with left door leading to bar sitting room and with right entrance to the bathroom complex [right image];*  
 [Hirano, 2012]

### 3.2 CONNECTING PEOPLE WITH INTERIOR COMPOSITION

Yaraicho house cube cavity essentially consists from four floating boxes habited variously with seven private rooms offering unique dis/comfort attributes.



Figure 17:  
*View to share house cube cavity during construction process: Floor slabs and one of four fourth floating box inhabited with seventh room volume; [Hirano, 2012]*

Hence, *doma* deep left corner encloses niche in first box with entrances nr.1 & nr.2 to single dorms of 11.42m<sup>2</sup> and 10.78m<sup>2</sup>. Room nr.1 is specific with low front window making tenant aware of outer gatherings. Room nr.2 is functionally elongated and offers view toward back patio tree.



Figure 18:  
*Full height glazed north wall of room nr.1 with two-slide opening to front part of house lot; [Hirano, 2012]*

Further via the central staircase, we arrive at the first floor with second and third volumes habited with rooms nr.3, 4 and 5 and shared toilet. Livable room nr.3 with small 10.84m<sup>2</sup> footprint facing the main street is awash with light through windows and membrane while completely occupying second box.



Figure 19:  
*Room nr.3 interior layout: Polycarbonate window light awash with view offering to doma area and street sensations; [Hirano, 2012]*

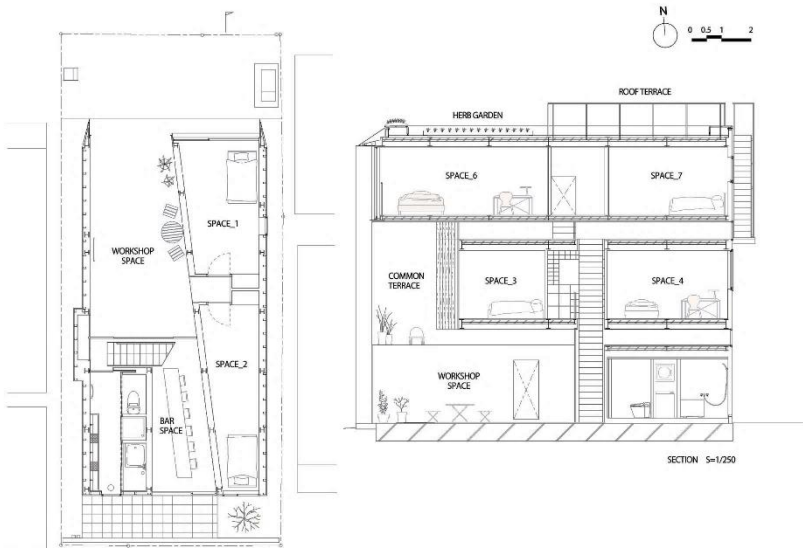
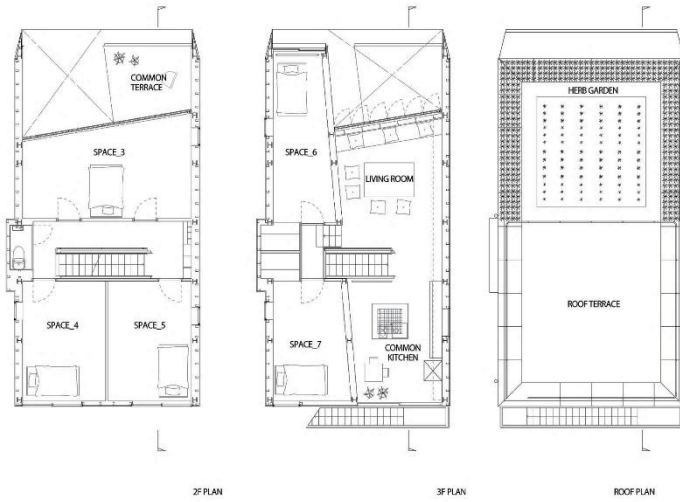


Figure 20: Yaraicho share house ground floor, first floor, second floor and roof-top plan with longitudinal section; [Provided with approval by Spatial Design Studio: Satoko Shinohara, 2012]



Figure 21:  
*First floor plywood covered level with three room nr.3,4 and 5 and toilet entrances;*  
*[Hirano, 2012]*

Rooms nr.4 and nr.5 compose third box while being equal in sizes [11.39m<sup>2</sup>] and oriented toward quiet back patio.

Moreover, central stair takes to second level common area with kitchen, dining and living rooms, resembling old style *kamado*. Living area is north oriented facing façade mebrane Opposite kitchen and dining area promote gathering around central tables, whereas their south end opens out to the rooftop stairwell.



Figures 22,23:  
*Living room [left] with windows oriented to façade and kitchen area central element [right] offering south view and stairs to roof-top;*  
*[Hirano, 2012]*

Central five stairs carry into third level fourth box carrying rooms nr.6&7 [11,21m<sup>2</sup> and 12.07m<sup>2</sup>]. Room nr.6 is charming polygon shaped funnel with full height window. Room nr.7 grace is being the most adjacent to the kitchen and living area, with confinement toward back patio.



Figure 24:  
*Room nr.6 interior volume with full height window offering curtain covering view to main street;*  
*[Moroney, 2012]*

Each of seven rooms is unique with lifestyle offering they advocate. Future tenants self-declare in type of their character with room they select. That being so, common areas composition supports staged communal sustainability with unavoidable engagement in visual and verbal communication among tenants. Thus, communication routes from ground floor *doma* to roof-top are made at far most distances, making their

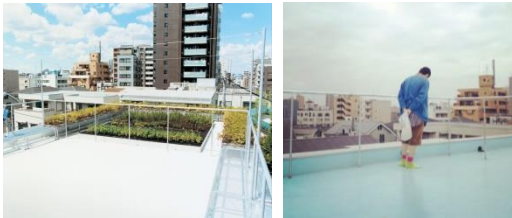
meeting points more often to occur. This means that single has to invest great social effort to live in Yaraicho house.



Figures 25,26:  
*Two house meeting coordinates:  
 Gathering atmospheres and reflections in doma area [left] and private gathering atmosphere in common area living room [right]; [Moroney, 2012]*

#### 4. CONCLUSION: INTERIOR BEHAVIORAL SCHOOL FOR SINGLES

Rooftop herb garden plays quintessential role in transforming anomalies of single life. One engages common physical and intellectual effort to raise food for others while simulating extended family farming. Common effort enhances emulation of empathy within ‘family’ members. Overall, Yaraicho house becomes behavioral school for new kind of statistically measurable ‘singles’ that would have been changing point in preserving society.



Figures 27,28:  
*Roof-top gathering surface and herb garden farming area [left] with terrace single person contemplation [right]; [Left photo: Hirano, 2012] [Right photo: Moroney, 2012]*

#### 5. BIBLIOGRAPHY / REFERENCES

[1] Edo Raku Editorial Department., Walking with Old Maps. Tankobon Softcover, May 20, 2018.  
 [2] Edx Learning Platform LLC, The University of Tokyo: Four Facets of Contemporary Japanese Architecture: Human: Lecture nr.5 architect Satoko Shinohara, 2023: <https://www.edx.org/learn/architecture/the-university-of-tokyo-four-facets-of-contemporary-japanese-architecture-4>  
 [3] Hamaguchi, Miho, Feudalism of Japanese Houses. Tokyo: Sagami. Shobo, 1949.  
 [4] Hauk L, Michelle, From doma to daidokoro: Japanese kitchens, The Architectural Review: Essays, January, 2022  
 [5] Kazuhisa, Arakawa, A Community of Connections: Looking Forward to the Solo Society, Nippon.com, January 13, 2020: <https://www.nippon.com/en/japan-topics/g00768/a-community-of-connections-looking-forward-to-the-solo-society.html>  
 [6] Uchi, Tsutomu, The Japanese Land Reform: Its Efficacy and Limitations: Towards Carlton Vic: The developing economies, Wiley-Blackwell,1966.

## 6. IMAGE REFERENCES

- [1] Arakawa, K. (2020). A Community of Connections: Looking Forward to the Solo Society [graph data drawing]. Nippon.com. <https://www.nippon.com/en/japan-topics/g00768/a-community-of-connections-looking-forward-to-the-solo-society.html>
- [2] Greve, G. (2017). Yaraicho Edo map [Scanned map]. Edo-Edopedia. <file:///C:/Users/BOJAN/Desktop/bab%20conference%202023/land%20reform/Edo%20-%20the%20EDOPEDIA%20-%20Yara%20district.html>
- [3] Hirano, T. (2012). Yaraicho share house [photographies]. Spatial Design Studio Office for architecture and design. <https://www.s-d-s.net/works/81>
- [4] Hishikawa, M. (1680). The Kitchen of a Joroya [drawing]. The Metropolitan Museum of Art. <https://www.metmuseum.org/art/collection/search/37254>
- [5] Moroney, C. Ryan, Koncarevic, Bojan. (2012). Yaraicho share house open doors [Photographies]. Mnemonigram. <http://mnemonigram.blogspot.com/2012/06/i-recently-attended-open-house.html?m=1>
- [6] Ouchi, T. (1966). The Japanese Land Reform: Its Efficacy and Limitations [scan: graph data drawing]. The Developing Economies. [https://www.ide.go.jp/library/English/Publish/Periodicals/De/pdf/66\\_02\\_01.pdf](https://www.ide.go.jp/library/English/Publish/Periodicals/De/pdf/66_02_01.pdf)



# IDENTIFICATION OF PARAMETERS AND TOOLS FOR URBAN FIRE HAZARD ZONATION MAPPING IN THE KERALA CONTEXT

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## ABSTRACT

The fire represents an unrestrained burning in space and time. Because of its frequency and severity, it has evolved to be one of the great damaging catastrophes in contemporary society with rapid urbanisation. Implementing sustainable and inclusive urban fire regulation systems into urban planning is crucial in reducing the risk of fire and promoting the welfare of people, property, and the economy. Hence this paper explores how the urban fire risk in an area can be mapped to develop institutional frameworks and guidelines. The study focuses on investigating the parameters specific to the Kerala context that assist in identifying hotspots of urban fires by creating an urban fire hazard zonation map. The study was divided into two phases. The initial phase was an extensive review of the literature studies, which involved a thorough assessment and comparison of various urban fire hazards, their parameters, and diverse methods and tools for spatial mapping of urban fire hazards. This led to the categorization of parameters into four domains: physical, environmental, social, and infrastructural. In the second phase, expert interviews with urban planners, firefighting officials and GIS experts were conducted to confirm the applicability of parameters and tools in the Kerala context which resulted in the addition of a new domain named “Cultural” as it is highly relevant to the assessment of urban fire mapping. The use of pyrotechnics in festivals and events, mass gatherings and storage of explosives were some of the matters of concern. The methods and tools identified were GIS, Kernel density analysis and space syntax method. The study results can aid in identifying urban fire hazard zones and implementing regulatory frameworks that incorporate National and State disaster management authority’s policies and guidelines.

*Keywords: Parameters of fire risk, Urban fire risk, Urban fire vulnerability, Fire hazard zonation mapping, GIS*

# IDENTIFICATION OF INDICES AND METHODS FOR MAPPING LANDUSE LANDCOVER (LULC),LAND SURFACE TEMPERATURES(LST) IN URBAN AREAS IN KERALA CONTEXT

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## ABSTRACT

Kerala has several initiatives to tackle the effects of climate change on agriculture, water, forests, and the coastal marine environment but lacks a cohesive policy to coordinate these efforts.

Fluctuations in daily minimum and maximum temperatures, and temperature differences between the city's core and perimeter were not taken into account while creating the master plan, therefore, the proposed modifications to LULC will further exacerbate LST variations. In Kerala, there is a need for a more precise integrated system for mapping and tracking changes in LULC and LST.

The expected scenario for climate change indicates that the temperature will almost surely rise by 2°C in 2050. Planning initiatives and climate change indicators, particularly LST, can contribute significantly to a new strategy for city development. The study aims to identify methods and indices for mapping the LULC and LST. The results of this research will contribute to the development comprehensive understanding of the dynamics of urban land use and the impacts of land cover changes on the thermal environment in Kerala.

The objectives of the study include studying and understanding the relationship between LULC and LST, To study the existing indices and methods for mapping LULC and LST in urban areas and identifying the indices and methods for mapping LULC and LST.

It is identified that the urban morphology and built-up density of a particular context are to be studied for accurate mapping and for finding the relation between LULC and LST in the specified context. The main reason for high temperatures in cities across the world has been identified as the conversion of land to urban use in analyzed studies. The interconnection between LST and vegetation cover is complex, with a negative linear relationship seen in literature case studies, but it depends on factors like seasonal variations and topography.

*Key words: Land use/ Land cover, Land Surface Temperature, indices, methods*

# POSSIBILITIES AND CHALLENGES OF INCORPORATING SPECIES HABITAT NETWORKS INTO MASTER PLANS

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## ABSTRACT

Rapid urbanisation without proper planning has raised many concerns in the social, political, ecological and economical fronts around the world. Biodiversity loss, resulting from a variety of anthropogenic activities is gaining momentum and requires immediate attention. In many countries, fragmented species habitat patches are connected through the process of habitat networking. Habitat networking is used for creating, restoring and maintaining habitats as well as for connecting fragmented habitats. Findings from studies show that habitat network plans and development guidelines have to be tailor made for each region as each area has its own characteristics and features. A basic understanding of habitats, issues faced by them, benefits of conserving them etc. were addressed followed by the various methods and tools used for species habitat networking around the world. The feasibility of incorporating habitat network plans into development plans in our country could be explored with enough research. It is evident through studies that the habitat network plans and development guidelines have to be tailor made for each region as each area has its own characteristics and features. Primary site analysis after extensive mapping of patches combined with the study of other countries can then be used in the preparation of development controls and regulations for future developments during the preparation of master plans. Apart from various software and simulations, local knowledge is to be used for the preparation of the plans and strategies. Furthermore, local stakeholder participation is an inevitable factor during the preparation of the species habitat networks. Inputs and constant exchanges with experts from different can help in species mapping in an area along with an understanding of their habitat preferences and routes taken by them on a regular basis. The paper points out various possibilities and challenges that the cities would face in overlaying the plan.

*Key words: Habitat networking, animal habitats, urban green spaces, habitat connectivity, habitat fragmentation*

# INTEGRATING CLIMATE CHANGE ADAPTATION INTO URBAN PLANNING STRATEGIES ANALYZING THE SPATIAL AGENDA FOR KARLSRUHE CITY - GERMANY

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## ABSTRACT

Cities are suffering from the impacts of climate-related hazards, such as extreme heat, flooding, drought, sea-level rise, and storms. To adapt to the impacts of climate change, cities must have a pragmatic approach that involves minimizing damage and reducing vulnerability to both current and future climate risks. The research aims to investigate the importance of integration between planning for urban development and planning for resilience, aiming to clarify the role of urban planning strategies in enhancing city resilience and emphasize the necessity of integration, consistency, and coordination between planning for resilience with planning for urban development. The research selected Karlsruhe City in Germany for analyzing "The Spatial Agenda" which is the updated "Karlsruhe Master Plan 2015" to be an integrated urban development concept for Karlsruhe 2020 and to adapt to the new environmental and social challenges and needs. The research results must answer how to achieve integration between City Development Strategy and Resilience Strategy, and what we need for shifting the planning process to become more multi-level connected, more cross-sectoral strategies, more participatory, more exchange knowledge, and finally more flexible, responsive, and dynamic.

*Keywords Climate Change - Adaptation and Mitigation Strategies - Urban Planning Agenda - Karlsruhe City*



## RESEARCH IN THE FIELD OF ARCHITECTURAL TECHNOLOGIES - IDEAS AND POSSIBILITIES

Prof. dr Bojana Zeković

Concept of the Session 5 entitled *Research in the field of architectural technologies – ideas and possibilities* was to gather young researchers in this field, namely, in areas of research such as architectural constructions, structural systems, energy efficiency and materialization of buildings. Most of the authors of the contributing papers are young PhD candidates, in the early phases of their studies, who still haven't submitted and completed their thesis proposals. Thus, the idea of this session was to enable discussion among candidates and professors, their future mentors, in order to validate their ideas and research potential. Among the chairs of the session were Professor Dušan Ignjatović, PhD, Associate Professor Ljiljana Đukanović, PhD and Assistant Professor Jelena Milošević, PhD, all from the Department of Architectural Technologies of University of Belgrade – Faculty of Architecture. The session was moderated and co-chaired by Assistant Professor Bojana Zeković, PhD.

Each presentation was followed by a brief discussion about the possibilities for further research within the scope of the PhD thesis. All presented topics, which covered wide variety of research fields, were considered significant and with potential to be elaborated in the future work on the thesis development. The issue of achieving sustainability through human centered design approach was condensed as the possible future field of research in the paper which presented issues of sustainable hospital design. For the research paper dealing with augmented architect-machine interaction for rehabilitation of modern heritage structural systems the comments were praising the comprehensive research that has been undergone, and advised for a more focused definition of the research problem. Also, for the research dealing with complex and integrated refurbishment using volumetric addition, comments were advising narrowing the research problem. On the other hand, in the paper dealing with optimization of residential buildings facade openings and shading systems some comments were suggesting a more complex variants definition. In the final paper, dealing with research possibilities of light-weight construction components based on timber fibers, possibilities for undergoing such research and its constraints were highlighted in the discussion.



# ARCHITECTURE — INFRASTRUCTURE — LANDSCAPE ASSIMILATION IN THE POSTINDUSTRIAL DEVELOPMENT OF DANUBE WATERFRONT IN BELGRADE: *RESEARCH-BY-DESIGN APPROACHES*

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## ABSTRACT

This paper presents the research of the typological frameworks loss between architecture, infrastructure and landscape in research-by-design results in a decade of work on the Master's final thesis and projects with the topic *Making of a City: postindustrial development of the area between Dunavska Street and the Belgrade's Danube waterfront*, under the mentorship of professor Nebojša Fotirić, with assistant Dr Bojana Jerković-Babović. Phenomena such as globalisation, hyperproduction of information, virtual interactions, etc., lead to specific social and cultural fragmentation within the framework of fluid exchange networks on a global and local level. The new relations between the local and the global are manifested by the separation between the symbolic meaning of the location, function and new forms of appropriation of space. Accordingly, the research questions in the context of the post-industrial phase of Belgrade's Danube Waterfront include the understanding of modern, hybrid programming settings and new models of spatial use. Such approaches, considering the needs of the contemporary aesthetic experience of the city, modernise architectural programs and transform typologies in inherited contexts. In this paper, out of 80 projects, 10 projects from the previous 10 generations of students were selected, which meet the criteria of (1) realizing the continuity of urban movement that connects architecture, infrastructure and landscape, (2) forming a dynamic perceptual experience in motion and (3) erasing clear boundaries between the interior and exterior. New urban landscapes are created, in which clear boundaries between architecture, infrastructure and natural landscape are lost in the conventional typological sense. This paper aims to show and expand the operational scope of architectural creativity, through results that actualize and operationalize the aforementioned changes in architectural thought and practice.

*Keywords: architecture, urban design, architectural education, industrial heritage*



## I. Introduction

This paper focuses on the specificity of the spatial framework of the former First Industrial Zone of Belgrade, which in the modern context, devastated and abandoned, is explored in the post-industrial and contemporary needs of Belgrade urban life. The context of the area of Belgrade between Dunavska Street and the Danube is a large space where solving the distances of infrastructural city networking of movements is one of the main parameters (Figure 1). The coast is limited in its course by a sudden break at the "Dorćol" marina, intensively used as a promenade. Dunavska ulica, as a transit, defined by a built structure in a state of partial or complete devastation, represents another big challenge in the aspirations of "lowering the city to the river" (Fotirić, Jerković-Babović, 2023, p 26).

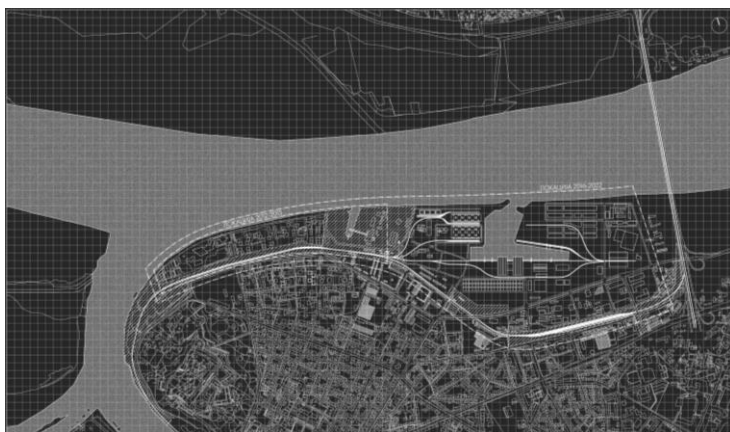


Figure 1 – Research area – Danube waterfront in Belgrade

This paper presents research-by-design approaches as a result based on a decade of work with students, where 10 representative projects were recognized over 10 years that meet the 3 basic criteria of assimilation of architecture, infrastructure and landscape. The research-by-design process consists of five main parts: conceptualization, defining the individual project task, program structure, design structure and presentation. The main theoretical research frameworks and recommended literature include theories of architecture and urbanism, contemporary architectural theories and theories of architectural design, along with theoretical sources from bordering fields of architecture, such as cultural studies, architectural philosophy, aesthetics, art, history and technology, as it will be presented in Chapter 2. The research process applies the results of theoretical research in practical architectural work, to critically analyze theoretical conclusions during architectural design and to operationalize theoretical conclusions into design tools such as diagrams, assemblies and conceptual models.

## **2. A-I-L ASSIMILATION: SHORT THEORETICAL BACKGROUND**

The contemporary context of multidimensional flows transforms the contemporary socio-spatial context into a continuous network of constant dynamic processes based on movement, transfers, transit, communication and information systems. Interactions of new information technologies and exchange processes simultaneously increase the mobility of people and the speed of information exchange (Jerković-Babović, Fotirić, 2019, p 211-217). Urban areas are measured by the range of infrastructure systems, power networks, communications and connections that enable continuous flows of exchange (Castells, 1996; Graham, Marvin, 2001). Technical-technological innovations that enable new typological, functional and disciplinary intersections open numerous innovative creative possibilities in architectural design, through softening of former rigid divisions between architecture, infrastructure and landscape. The networking paradigm of the 21st century has contributed to new ways of connecting relations in cities and the theory of architecture explores the needs and possibilities of uniting infrastructure, architecture and landscape into a unique dynamic system (Koolhaas, 1998; Allen, 1999; Easterling, 1999, Pawley, 1998). The infrastructural character of contemporary architecture is related to the development of networked infrastructural systems, which open up new potentials for understanding and reading urban spaces (Pewley, 1998; Graham, Marvin, 2001). Accordingly, public city spaces, especially spaces of infrastructural purpose, neglected or seemingly undefined, are explored as the main connectors of aesthetic experience and socialization of society. Dispersions of disciplinary and typological frameworks in hybridity become potentials of architectural creativity, and cultural and aesthetic identifications with the values of the contemporary context of networking, globalization, fluidity and dynamization (Jerković-Babović, 2022).

## **3. A-I-L ASSIMILATION: RESEARCH-BY-DESIGN OUTCOMES**

Based on theoretical analysis, the main design potentials are recognized in dynamic aspects such as communications, exchanges, transfers, transits, movement, circulation, retention, acceleration, deceleration, etc., where the main research and design task is their translation into architectural and urban design elements.

This chapter focuses on this paper's aim to present the creative potentials of the dispersion of typological definitions in the modern city, as a reaction to the constantly changing conditions of the context based on the following criteria: (1) forming the continuity of urban movement that connects architecture, infrastructure and landscape, (2) forming a dynamic perceptual experience of space while in motion and (3) erasing clear boundaries between the interior and exterior (Jerković-Babović, 2022, p 104-106). All the

selected projects were conceived according to individual research topics, firstly analyzed theoretically and then interpreted into architectural and urban design methods and projects (Fig. 2).<sup>6</sup>

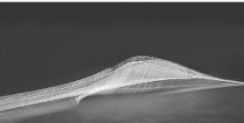
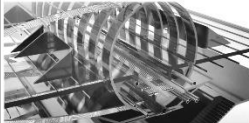

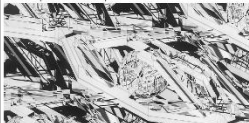

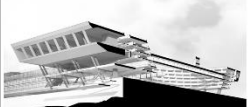



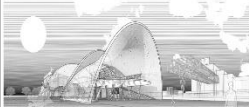
CRITERIA	SELECTED RESEARCH PROJECTS	
<p>(1) forming the continuity of urban movement that connects architecture, infrastructure and landscape</p>	<p>[1] "Decelerating the flow - Shaping the railway corridor into a new urban landscape" (Bojana Jerković)</p> 	<p>[6] "Dual cycle of the marketplace - preadaptation of an abandoned infrastructure corridor" (Mirjana Marić)</p> 
	<p>[2] "Border Territory - Production of Dunavska Street as an autonomous city territory" (Jelena Stojić)</p> 	<p>[7] "Architecture of consumption - terminal and shopping centre" (Mirko Milanović)</p> 
<p>(2) forming a dynamic perceptual experience of space while in motion</p>	<p>[3] "To and through - Designing a system of moves and junctions by forming the experience of space about the speed of movement" (Jovana Mihajlović)</p> 	<p>[8] "Free Zone / Zone of Control: Transit Spaces and Surveillance in the 21st Century" (Aleksa Belić)</p> 
	<p>[4] "Old marker - new landscape: the possibilities of using a crane in the new architecture of the Danube coast" (Jovana Vidaković)</p> 	<p>[9] "Dart-jel: Re-articulation of railway transit flows" (Vid Savić)</p> 
<p>(3) erasing clear boundaries between the interior and exterior</p>	<p>[5] "Wave Front - Artificial River Landscape" (Jovana Pavlović)</p> 	<p>[10] "Built Sound - Sonic Potential of Architecture" (Pavle Nikolić)</p> 

Figure 2: 10 selected research projects according to defined criteria

<sup>6</sup> for more detailed information about projects at: Fotirić, Jerković-Babović, 10.10, 2023.

The following Fig. 3 presents the research outcomes – synthesis of the main assimilation design methods, divided into formative and functional categories, in research architectural design.

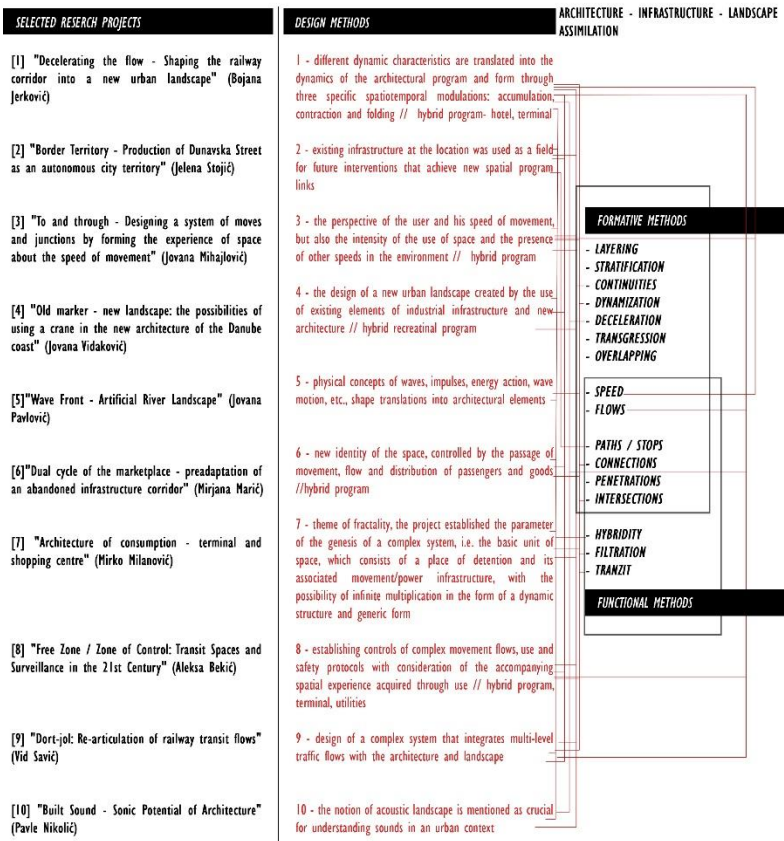


Figure 3: Synthesis of the a-i-l assimilation design methods – formative and functional

Following the understanding of architecture as a "discipline of circumstances and situations" (Allen, 2009, p 11), the complexity of the contemporary context and the need for a dynamic, active role of the architect goes beyond mechanical procedures ", so the project becomes a larger theoretical construct, defined outside the studio or construction site, expressed through a medium that goes beyond the object and the drawing" (Allen, 2009, pp 12). In this way, the architectural and design reactions to the fluidity of the contemporary context are reflected in the rejection of the repetition of established concepts, rigid rules and solutions, affirming the individualisation of each design procedure, process and project (Jerkovic-

Babovic, 2022, pp 135). Subjectivity, as a consequence of post-structuralist interdisciplinary influences on architectural thought from the end of the 20th and the beginning of the 21st century, affects the authenticity and specificity of each design process and the loss of big narratives in contemporary architecture (Jerkovic-Babovic, 2022, pp 134). Therefore, "practice is not a static construct, but is defined by its flows" (Allen, 2009, p 13), which is why there is not one narrative, one theory, or one principle, so the architectural design is based on their pluralism and differences, as potential qualities. Unlike purely discursive practices, the material aspects of architectural practice evolve by operating with translations, transpositions and transcoding of various forms of presentations and media, which constantly develops new concepts in the dynamics of the design process (Jerkovic-Babovic, 2022, p 135).

#### 4. CONCLUSIONS

Referring to the theoretical framework on the topic and the very large and specific spatial context, such as the former Belgrade Industrial Zone, this research presented the criteria and selected representative graduate projects, based on which the creative design methods were analyzed and synthesized. Therefore, this paper highlights the creative potential of the loss of former typological definitions and interdisciplinary approaches in architectural design. The results of the analysis are methods and techniques that are divided into the programmatic and formative domains of achieving the assimilation of architecture, infrastructure and landscape through methods such as layering, stratification, continuities, dynamization, deceleration, transgression, overlapping, hybridity etc. (Fig. 3). Formative processes are creative, subjective interpretations of the main landscape-infrastructure-architecture assimilation through shape, referring to contemporary theoretical positions of subjectivity and loss of big aesthetic narratives in contemporary cities.

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#### 5. REFERENCES

- [1] Allen, S. *Points + Lines*. New York: Princeton Architectural Press, 1999.
- [1] Allen, S. *Practice: Architecture, Technique + Representation*. New York: Routledge, 2009.
- [2] Castells, M. *The Rise of The Networked Society*. Oxford: Blackwell Publishers, 1996.
- [3] Easterling, K. *Organization Space: Landscapes, Highways, and Houses in America*. Cambridge, Mass.: MIT Press, 1999.
- [4] Fotirić, N., Jerković-Babović, B., 10.10 Proizvodnja grada: Post-industrijska faza područja između Dunavske ulice i dunavskog priobalja u Beogradu. Beograd: Univerzitet u Beogradu – Arhitektonski fakultet, 2023.
- [5] Graham, S., Marvin, S. *Splintering Urbanism*. London: Routledge, 2001.
- [6] Jerković-Babović, B., Fotirić, N., Patterns of fluidity: Mostar Interchange in Belgrade“, *Phlogiston – Journal for History and Philosophy of Science and Technology*. Belgrade: Museum of Science and Technology, pp 211-217, 2019.
- [7] Jerković-Babović, B., Instrumentalizacija fenomena fluidnosti u arhitekturi XXI veka, doktorska disertacija. Beograd: Univerzitet u Beogradu – Arhitektonski fakultet, 2022.
- [8] Koolhaas, R. et al., *Small, Medium, Large, Extra-Large*. New York, N.Y.: Monacelli Press, 1998.
- [9] Pawley, M. *Terminal Architecture*. London: Reaktion Books, 1998.

# THE IMPORTANCE OF SITE SPECIFIC SUSTAINABLE HOSPITAL DESIGN: GENERAL HOSPITAL IN PLJEVLJA, MONTENEGRO

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## ABSTRACT

The emphasis on ecological design in healthcare settings is growing daily, reflecting the worldwide move towards sustainable planning. These design principles were emphasized in the contest proposal for General Hospital in Pljevlja, Montenegro. Across various design iterations and conceptual frameworks, the final competition entry distinctly emphasizes the integration of natural landscapes with the hospital's architectural design, prioritizing the main hospital users - the patients. The goal was to create a relationship between nature and the architectural structure in healthcare settings, while elevating patients' comfort. We emphasize the enhancing of environmental awareness through passive design techniques and energy-efficient measures, particularly given the information about unique energy usage patterns in hospitals. This approach takes into account the distinct climate and location-specific needs, which are set to be the main factors in the early stages of design process.

*Key words: hospital design, site specific design, sustainable architecture, bioclimatic architecture*

## **I. INTRODUCTION**

In the context of sustainable development, as defined by the Brundtland Report [1] - development that meets the needs of the present without compromising the ability of future generations to meet their own needs - it becomes pertinent to consider architectural functions with an emphasis on sustainability.

Regarding specific architectural functions, such as healthcare buildings, The Indian Green Building Council has highlighted several advantages, as detailed by Srinivas in 2014. [2]:

1. Faster patient recovery times.
2. Prevention of Sick Building Syndrome (SBS) for both patients and staff.
3. Lowered stress levels for hospital personnel, enhancing the quality of patient care.

Examining the sustainability of hospitals encompasses more than merely environmental conservation. This domain primarily acknowledges three intertwined aspects: environmental, economic, and social – which are all impacted by the architectural solutions. [3]

This research aspires to identify design methods specific to hospital structures, given their distinct design features, execution processes and the intricate interplay of humans and their environment during utilization, for the specific given landscape and weather conditions of Pljevlja in Montenegro.

We submitted a design proposal for this General Hospital as part of the architectural competition [4], with a strong focus on passive energy-saving systems that align with the site's limitations. Below are the results of our research-driven design.

## **2. PROPOSED DESIGN METHODOLOGIES/MEASURES**

Rather than prescribing fixed solutions, we adopted a methodology of research through design, critically examining each iteration. Informed by world-renowned frameworks such as LEED and Levels, and mindful of the distinctive topography and climate, we've put forth strategies tailored for the design of this typology.

These strategies derive from in-depth analysis of the specific location and landscape factors (like orientation, sunlight, and site contours), weather conditions (including sun, wind, rain, and angles of sunlight), and the hospital's unique program requirements.

## **3. HOSPITAL DESIGN PROJECT IN PLJEVLJA, MONTENEGRO**

Interacting with nature is identified as a key factor for enhancing healthcare at the given location. Our design prioritizes visual and physical access to the breathtaking surroundings, including newly developed park areas within the plot. The structure's main design ensures the building sprawls around the site's edge, fostering an intimate inner space (Figure 1). This design optimizes views, sunlight, and ventilation by maximizing the distance between building sections. The hospital employs an architectural motif that allows interaction with nature while providing shade and protection – double facade. This "shielding" exterior design extends to the building's base, promoting sheltered outdoor areas.

Most accesses, including main entrances, come from peripheral roads, primarily from the east. Underground parking minimizes surface traffic, enhancing the site's green and serene ambiance.

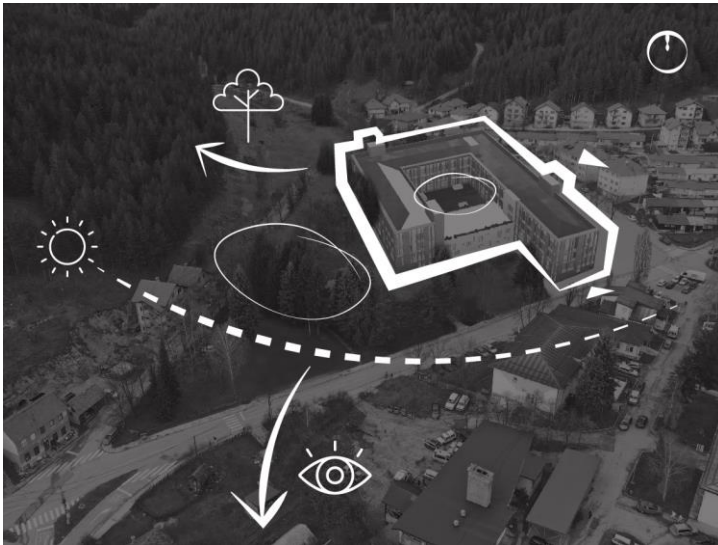


Figure1: *Form & placement of the hospital building on the lot: surroundings and orientation*

The particular design approaches employed for this project were dictated by the needs of the hospital's functionality, including:

- Positioning patient rooms on the southern facade to ensure maximum sunlight exposure and optimal views. By arranging them in grid pattern (8x8m), it enables natural ventilation, optimizes sunlight utilization, and reduces energy consumption for both heating and cooling. Additionally, stacking them vertically creates a dedicated patient zone with regulated access, temperature, lighting, and noise levels (Figure 2).
- A corresponding group emerged on the opposite side of the corridor, designated for doctors' offices. These rooms benefit from more diffused sunlight and a northern orientation. This setup is optimized by having smaller façade openings (windows) and larger sections clad in façade walls (Figure 2).





Figure2: Visualization of the North-west (left) & south-west (right) façade

- Incorporating an exterior corridor in the form of a glazed balcony on the southern facades not only shields the rooms from external elements but also ensures a controlled environment. Additionally, it provides shade in the hot summer months and acts as a thermal buffer during the winter (Figure 3).

In this arrangement, each patient's room is equipped with a balcony, which helps mitigate some of the anticipated energy use from heating and cooling the area.

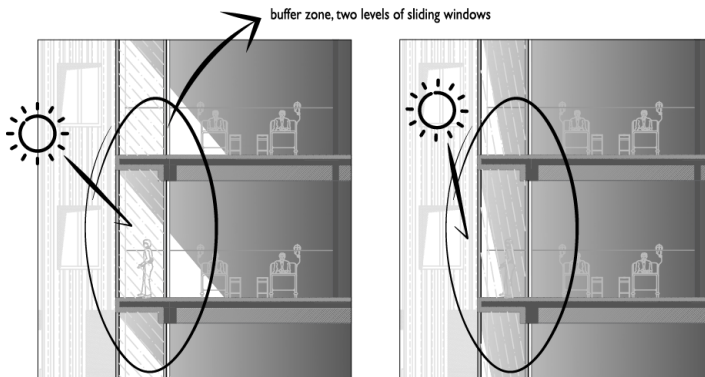


Figure3: Sections through the patients' room and glazed (buffer) balcony in summer (left) & winter time (right)

- The entire building features straightforward and direct access, with four strategically positioned vertical communication points. These hubs have elevators that run from the garage to the roof. Additionally, all corridors are spacious, ensuring effortless maneuverability (Figure 4).

- The design incorporates an eco-conscious microclimate areas, distributed over three zones: the atrium, the roof of the building's fourth (lowest) section, and an open external garden. This garden features a grassy buffer adjacent to the forest to shield the hospital from potential wildfires.

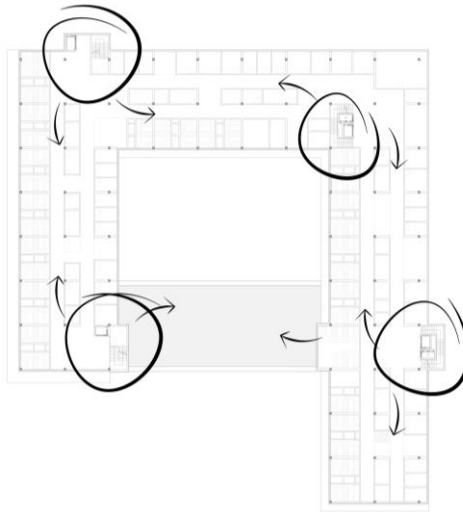


Figure4: *Floor plan of the hospital with marked entrances*

#### 4. CONCLUSIONS

Constructing a sustainable hospital involves the same energy considerations as other typologies. However, the primary users of this facility typically have higher energy demands than a standard resident or employee. This is because their comfort requirements are paramount and should not be overlooked. Ensuring their comfort is the central objective when designing a new hospital.

In the design process of this hospital, our aim was to reduce the energy consumption of patients, all while enhancing their comfort levels. This ensures that the final outcome meets both ecological and medical standards.

#### 5. REFERENCES

- [1] Brundtland, G. (1987). Report of the World Commission on Environment and Development: Our Common Future. United Nations General Assembly document A/42/427.
- [2] Srinivas, S. (2014). Technical bulletin: Green hospitals. Retrieved from [https://igbc.in/igbc/html\\_pdfs/technical/Green%20Hospitals.pdf](https://igbc.in/igbc/html_pdfs/technical/Green%20Hospitals.pdf)
- [3] Alsawaf, E.S., & Albady, A.M. (2022). Principles for the sustainable design of hospital buildings. *International Journal of Sustainable Development and Planning*, 17(6), 1797-1808.
- [4] Government of Montenegro. (2023). Konkurs za idejno-arhitektonsko rješenje objekta opšte bolnice u Pljevljima. Retrieved from <https://www.gov.me/clanak/konkurs-za-idejno-arhitektonsko-rjesenje-objekta-opste-bolnice-u-pljevljima>



# A FRAMEWORK FOR THE AUGMENTED ARCHITECT-MACHINE INTERACTION IN THE REHABILITATION OF MODERN HERITAGE STRUCTURAL SYSTEMS

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## ABSTRACT

Rehabilitation in architecture is a key method for achieving sustainable development goals through the utilization of existing resources, while preserving important historical monuments. When considering adaptive reuse of buildings, the evaluation of their structural health is of utmost importance. In practice, the structural evaluation and architectural design phases often overlap, creating a repeated design refinement process, and inefficient time consumption. The main hypothesis of this study is that the design process of structural rehabilitation can be elevated by reaffirming the symbiotic aspect of the human-machine interaction in the architectural domain, aided by artificial intelligence. The main goal of this paper is to develop a framework for this interaction by exploring specific problems that arise in the fields of structural diagnostics and the development of intelligent digital tools in the built environment field. The research methodology is based on the identification of relevant concepts developed in the field, upon which the criteria for a contemporary architect-machine interaction system is formed. Future research will focus on the practical issues related to modern heritage preservation and rehabilitation in the local context.

*Key words: modern heritage, augmented intelligence, human-computer interaction, structural systems rehabilitation, human-machine symbiosis.*

## I. INTRODUCTION

The topic of structural rehabilitation underlines the idea of repurposing and adapting the existing structures for housing varying functions. This concept is emphasized by 2021. Pritzker prize laureate, Anne Lacaton, who states that in architecture it is important to ‘Continue the story, reuse, reinvent, recompose, cling, graft, extend: (that is) the way of the future, a new intelligence for architecture’ (Spoormans et al., 2018). In the context of the existing building stock, Modern heritage plays a significant role since it is a product of the widespread international phenomenon from the 20<sup>th</sup> century. The question at hand relates to a wider debate over the concept of building vs. demolishing, which is narratively problematized in the film by Jasmina Cibić, focused on four personifications of The Motherland: The Builder of the National Identity, The Pragmatist, The Conservator, and The Architect/Artist (The Museum of Contemporary Art Belgrade, 2015) (Fig. 1). This artwork showcases important factors in the building stock preservation decision-making process, such as social, cultural, and economic values identified in the heritage buildings. The narrative symbolically takes place in the Palace of Serbia, an important local monument from the Modern movement.



Figure 1: Still image from the film 'Tear Down and Rebuild', Jasmina Cibić, 2015.

In recent years, various frameworks have been developed with the purpose of solving the problem of time-consuming and inaccurate manual inspection of the existing structures, mostly based on artificial intelligence algorithms and other soft computing techniques (Harirchian et al., 2021). The interaction between the architect and the machine is critical for integrating the established methodologies into building practice, which is something that most research in the field lacks. The requirement to specify a strategy for the structural rehabilitation of the existing modernist buildings through the development of the symbiotic relationship between the architect and the digital tools which he uses gives rise to the research problem, with the potential to create an efficient collaborative model which synthesizes the diagnostic and design phase of the project development.

## **2. THE AUGMENTED ARCHITECT-MACHINE INTERACTION FOR MODERN HERITAGE STRUCTURAL REHABILITATION**

In the 1960's, researchers from the Massachusetts Institute of Technology (MIT) explored the 'the architecture machine' phenomenon, which constituted of the intimate relationship between two different species (man and machine), two distinct processes (design and computing) and two different intelligent systems (the architect and the architecture machine) (Negroponte, 1970). The goal of creating this symbiotic relationship, according to Nicholas Negroponte, is seen in the light of advancing the human reasoning capabilities, since architects cannot deal with large-scale problems because of their inherent complexities, also overlooking small problems since they represent unique cases (Negroponte, 1970). The aforementioned 'unique cases' are often found in the rehabilitation practice since every building presents a particular piece of architectural thought combined with its aging process.

The digital tools used for the diagnostics and assessment of the building's state have largely developed in the era of the 4th Industrial Revolution (Sousa et al., 2019), with research aimed at incorporating different artificial intelligence algorithms into the process. The main issue discovered in the existing research is seen in the fact that it is in the early stages of development, with little synthesis which would be incorporated into the rehabilitation-based building practice, as a unified platform or digital tool. A particular potential is discovered in the domain of rapid evaluation techniques which could be used as a collaborative tool to bridge the gap between the architectural design stage and the inspection of the existing state of the building structure. Artificial intelligence combined with the remote sensing technologies could represent the basis of the symbiotic relationship and direct link between the architect and the building which is the subject of his (re)design.

The Augmented Architect-Machine Interaction for Modern Heritage (AAMIMH) represents a potential novel method in the rehabilitation practice which incorporates an artificial intelligence-based tool for the building's current state evaluation and its future behavior prediction. The first stage of the interaction is represented by the building's structural evaluation, which as a result gives a report on the discovered damage and needed restoration work. This stage incorporates image-based machine learning techniques which allow the rapid evaluation process. The second stage of the interaction would include the creation of the digital twin of the building with deep learning based semantic segmentation of the structural elements. The digital twin represents the ground for accurate design development, with all the limiting aspects usually found in existing buildings already in the software in which the design is developed. The third stage of the interaction incorporates the FEM (Finite Element Method) analysis of the designed modifications to the existing building in terms of its structural impact and future behavior predictions.

### 3. CONCLUSIONS

This paper highlights an important aspect of the artificial intelligence integration into the built environment field which is focused on rehabilitation practice. A framework is developed around potential stages in the evaluation-design process as an integral project development method which allows for a more efficient and intuitive design approach. The research is grounded on the structural domain of the existing buildings, as one of the most important limiting factors in the building rehabilitation design. The presented framework is based on the symbiotic interaction between the architect and the machine, in the form of digital tools.

Particularly, the presented research on the combination of intelligent information systems with the rehabilitation of structural systems is seen as beneficial in several points:

- The design process can be enhanced through the augmented architect-machine interaction by creating a collaborative process which bridges the gap between the existing state of the building and the design intention;
- This research could present an advancement for the general problem-solving in the rehabilitation domain.

To further test out the presented ideas, future research will focus on specific steps in the diagnostic and rehabilitation design processes, aimed at the representative Modern heritage examples in the local context.

### 4. REFERENCES

- [1] Harirchian, E., Aghakouchaki Hosseini, S. E., Jadhav, K., Kumari, V., Rasulzade, S., Işık, E., Wasif, M., and Lahmer, T. A review on application of soft computing techniques for the rapid visual safety evaluation and damage classification of existing buildings. *Journal of Building Engineering*, 43, 102536, 2021.
- [2] Negroponte, N. *The Architecture Machine: Toward a More Human Environment*. The MIT Press. 1970.
- [3] Sousa, J. P., Henriques, G. C., and Xavier, J. P. 11th-13th September 2019 Porto, Portugal Faculty of Architecture University of Porto (Vol. 3). 2019.
- [4] Spoormans, L. G. K., Jonge, W. de, and Stevenson-Brown, J. (Eds.). *Visiting Professor Anne Lacaton: "Transform, add, re-use, never demolish!"* TU Delft, 2018.

# RESIDENTIAL BUILDINGS ENERGY PERFORMANCE OPTIMISATION - FAÇADE OPENINGS AND SHADING DEVICES

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## ABSTRACT

This paper presents a methodological approach to optimization of facade openings and shading devices on residential buildings in the city of Belgrade, Serbia, from the aspect of building's energy performance. The research is carried out using digital simulation tools, simulating a selected type of residential building, varying the conditions of the urban environment in which the building is located, the size and geometry of facade openings, as well as the types of sun shading elements, taking into account the functional, financial and social aspect of their application on residential buildings in Belgrade. The dimensions and types of openings and shading devices are evaluated based on the simulation results, taking into account differences in individual apartment's energy needs based on orientation and the position in the building. The analysis of the obtained data and their mutual synthesis leads to recommendations for the design of residential buildings of the observed type for the climate conditions of Belgrade.

*Key words: energy performance, windows, façade, shading, residential buildings*



## **I. INTRODUCTION**

In the context of global warming, as well as the increasingly pronounced urban heat island effect, overheating of buildings during the summer months is becoming an increasing problem. The transparent parts of the facade envelope are the zones of the most intense heat exchange between the interior and exterior spaces. In order to improve the performance of the building and reduce the need for energy consumption, it is necessary to adequately design window openings and sun shading elements, taking into account all the functional and aesthetic aspects of the building as well as the limitations imposed by the visual comfort conditions and technological / structural aspects of the building.

This paper focuses on how the building openings — their size, shape, division, and material characteristics along with shading devices — their type and usage pattern influence energy performance of a typical residential building. This paper presents a research methodology conducted in formulating a PhD thesis on this topic.

## **2. METHODOLOGY**

Research methodology is adapted from research papers with similar topic of research.<sup>[2]</sup> Research is carried out into three main segments: Model formulation, Energy simulation and Result Analysis which are subdivided into smaller segments that describe and analyze more closely all the relevant aspects of the main topic.

Firstly, in order to determine the influence of façade openings and shading devices on energy performance, there has to be a base building model on whose energy performance these influences are measured / simulated. Model building is chosen based on its quantity in Belgrade's building stock and its relevance for the research topic. Chosen building model is placed in the urban environment that corresponds to this building type's real-life surroundings in order to simulate the influence from built and natural environment.

On the determined building model, the changes are made on the size and geometry of window openings in the digital simulation software, varying their sizes both uniform on the entire façade and relative to their position in the building on the vertical axis — examining the influence of window-to-wall ratio and urban environment on the building's solar gain. These variants are simulated in all four cardinal directions. Secondly, shading devices are added to the model. Types of shading devices considered for research are valorized in the respect of their influence on building's energy performance and frequency of their use on residential buildings in Serbia. Chosen shading device types are then applied in the energy model and simulated with different usage patterns, taking into account differences in user behavior affecting energy performance.

After analyzing the results of both façade openings and shading devices in all the simulated variants, optimal combinations of size and position of windows and types of shading devices are given for all the cardinal directions, discussing the different possible combinations and resulting outcomes on building's functional, aesthetic and energy performance aspect.

### **3. MODEL FORMULATION**

Literature review suggests that most of research conducted on the topic of optimizing facade openings and shading elements from the aspect of energy performance is conducted on office buildings (52%), while residential buildings are the subject of only 14% of research in the aforementioned topic, <sup>[5]</sup> even though they are the space in which we spend most of our time and are therefore, the focus of this research. Since the research can mostly influence the building of new buildings, they are a starting point for consideration. Based on the National Typology of Residential Buildings in Serbia Constructed since 2013 <sup>[3]</sup> most often built type of residential building after 2013. is the four-storie freestanding building, so that type has been chosen as a base model.

The model is materialized in accordance to the Rulebook for energy efficiency <sup>[6]</sup> for newly-built buildings. Digital model building is placed in four variants of urban environment with differences in proximity of surrounding buildings, their heights as well as the proximity and existence of tall vegetation.

### **4. BUILDING ENERGY SIMULATION**

When it comes to digital simulation software for running the calculations there are many different options to choose from. For this research, Design Builder is the software that was chosen because of its availability, ease of use, and being equipped with all calculation modules required for this research.

First aspect that is simulated is the influence of size and geometry of window openings on energy performance of a building. In first simulated scenario window sizes and shapes correspond to the chosen building type from the Typology. Then, that same window area would be arranged differently on the façade, measuring the impact that window geometry and number of divisions have on energy performance. Minimum window area taken into account is a minimum prescribed by the rulebook for the visual comfort, while the maximum window area analyzed is maximum possible having in mind constraints imposed by the building's structure. Windows are also varied in size from bottom to top of the building, reasoning that apartments on lower floors need bigger openings due to them being in shade from neighboring buildings and trees. Higher floors, while not requiring as much sunlight, have better view and are usually more expensive to buy, thus also earning them the consideration of larger window openings.

Second aspect is the influence of shading elements on building's energy performance. All variants of shading system are simulated on a single type window. Shading devices considered in this research are the

ones used most commonly in residential buildings in Serbia. [4] Only outside shades will be taken into account since their influence on energy demand is greater [1] as is their impact on the visual identity of the building. Therefore, the shading devices chosen are the roller shades and outside horizontal louvres — fixed and movable, which are the most widely researched shading devices according to Kirmat et al. [5].

## 5. CONCLUSIONS

Designing a building with adequate window-to-wall ratio and shading elements can largely improve its energy performance. In order to do so, many case-specific aspects need to be considered including building's function, orientation, occupancy, urban environment and user behavior.

## 6. REFERENCES

- [1] Barozzi, M., Lienhard, J., Zanelli, A., & Monticelli, C. (2016). The sustainability of adaptive envelopes: developments of kinetic architecture. *Procedia Engineering*, 275 — 284.
- [2] Grujić, M. (2016). Optimisation of transparent ratio in highly glazed office building facades for Belgrade climate conditions. Belgrade.
- [3] Jovanović Popović, M., Ignjatović, D., Đukanović, L., Nedić, M., & Zeković, B. (2016). National Typology of Residential Buildings in Serbia Constructed since 2013. Belgrade: Faculty of Architecture, University of Belgrade and GIZ - Deutsche Gesellschaft für internationale Zusammenarbeit.
- [4] Jovanović Popović, M., Ignjatović, D., Radivojević, A., Rajčić, A., Đukanović, L., Ćuković Ignjatović, N., & Nedić, M. (2013). National Typology of Residential Buildings in Serbia. Belgrade: Faculty of Architecture, University of Belgrade and GIZ - Deutsche Gesellschaft für internationale Zusammenarbeit.
- [5] Kirmat, A., Kundakci Koyunbaba, B., Chatzikonstantinou, I., & Sariyildiz, S. (2016). Review of simulation modeling for shading devices in buildings. *Renewable and Sustainable Energy Reviews*, 53, 23–49.
- [6] (2011). The Rulebook on the Energy Efficiency in Buildings. Official Gazette of RS, br. 61/2011.

# FRAMEWORK FOR THE COMPLEX AND INTEGRATED REFURBISHMENT OF MULTI-FAMILY HOUSING STOCK OF SERBIA USING VOLUMETRIC ADDITIONS

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## ABSTRACT

This paper presents the framework for the application of complex and integrated refurbishment to the existing multi-family housing stock in Serbia. The subject of the research is the application of the strategy of complex and integrated refurbishment by adding volumes (increasing usable space) to existing multi-family buildings with the primary goal of achieving higher energy efficiency while remodeling and modernizing residential units and improving vertical building communications. The paper investigates the framework for the implementation of that strategy. The framework encompasses several interrelated aspects for complex and integrated refurbishments, such as determining the energy, spatial, organizational, and functional deficiencies of the building; an analysis of the urban planning parameters; a determination of the stakeholder roles; an analysis of the possibility of volumetric additions; an analysis of the use of environmentally friendly and natural materials; an analysis of the structural capacity of the building; and an analysis of the economic feasibility of the complex refurbishment. The research identified the advantages and limitations of applying the volumetric addition strategy to multi-family residential stock in Serbia.

*Key words: complex and integrated refurbishment, framework, methodology, multi-family housing stock, volumetric additions, energy retrofit, energy efficiency, stakeholder roles, economic feasibility*

## I. INTRODUCTION

This paper focuses on establishing a framework for the implementation of a complex and integrated refurbishment approach to multi-family residential buildings in Serbia. Most of these buildings are characterized by high energy consumption for heating due to the poor thermal performance of the building envelope. Created according to the design regulations valid at the time when they were built, they have major spatial and organizational deficiencies regarding the size of apartments, outdated and inflexible spatial organization, and a lack of elevators. The subject of the research includes defining the steps in the decision-making process for implementing the complex and integrated refurbishment approach in existing residential buildings. Besides energy improvements, it is necessary to enhance the building's functionality. The research goal is to define a framework for decision-making regarding the application of complex and integrated refurbishment of existing multi-family buildings in Serbia through volumetric additions. Complex and integrated refurbishment includes both energy and spatial-functional renovation and enhancement. The approach of renovating existing buildings by adding new structures has significant functional advantages that distinguish it as one of the more important methods for comprehensive building renewal. According to today's energy regulations in Serbia, for the energy refurbishment of an existing building, it is necessary to increase the energy class by one level through the renovation [1]. Significantly higher energy requirements for existing buildings are in the European Union. Through the EU directives, it is foreseen that the long-term strategy of renewing the existing building stock will achieve a highly energy-efficient and decarbonized building stock by 2050 (reduction of carbon gas emissions by 80–95% compared to 1990) [2]. Since the share of existing housing stock is much higher than that of newly designed ones, its renovation is a key factor in the task set by the European Commission [3].

The research problem is the high energy consumption for heating in existing residential buildings. The largest share of Serbia's residential housing stock consists of buildings constructed during the mass construction period from the 1960s to the 1980s (Fig. 1). These buildings typically have poor energy performance. Furthermore, these buildings typically consist of small apartments with rigid and inflexible spatial organization [4,5].

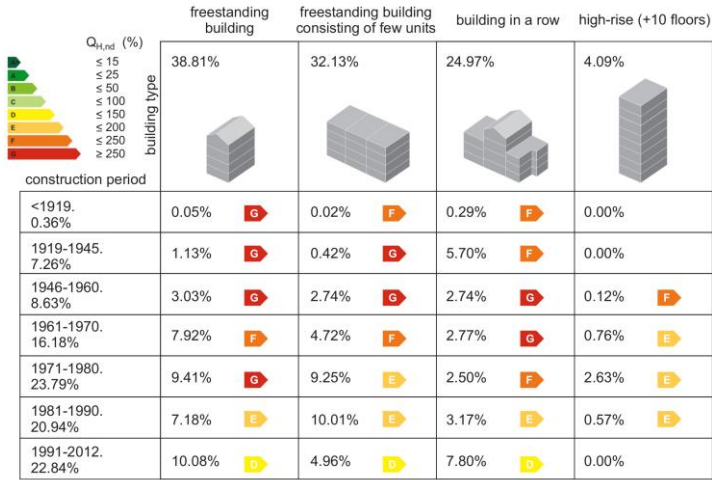


Figure1: Statistical representation of types of multi-family housing according to time period of construction in Serbia and calculated energy performance classes [4,5]

## 2. FRAMEWORK FOR THE COMPLEX AND INTEGRATED REFRUBISHMENT

This paper presents the methodology in the decision-making process for implementing complex and integrated refurbishment of existing buildings through volumetric addition.

The first step involves the analysis of the selected multi-family building (Fig. 2). By determining the thermal envelope structure and the applied heating system, the energy required for heating and the energy class of the building are calculated. The second analysis includes an assessment of the spatial, organizational and functional characteristics of the building. It is determined whether the building has any deficiencies or whether they can be improved.

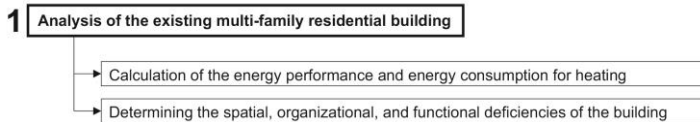


Figure2: Step 1 – Analysis of the existing multi-family residential building

The second step involves the analysis of urban planning parameters (Fig. 3). Based on location data, it is determined whether extensive interventions on the building, such as extensions that affect the building's dimensions, floor count, and increased gross floor area, are feasible.

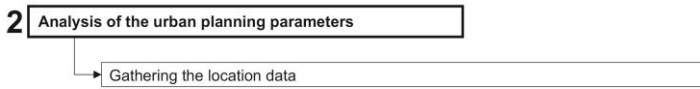


Figure3: Step 2 – Analysis of the urban planning parameters

If urban planning parameters allow for more extensive interventions on the building, we move on to the third step - determining the roles of interested parties (Fig. 4). The question of investing in the renovation of multi-family buildings is closely tied to ownership considerations. According to statistical data, 98.3% of homes in Serbia are privately owned [6]. Obtaining the consent of all apartment owners is necessary for building renovation, which can create significant challenges in the renovation process itself. Inadequate regulations, a lack of enforcement mechanisms, and weak government institutions contribute to the deteriorating condition of buildings in Serbia [7]. The social status of households and a strong, united, and resilient residential community play a crucial role in such extensive renovations. In this context, municipal policy support in the form of subsidies and grants is of essential importance [8]. Key challenges in achieving residential building renovation often revolve around conflicting stakeholder interests. Involving apartment owners in the early stages of the design process is important for effective decision-making [9]. Additionally, the accessibility and flexibility of operators in their interactions with apartment owners are crucial for the successful completion of the design and renovation process.

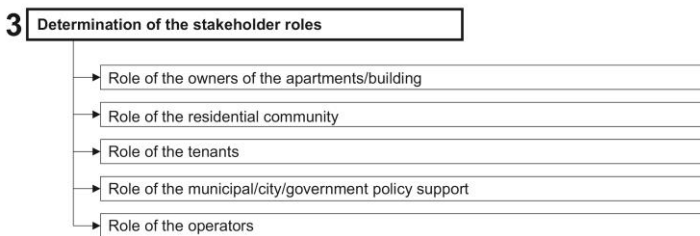


Figure4: Step 3 – Determination of the stakeholder roles

By aligning all interested parties, we proceed to the fourth step, where the application of volumetric additions to the building is determined (Fig. 5). This method, apart from changing the thermal characteristics of the envelope changes the shape factor and increases its useful living space, enabling the redefinition of the existing apartments of minimal dimensions and outdated and rigid spatial organization [10]. The functional characteristics of the building, such as inadequate vertical communications, can also be

improved by applying volumetric additions. A vertical volumetric addition on the roof of a building increases its useful living space (Fig. 6)

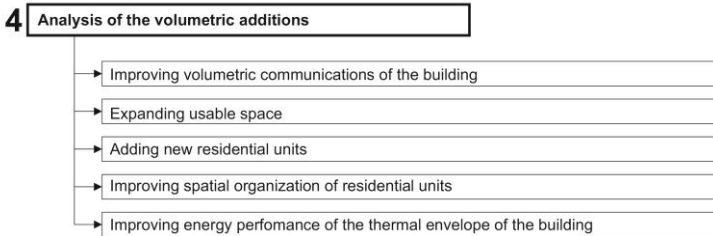


Figure5: Step 4 – Analysis of the volumetric additions

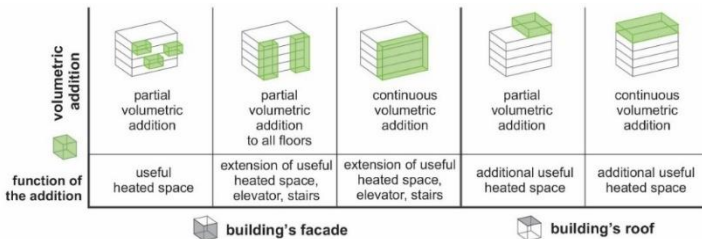


Figure6: Variants of volumetric additions to an existing building

By defining volumetric additions to the building, we move on to the fifth step, which involves the use of environmentally friendly materials (Fig. 7). As complex and integrated refurbishment of a building should be time-efficient, the application of prefabrication is suggested. Prefabricated assemblies offer several advantages compared to traditional construction, including time savings, the potential for using more environmentally friendly materials, and reduced financial investment. This research suggests the use of prefabricated wooden panels, both due to the use of natural materials and the lightweight nature of the structure, which should minimize the load on the existing building structure.

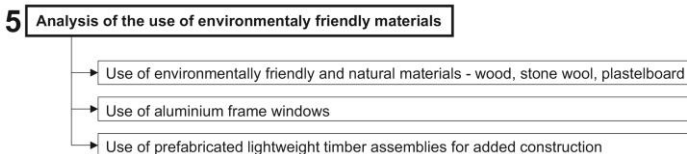


Figure7: Step 5 – Analysis of the use of environmentally friendly materials



By determining the type of construction for volumetric additions, we proceed to analyze the static load on the existing building. For this analysis, it is crucial to ascertain the total load on the existing building and perform a structural calculation of the existing building to verify if it can withstand this load (Fig. 8).

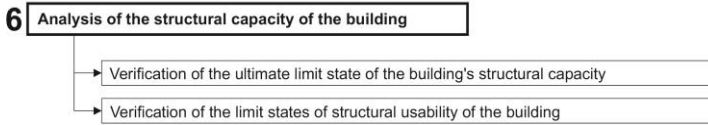


Figure8: *Step 6 – Analysis of the structural capacity of the building*

If Step 6 receives a positive evaluation, we proceed to the final step: the analysis of the economic justification for complex and integrated refurbishment (Fig.9). In this analysis, the total investment renovation costs are calculated. Then, energy savings over a longer period compared to the existing condition are computed. Additionally, the value of the building after renovation is assessed (improvement of the thermal envelope, increased usable space, and the addition of functions). By increasing the number of residential units, the sale of which could cover the initial renovation investments, economic feasibility for complex and integrated refurbishment can be achieved.

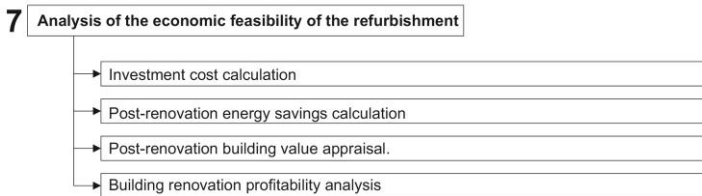


Figure9: *Step 7 – Analysis of the economic feasibility of the refurbishment*

The entire methodological framework is shown in the Figure 10.

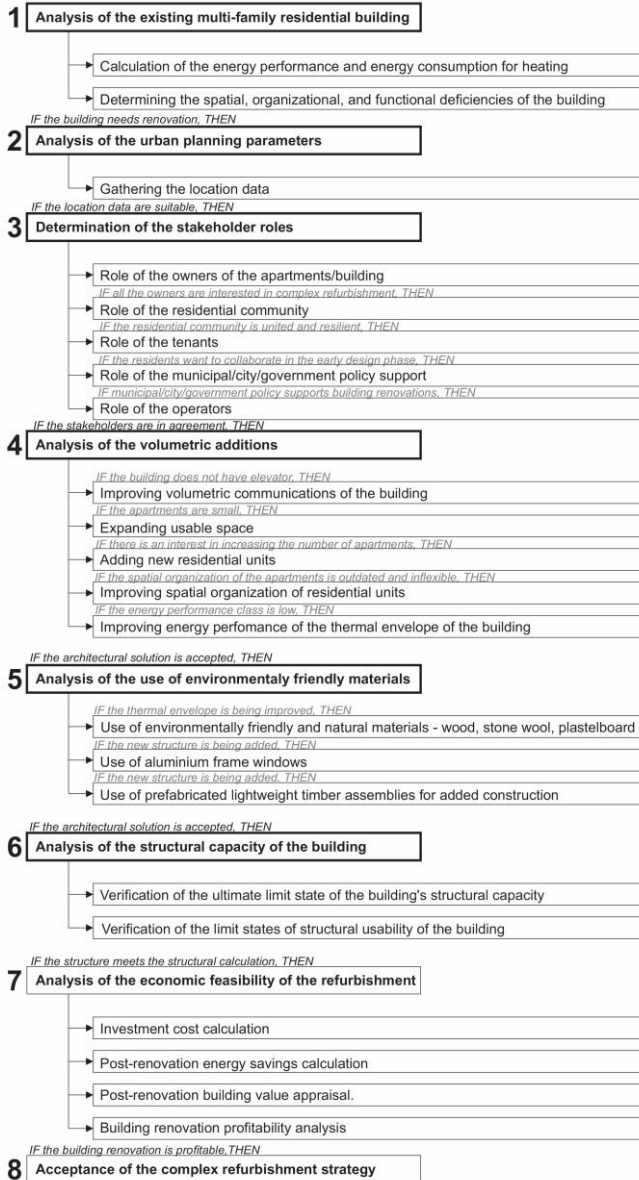


Figure 10: Framework for the implementation of a complex and integrated refurbishment approach to the multi-family housing stock of Serbia

### 3. CONCLUSIONS

The presented framework for the implementation of complex and integrated refurbishment using volumetric additions to an existing building represents the aspects that must be considered in the decision-making process for building renovation. These aspects are presented hierarchically, and further research is needed to delve into each aspect in more detail. The complex and integrated refurbishment that includes energy efficiency improvement and spatial expansion with the improvement of functions can be recognized as an adaptable method for future uses from the perspective of the resistance and adaptability of the already-built context. On an urban scale, this method of retrofitting can be introduced as a strategic approach for improving the energy efficiency of existing buildings in the region.

### 4. REFERENCES

- [1] Ministry of Environmental Protection Government of the Republic of Serbia, Rulebook on Energy Efficiency, 2011, 61.
- [2] EUR-Lex, EU Directive 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency, Official Journal of the European Union, L156/75-91, 2018. [https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L\\_.2018.156.01.0075.01.ENG](https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2018.156.01.0075.01.ENG)
- [3] European Commission, A Renovation Wave for Europe- Greening Our Buildings, Creating Jobs, Improving Lives, 2020, <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52020DC0662>
- [4] Jovanović Popović, M., Ignjatović, D., Radivojević, A., Rajčić, A., Đukanović, Lj., Čuković Ignjatović, N., Nedić, M., National typology of residential buildings in Serbia, Faculty of Architecture, University of Belgrade, Serbia, 2013, <http://eeplatforma.arh.bg.ac.rs/en/publications/national-typology-of-residential-buildings-in-serbia>
- [5] Jovanović Popović, M., Ignjatović, D., Radivojević, A., Rajčić, A., Đukanović, Lj., Čuković Ignjatović, N., Nedić, M., Atlas of multifamily buildings in Serbia, Faculty of Architecture, University of Belgrade, Serbia, 2013, <http://eeplatforma.arh.bg.ac.rs/en/publications/atlas-of-multifamily-housing-in-serbia>
- [6] Statistical Office of Republic of Serbia, Census of Population, Households and Dwellings in the Republic of Serbia, Book 25: Dwellings according to the ownership and tenure status of households, 2013, <https://publikacije.stat.gov.rs/G2013/pdf/G201318018.pdf>
- [7] Mojović, Dj., How to Efficiently Maintain a Residential Building: Modern Concept of Organization, Management, and Maintenance of Condominium Ownership Residential Buildings, Urban Development Program, Belgrade, 2009, [https://detelinara.org/wp-content/uploads/2014/03/Kako-efikasno-odrzavati-stambenu-zgradu\\_Program-za-urbani-razvoj.pdf](https://detelinara.org/wp-content/uploads/2014/03/Kako-efikasno-odrzavati-stambenu-zgradu_Program-za-urbani-razvoj.pdf)
- [8] OECD, Social housing: A key part of past and future housing policy, Employment, Labour and Social Affairs Policy Briefs, 2020, [https://read.oecd-ilibrary.org/view/?ref=137\\_137578-34brg1nxua&title=Social-Housing-A-Key-Part-of-Past-and-Future-Housing-Policy](https://read.oecd-ilibrary.org/view/?ref=137_137578-34brg1nxua&title=Social-Housing-A-Key-Part-of-Past-and-Future-Housing-Policy)
- [9] Golić, K., Kosorić, V., Lau, S., A Framework for Early Stages of Socially Sustainable Renovation of Multifamily Buildings with Occupants' Participation, Sustainability, 2020, 12(21), 8823 <https://doi.org/10.3390/su12218823>
- [10] Čuković-Ignjatović, N., Ignjatović, D., The possibility of extension in the longitudinal and transverse direction, in Jovanović-Popović, M. (ed.), Energy optimization of buildings in the context of sustainable architecture - Part 2, (pp. 115-132), Faculty of Architecture Belgrade, 2005.

# THE APPLICATION OF STRUCTURES MADE OF LIGHT-WEIGHT CONSTRUCTION COMPONENTS BASED ON TIMBER FIBRES

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## ABSTRACT

In a world where resources are continually depleted, the necessity of recycling and regenerating materials cannot be overstated, particularly when it comes to the natural substance - wood. The subject of this study includes the use of new materials as well as constructive solutions based on such materials. The primary objective of this research is to address the need for renewable materials and resources, which is consistent with the move from synthetic to natural materials. The research will attempt to improve our understanding of lightweight constructions, such as the technique of generating monofilaments from solid wood and wood-based fibers. Wood, as a natural and living material that integrates well with modern technologies, has the potential to be a long-term component of architectural trends.

*Key words: Timber Construction, Innovative Materials, Textile Structures, Solid-Wood Monofilament*

## I. INTRODUCTION

This research focuses on the evolution of textile manufacturing principles from synthetic to natural materials, as well as their complicated automated procedures (Cherif et al. 2011). Over the last decade, all research into novel materials has gradually focused toward recycling and natural material creation. A shift from synthetic to natural fiber-based products is visible. Digital fabrication advancements, particularly in robotics, bring new design concepts and additive manufacturing (AM), simplifying fiber production by merging recycled and renewable wood with additives (La Magna et al. 2013). Aside from 3D printing, AM provides techniques such as "Automatic Fiber Placement" and "Automatic Tape Laying," which are still being tested in the field. Innovative techniques such as creating monofilaments from solid wood are being investigated in order to harness and expand the potentials of additive manufacturing. Since 2011, there has been an increase in research on this topic, with a profusion of studies obtained, although practical applicability in real-world settings has remained underexplored. The study's goal is to shed light on the production and usage of fibrous materials, as well as to investigate techniques for future application and implementation in traditional household construction situations.

## **2. CRAFTING TEXTILES FROM SOLID-WOOD MONOFILAMENT**

Researchers such as Bechert and colleagues (Bechert et al. 2016) have investigated this material, which represents a wood filament. The filament is created by mechanically cutting strips from the tree's bark. The strips are then glued together and spatially connected to produce a continuous filament in the following step. Various additives are employed in the robotic joining procedure. Cyanoacrylates enable for rapid bonding but are moisture sensitive. UV additives and resins are also alternatives. This method denotes a mechanical technique of linking strips to automatically generate a continuous filament, from which a weave is derived utilizing AM technology to create a lightweight structural component (Dawod et al. 2019).

This technique not only opens the door to radical design, but it also raises the issue of adapting and reinventing existing building methodologies. Analyzing the thermal and structural properties of different additives used in the production of monofilaments can potentially serve as an alternative to various traditional materials in the future, providing an environmentally sustainable option that impresses with its form and functionality.

## **3. TEXTILE TECHNIQUES IN A NEW LIGHT**

It is practical to design architectural components made of monofilament using the robotic production method, attaining better precision than current wood goods. The technique of inserting monofilament is based on sequentially layering fibers from each distinct assembly, resulting in an overlapping effect that results in the component's thickness and rigidity. Because of the amount of intersections, overlaps, and variable lengths, the structure has varying stiffness levels. However, inconsistent material distribution and strip density might cause irregularities in the vertical profile of the element, creating unpredictability in the component's height. Based on these outcomes, it is possible to conclude that the element has not been thoroughly investigated as the primary structural material, but rather as a supplementary material ideal for transitioning from synthetic to natural materials in the context of traditional materials. Natural fibers have environmental advantages, such as CO<sub>2</sub> absorption during growth and less usage of nonrenewable resources as compared to other materials, as well as biodegradability. Wood, as a traditional material in our building, will be the topic of additional investigation in light of modern architecture, particularly when examined through the lens of novel cladding materials based on timber fibers.

## **4. CONCLUSIONS**

With its entire structure and continuous strands, the continuous wooden monofilament sets the way for revolutionary replacements of traditional materials such as synthetic fibers in the future. The research looks into the characteristics of this monofilament and how it interacts with additive manufacturing. The innovative manufacturing technique transforms timber materials, positioning them as prospective alternative materials in architecture, membranes, façade cladding, and interior finishes. The use of wood, a natural

material traditionally utilized in building, and further transforming it through creative materials and applications in contemporary architecture under local conditions. According to the findings, timber materials could play an important role in sustainable construction and design in the future.

## 5. REFERENCES

- Cherif, C. (2011). *Textile Werkstoffe für den Leichtbau*. Berlin-Heidelberg: Springer.
- La Magna, R., Gabler, M., Reichert, S., Schwinn, T., Waimer, F., Menges, A., & Knippers, J. (2013). From Nature to Fabrication: Biomimetic Design Principles for the Production of Complex Spatial Structures. *International Journal of Space Structures*.
- Gutwasser, F. (1990). *Chemische Vergütung und Verklebung von Weidenflechtmaterialien mit technologischen Konsequenzen für den Verarbeitungsprozess* (Thesis). Akademie der Landwirtschaftswissenschaften der DDR.
- Bechert, S., Knippers, J., Krieg, O. D., Menges, A., Schwinn, T., & Sonntag, D. (2016). Textile Fabrication Techniques for Timber Shells: Elastic bending of custom-laminated veneer for segmented shell construction systems. In *Advances in Architectural Geometry 2016*. Zurich
- Dawod, M., Deetman, A., Akbar, Z., & Heise, J. (2019). Continuous Timber Fibre Placement-Towards the Design and Robotic Fabrication of High-Resolution Timber Structures. *Eindhoven University of Technology and Universität Stuttgart*, (p. 3). DOI: 10.13140/RG.2.2.31569.68963



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