BOOK OF PROCEEDINGS

1st International Conference on Built Environment

ICBE 2026



MAY 08th-09th, 2026
POLIS University, Tiranë

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Conference Theme and Rationale

The 1st International Conference on Built Environment (ICBE 2026) was conceived as an international and interdisciplinary forum for advancing knowledge, critical discussion, and innovation across architecture, urban planning, engineering, construction, materials, design, and the wider built environment. Organized by POLIS University in collaboration with the National Agency for Scientific Research and Innovation in Albania (AKKSHI), the Academy of Sciences of Albania and the University of Ferrara in Italy, the conference brought together academics, researchers, practitioners, students, and industry representatives to exchange research findings, professional experience, and emerging perspectives on the transformation of contemporary cities and territories.

The conference theme reflected the increasingly complex challenges shaping the built environment, with particular attention to sustainability, resilience, technological innovation, heritage preservation, and socially responsive design. Contributions addressed sustainable architecture and green building, innovative construction technologies and materials, climate-responsive and energy-efficient design, disaster risk reduction, circular approaches to construction, and the integration of renewable energy. Equal emphasis was placed on digital transformation through Building Information Modeling, Geographic Information Systems, artificial intelligence, data analytics, automated solutions, digital fabrication, and advanced manufacturing.

ICBE 2026 also recognized that the future of the built environment cannot be approached through technological innovation alone. Urban transformation, cultural heritage, adaptive reuse, inclusive design, ecological thinking, art, and interdisciplinary research were therefore integral to the conference rationale. The scientific sessions examined topics ranging from seismic resilience, geotechnical engineering, and structural safety to urban fragmentation, public space, heritage conservation, adaptive environments, and new relationships between human and non-human systems.

Through keynote lectures, scientific presentations, case studies, and interdisciplinary debate, the conference encouraged connections between research and practice while promoting approaches capable of responding to environmental, social, cultural, and technological change. The breadth of contributions demonstrated the value of bringing engineering, architecture, urbanism, design, heritage, and emerging technologies into a shared academic framework for more resilient, sustainable, adaptive, and human-centered environments.

Held on 8-9 May 2026 at POLIS University in Tirana, with in-person and online participation, ICBE 2026 welcomed guest speakers and participants from Albanian and international universities, research institutions, professional organizations, and industry. Its sessions established a platform for presenting current research, exchanging expertise, strengthening meaningful collaboration, and identifying future directions for the built environment.

The event

The **1st International Conference on Built Environment (ICBE 2026)** is an interdisciplinary academic and professional forum dedicated to exploring contemporary challenges, emerging research, and innovative approaches shaping the future of the built environment. Bringing together researchers, academics, architects, engineers, urban planners, designers, practitioners, and industry professionals, the conference promotes the exchange of knowledge and encourages collaboration across traditionally interconnected disciplines. Its thematic scope encompasses sustainable and resilient construction, technological innovation, advanced building materials, urban transformation, cultural heritage, and interdisciplinary design approaches. Particular attention is given to the growing role of digital technologies, data-driven methodologies, intelligent design processes, and advanced analytical tools in supporting more informed and responsive approaches to architecture, engineering, and urban development. At the same time, ICBE 2026 recognizes the importance of environmental responsibility, cultural identity, social needs, and human-centered design in shaping contemporary cities and territories. Through keynote lectures, scientific sessions, case studies, and interdisciplinary exchange, the conference provides a platform for presenting current research, discussing professional experiences, and developing new perspectives capable of contributing to **safer, more sustainable, adaptive, inclusive, and resilient built environments**.

Objectives

- Promote interdisciplinary collaboration among researchers, academics, practitioners, and professionals in architecture, engineering, urban planning, construction, design, heritage, and related fields of the built environment.
- Advance the use of digital technologies and innovative methodologies, including BIM, GIS, artificial intelligence, data analytics, digital fabrication, and parametric approaches, in research and professional practice.
- Encourage sustainable, resilient, and climate-responsive approaches to architecture, construction, and urban development through innovative materials, energy-efficient strategies, and environmentally responsible design.
- Address contemporary challenges affecting cities, buildings, and infrastructure through scientific research, applied case studies, evidence-based approaches, and innovative design solutions.
- Promote the conservation, transformation, and adaptive reuse of cultural heritage, balancing cultural identity, contemporary needs, structural safety, and responsible urban development.
- Support human-centered and socially responsive urban transformation, considering public space, mobility, ecological systems, community needs, and the wider social and economic impacts of the built environment.
- Provide a platform for knowledge exchange and emerging research, enabling scholars, young researchers, professionals, and students to present innovative ideas, strengthen international collaboration, and contribute to future directions in the built environment.

Main Conference Themes

- Sustainable architecture and green building practices.
- Innovations in construction technologies and materials.
- Heritage preservation and adaptive reuse in the built environment.
- Digital tools and smart technologies in architecture and construction (e.g., BIM, GIS).
- Climate-responsive and energy-efficient design.
- Disaster risk reduction and resilience in the built environment.
- Circular economy approaches in construction and material usage.
- Integration of AI and data analytics in building design.
- Acoustic and thermal performance in building design.
- Renewable energy integration in building systems.
- Advanced manufacturing techniques in construction, such as 3D printing.
- Innovations in construction technologies and materials.
- Heritage preservation and adaptive reuse in the built environment.
- Disaster risk reduction and resilience in the built environment.
- Digital tools and smart technologies in architecture and construction.
- Advanced manufacturing techniques in construction.
- Geotechnical Engineering for Sustainable Development.
- Cartography and Geographic Information System.
- Computer Automated Solutions for Built Environment.
- Reliability in Civil Engineering.
- Urban planning strategies for resilient cities.
- Climate-responsive and energy-efficient design.
- Regulatory frameworks and policies impacting construction and urban development.
- Design in the Era of Anthropocene (Rethinking the Relation between Human and Non-Human Species)
- Speculative Design (with Attention to “Discursive” and “Critical” Design)
- Design and Cross-Disciplinarity (with Emphasis on Processes rather than Design Outputs)
- Inclusive Design
- Art and Urban Regeneration (Focus on Participatory, Collaborative, and Research-Based Practice)
- Relational Art and Architecture
- Monuments and ‘Anti-Monuments’ (Particular Attention to the Process of Designing and Building the City)

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The conference is structured around six thematic sessions, each addressing a specific area of research and practice within the built environment.
Each session is coordinated by experts in the relevant disciplinary field and is open to professors, researchers, PhD candidates, and other scholars and professionals contributing to the conference themes.

SESSION I
Urban Planning and Societal Impact

Chair: Dr. Gent Avdija

This session examines the relationship between urban transformation, spatial development, and their social implications within contemporary cities. Contributions address rapid urbanization, urban fragmentation, the transformation and loss of public space, informal and spontaneous development, and the challenges associated with balancing growth and modernization with human-scale urban environments. Particular attention is given to the evolving conditions of Albanian cities and to planning approaches capable of supporting more inclusive, sustainable, socially responsive, and livable urban environments.

SESSION II
Sustainable Materials, Resilient Construction & Smart Design

Chair: Dr. Endri Duro

This session explores innovative approaches to sustainable construction, resilient structural systems, and environmentally responsive design. Particular attention is given to sustainable materials, energy-efficient and climate-responsive strategies, prefabricated and lightweight construction technologies, and human-centered approaches to structural and architectural design. The session investigates how material innovation, technological development, and responsible design practices can contribute to safer, more efficient, adaptable, and environmentally sustainable built environments.

SESSION III
Technological Advancements and Seismic Design for Resilient Places

Chairs: Dr. Seyyed Behrad Emadi & Dr. Ornela Şen

This session examines the role of technological innovation and advanced engineering methodologies in developing safer, more resilient, and adaptable built environments. Contributions address seismic hazard and risk assessment, digital fabrication, parametric and computational approaches, transformations of building envelopes and prefabricated housing systems, and emerging concepts for future urban mobility. The session highlights how the integration of engineering knowledge, digital technologies, and resilience-oriented design can strengthen the capacity of buildings, infrastructure, and urban environments to respond to contemporary and future challenges.

SESSION IV

Cultural Heritage

Chairs: Dr. Nikolla Vesho & Dr. Marsela Demaj

This session addresses the preservation, interpretation, and transformation of cultural heritage within contemporary architectural and urban contexts. Contributions explore conservation strategies for historic buildings and sacred architecture, seismic assessment and strengthening of heritage structures, adaptive reuse, and the social implications of urban regeneration and heritage loss. Particular emphasis is placed on achieving a responsible balance between conservation ethics, cultural identity, structural safety, and the evolving functional requirements of historic buildings and urban environments.

SESSION V

Spaces of Connection: Art and Design for an Interspecies and Interdisciplinary Environment

Chair: Dr. Francesco Scasciamacchia

This session explores the intersections of art, architecture, design, technology, and the built environment through interdisciplinary and experimental perspectives. It investigates changing relationships between human and non-human systems, spatial perception, adaptive reuse, post-industrial landscapes, urban representation, digital heritage, and environmentally and socially engaged design practices. Through critical, speculative, participatory, and research-based approaches, the session examines how art and design can generate new forms of connection, reinterpret existing environments, and contribute to emerging cultural and spatial narratives within contemporary cities.

SESSION VI

Next-Generation Pioneers of the Built Environment

Chair: Dr. Flogerta Krosi

This session provides a dedicated platform for emerging researchers and students to present innovative, experimental, and forward-looking approaches to the built environment. Contributions span architecture, engineering, urban planning, environmental resilience, design, and related creative disciplines, reflecting the interdisciplinary character of a new generation of researchers and practitioners. Through projects addressing topics such as bioclimatic design, flood-risk management, structural technologies, architecture-inspired design, and critical interpretations of objects and social space, the session encourages critical inquiry, experimentation, and new perspectives on the future of the built environment.

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SESSION I

Urban Planning and Societal Impact

Urban transformation and growth: Rapid urbanization / Urban expansion / Contemporary city transformation / Growth and modernization.

Urban form and spatial quality: Urban fragmentation / Human-scale development / Public-space transformation / Spatial continuity and connectivity.

Society and the city: Social impact of urban development / Community needs / Inclusive urban environments / Quality of urban life.

Planning challenges in changing cities: Spontaneous architecture / Informal development / Sustainable urban planning / Transformation of Albanian cities.

The Fading Public Realm:
From Expansive Open Spaces to Morphological Compression in Durres' Rapid Urban Growth.

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Abstract

Durres, located in Albania's western lowlands, has always been the main destination for internal immigration. From the early years after the Second World War, especially after the 90s, thousands of families from rural areas moved to the cities, transforming them into some of the fastest-growing areas in Albania. This wave of migration simulated rapid, mostly uncontrolled urbanization that changed the cityscape at its roots.

This study aims to analyze how open public spaces are increasingly being compressed as a result of rapid growth since the 90s. As we compare the historic map of the city of Durres, dating from 1928, with the more recent ones (2020-2025), one can notice a dramatic decrease in the percentage of open public space for inhabitants (Figure 1). This has created a strong sense of overload in the historical centre.

In 1928, Durres still had large public spaces: large squares and commercial streets that invited people to conduct their activities while serving as social spaces. These elements gave the city its identity and made it function as a city. But after the 90s, things changed rapidly; the boom of the buildings, tourist pressure, speculative real estate development, and the uncontrolled urban expansion reduced the open space ratio. And the result was a fragmented urban landscape, overloaded and increasingly less friendly to residents.

While using morphological analysis and GIS tools, this research calculates the quantitative transformations and identifies the most affected areas. This morphological compression has not eroded only the social and cultural role of the squares as public spaces – it has weakened the city's resilience to the climate challenge and demographic growth.

Keywords: *Rapid Urbanization, Public Space, Urban Fragmentation, Urban Resilience, Spatial Compression.*

1. INTRODUCTION

Public spaces are considered the most important elements of the city. They are not only areas that serve for walking in, but they are also important places for social interaction, collective memory, and places to stay.

In Mediterranean cities, like Durres, these spaces have always had a central role. Public spaces and commercial roads have served as meeting nodes, but also as urban structures that organized urban life. In these areas, economic activities were held, but in the meantime, the identity of the city was being built.

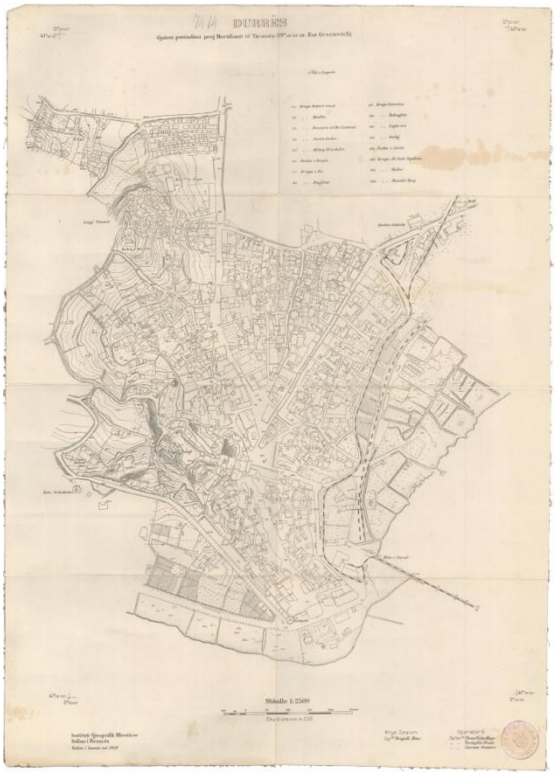


Figure 1: These two maps serve as the basis for the analysis. The first map (on the left) shows the map of the year 1928 of the whole city of Durres. The second map (on the right) shows the map of the city of Durres in 2020-2025 (the exact year is unknown).Source: AQTN

However, in the last few decades, this relation has changed, leading to a disbalance between urban elements. Rapid urbanization, especially after the 90s, has brought about a significant increase in the urban density. The buildings are being built, while the free spaces (once serving as public ones) are being shrunk. And often even without a plan.

In this context, Durres represents a significant case study. Rapid demographic growth and uncontrolled development have changed the relationship between free unbuilt spaces and those being built. But this is not a case about the urban form; this is a change that affects how the city functions and is being perceived.

This study tends to analyze this process, which here is determined as morphological compression of urban spaces. The analysis is focused on the historical center of Durres and its transformations over the past 100 years.

In this context, it is important to understand that public spaces are not only free spaces left between buildings, but they are also active parts of urban structure. They organize the movement, but also the posture (figure 2). In many cases, they create the rhythm of the city and directly affect the manner in which it is perceived by the inhabitants and visitors.

When these spaces are reduced or fragmented, the impact is not only visual, but functional and social. The city becomes more dense, but not necessarily more livable. The movement might be faster, but the stay becomes difficult. And with that, also the possibility for spontaneous interaction in public space.

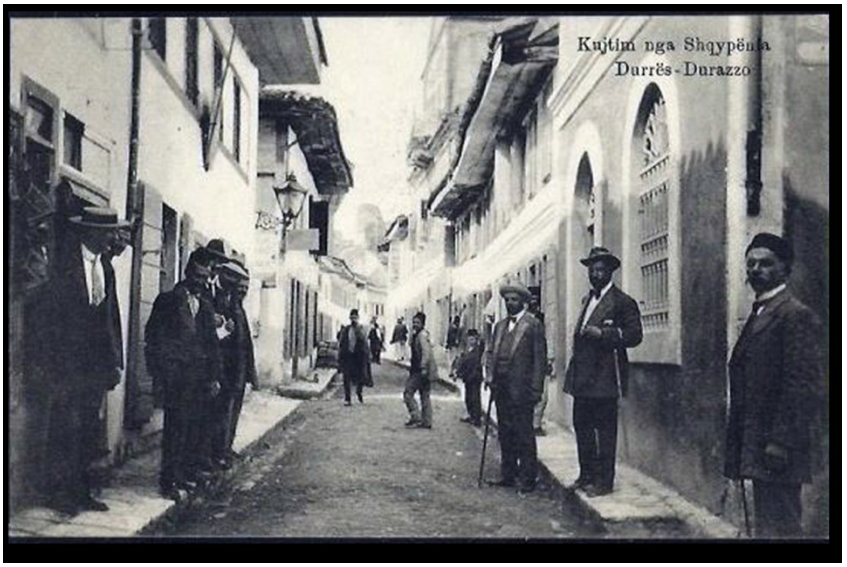


Figure 2: In this image, one of the main axes of Durres city, the Boulevard in 1917, is shown. Image from Kozma Borova.
We can notice the people gathering in the Boulevard, giving this space a social dimension.

In the city of Durres, this dynamic is also linked with the pressure coming from the tourist and economic development. The areas once serving as meeting nodes and other activities are transformed gradually into built areas or transit zones. This has changed the balance between the public and private spaces.

At the same time, the absence of a clear planning structure has made it possible for these transformations to happen in a fragmented manner. We do not have a linear process, but a series of interventions distributed in time and space. Exactly this makes it necessary to read the city morphologically to better understand not only what has changed, but also how and why this change has happened.

2. LITERATURE REVIEW

Public spaces represent one of the most important elements in the urban structure, directly influencing the way cities are perceived, used, and lived. In this sense, Kevin Lynch highlights that urban elements such as streets and squares are part of the image of the city and affect its readability and orientation (Lynch, 1960). In a similar way, Camillo Sitte argues that the quality of public spaces is directly linked to their organic organization and to the relationship between the built and unbuilt space (Sitte, 1889), while Jan Gehl puts the human dimension at the center, highlighting that the public spaces must support social interoperability and urban life (Gehl, 1987).

These approaches are fundamental, especially to better understand the transformation of Mediterranean cities like Durres, where historically public spaces have always been integral parts of social and economic life. In this context, urban squares are not only considered as morphological elements, but also as structures that bear the identity of the city (Altay et al. 2023; Szövényi et al., 2025). In the case study of Durres' city, this could be understood and noted in the historical maps, where open spaces and squares consisted of a linked network with commercial and social functions.

However, the literature shows that rapid urbanization has changed this rapport between the built environment and the free space radically. The increasing urban pressure, the development of modern infrastructure and mobility, and the growth of the city itself have led to the dominance of the transitional function over the social function (Hao, 2021). This phenomenon is especially evident after the '90s, when the uncontrolled development has fundamentally changed the city's morphology.

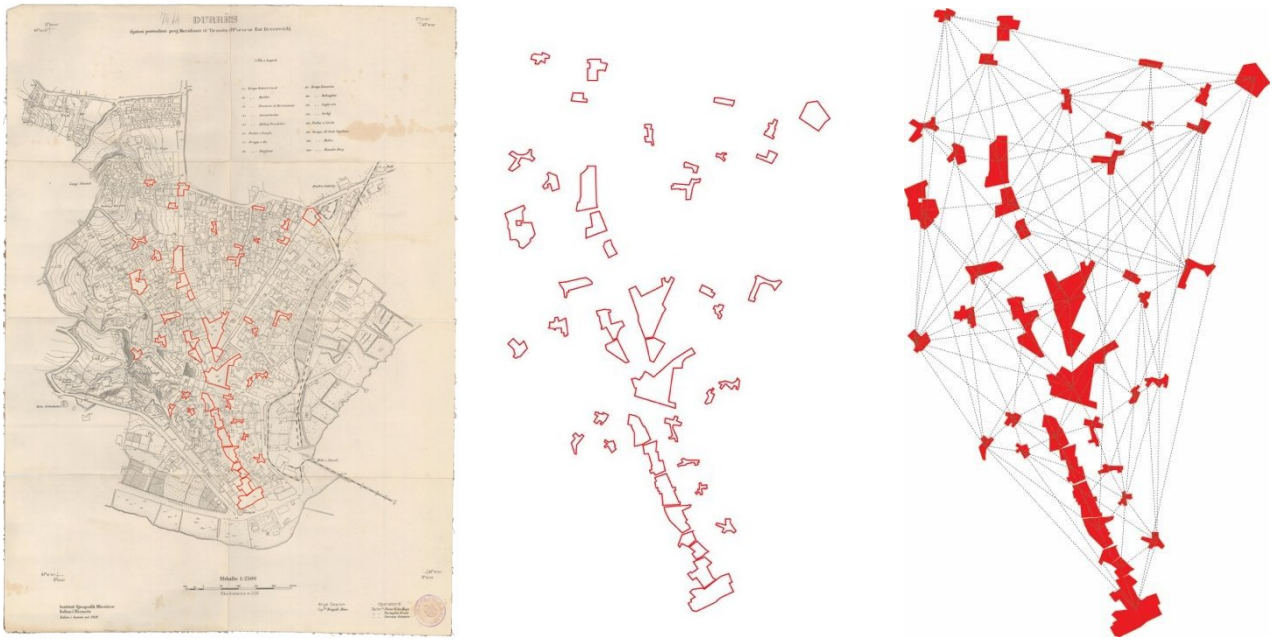


Figure 3: Analysis made on the 1928 map, showing the spread of the public squares in the whole city and functioning as a mesh. Source: AQTN, Analysis made by the author A.Sava (2026).

On the same line, studies over coastal cities show that rapid urbanization, which induces the reduction of public and ecological spaces, undermines urban sustainability (Huang et al., 2023).

This situation is also reflected in the city of Durres, where the reduction of open and green spaces has created a compressed and less resilient urban environment. As studies show, green spaces, these areas play an important social and economic role, but often they are sacrificed for other rapid urban developments (Odhengo et al., 2024; Scheiber et al., 2026).

An important contribution to this study comes from the previous analysis of the "Epidamn" Boulevard in Durres, where the morphological transformations of this axis are treated in relation to urban identity and historical changes of the city (Sava, 2026). This study evidences the transformation from an organic structure (Figure 3), characterized by small squares integrated in the main axis, toward a more linear and rationalized one, reflecting political influence in different periods of time. In this way, the boulevard is interpreted not only as an element for people to walk in, but as a structure that builds and transforms the collective identity of the city. This interpretation is used as a basis for the actual analysis, expanding the focus from only a linear axis toward the whole public squares within the city of Durres.



Figure 4: Analysis made on the 2020-2025 map, showing the disjunction of the public squares. The mesh looks less dynamic, representing the drying of the identity of the city. Source: AQTN, Analysis made by the author A.Sava (2026).

Another important dimension to consider is the social one. Squares are essential for the social

capital and for the creation of sustainable communities (Guang & Wang, 2023). In Durres, the gradual disappearance of squares and small public spaces has led to the weakening of social interactions and also a new way of perceiving the city as more of a transit space than a living space.

This transformation could also be understood through the concept of urban fragmentation. According to Kärrholm and Wirdelöv (2019), public spaces in contemporary cities are frequently divided into isolated fragments, losing in this way the continuity and their social function. This situation is also evident in Durres, where the public spaces do not function as a linked system, but as scattered and weakened elements (figure 4).

At the same time, the transformation of public space is also linked to political and economic factors. Mela (2014) and Narciso (2017) argue that public spaces are a result of power relationships and economic processes, often leading to control, privatization, and territorial reconfiguration. In Durres, this is reflected in the developments after the '90s, where the public interventions have directly affected the reduction of public spaces.

From a morphological perspective, the transformation of squares and public spaces could be analyzed through the changes in form and function.

Different studies show that these spaces switch from organic and flexible configurations into more regular structures, but more limited (Shobeiri, 2018; Milani & Assarzadeh, 2025). This process is clearly evident in the city of Durres, where the historical maps show a more open and diverse structure, whereas the latest developments show a compression and uniformization of urban form.

At the same time, contemporary approaches propose ways to re-establish urban continuity and to reorganize fragmented spaces. The concept of spatial-stiching suggest the recreation of the links between divided spaces to return urban coherence (Li, 2024). This approach is important in Durres, where a strategy like this could help in the restitution of the role of public spaces as structural elements of the city.

The existing literature offers a wide theoretical framework to understand the transformation of public spaces in the context of rapid urban growth. In Durres, these processes are manifested in a clear manner through reduction, fragmentation, and transformation of urban spaces. This makes the city of Durres an important case study to analyze the passage from an urban structure based on open spaces and social interaction, toward a more compressed form dominated by other urban functions.

3. METHODOLOGY

This study is supported by an integrated research approach that combines urban morphological analysis, historical comparisons, and the use of digital tools for spatial analysis. The methodology is conceived to understand in a profound way the transformations of public spaces in the city of Durres, while analyzing the changes in form, function, and the relationship

between the unbuilt space and the built one in different periods of time.

The focus is on the comparative analysis of urban maps, starting from the 1928 map, toward a more recent one. The 1928 map represents a moment of the organic development of the city, where the urban structure is characterized by a balanced rapport between the built areas and those open free spaces. Meanwhile, the more contemporary maps show the effects of rapid urban growth, uncontrolled evolution, and urban tension. Through this comparison, one can notice the changes in the spatial configuration and also in the morphological structure of the city.

The morphological analysis is realized using the Gestalt figure-ground principle (Figure 7), which makes possible the visualization and interpretation of the relationship between the free space and the non-free space. Through this method, it is possible to identify not only the reduction of public spaces, but also the transformation of their typologies, from open and integrated in urban structure squares, into fragmented places and often unclear in function. In this way, this analysis is not focused only on the quantity of the public realm, but also on the form, dimensions, distribution, and the connection with surrounding elements.

Simultaneously, the study also comprehends a quantitative component, through which the measurement of the percentage of public spaces in rapport with total urban area is made possible. Also, the identification of the areas where the spatial compression is more evident is seen through these quantitative analyses. These findings support and verify the morphological results, while offering a stronger basis for interpretation.

Another important component of methodology is the functional analysis of public spaces. Through the comparison of the usage of these spaces in different periods, this study draws attention to the transformation from areas that once served as places to stay, commercial and social interaction, toward places dominated by the movement and transition. This change in function could be interpreted in relation to socio-economic developments and urban politics that have affected the shape of the city.

The methodology also takes into consideration a critical analysis of existing literature, while linking the empirical findings with theoretical concepts elaborated by different authors about the public space, urban fragmentation, and sustainability. This theoretical-epirical approach allows Durres not to be seen as an isolated case study, but to be put into a more global context, where the rapid urban growth and the transformation of public spaces are common.

In general, this methodology tends to combine visual analysis, quantitative measurements, and theoretical interpretation to create a full overview of the transformation of public spaces (Figure 5) in the city of Durres. While combining these analyses, this study evidences not only physical transformations in the urban form, but also their implications in the social functionality, identity, and sustainability of the city.

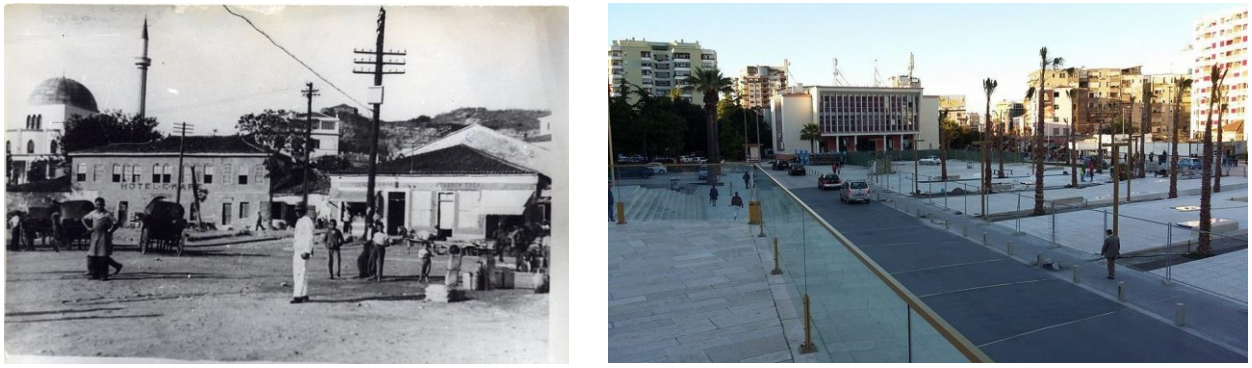


Figure 5: Images of the Square "Liria" in the center of the city of Durres. On the left (1917), the square serves other activities like commercial, gathering, and social. On the right (2024), the same square in the city center, but it is evident the loss of activities and the space is used only by trespassers. Source: AQTN.

4. RESULTS AND DISCUSSIONS

The core of this analysis is the findings that suggest that the city of Durres, in different periods of time, shows a deep transformation in the ratio between the public squares and the built environment, reflecting in this way the transition from an organic urban structure toward a more compressed and fragmented form. The comparison of two maps (1928 and 2015), spanning about 100 years of changes, shows a significant reduction of open and free public spaces and also a major change in the way these spaces are organized and function as a whole in the city.

In the first phase, represented by the map of 1928, the urban structure is characterized by an organic configuration, where the public spaces are spread throughout the whole urban structure.

The squares and public spaces are not isolated urban elements; they act as an important core of a continuous spatial system that includes social functions, economic, and commercial ones. These spaces operate as urban nodes, while creating meeting points and interactions that contribute to the social capital and shape the city's identity (Guan & Wang, 2023; Altay et al., 2023). The proportion between the built and the open space is represented in a sustainable balance, reflecting a controlled development and strongly connected with the human dimension of the city, in accordance with Sitte and Gehl principles.

However, the contemporary analysis shows an evident transformation toward a spatial compression and urban structure fragmentation. The public spaces no longer function as a web in the whole city, but rather as small elements that do not become part of the whole. The public spaces that were once part of this system have been reduced significantly, often losing their social activity. This reduction is accompanied by a growth of built structures and also by the dominance of transit and mobility functions (such as roads, etc.) over those of gathering and meeting. As Hao (2021) suggests, the social spaces are transformed into functional corridors in the rapid urbanization context, while limiting their usage for public interaction.



Figure 6: Geometrical analysis of the public squares in 1928 (on the left table) and one more recent in 2020-2025 (on the right). Geometric forms seem to have lost their identity and are simplified. Analysis made by the author A.Sava (2026).

An important finding of this study is also the gradual abolition of squares as urban typologies. Different from the 1928 structure, where the squares had a diversity of geometrical forms (Figure 6) and multiple functions, in the actual situation, they no longer exist or are transformed into residual spaces, without a clear public function. This finding is in accordance with the study of Shobeiri (2018), who highlights that urban squares have transitioned from a flexible and free form toward more controlled and limited configurations.



Figure 7: Analysis made on both maps (left: the map of 1928, right: the map of 2020-2025), based on the Gestalt principles, on behalf of the study of the built areas and voids. Source: AQTN, Analysis made by the author A.Sava (2026).

At the same time, quantitative analysis confirms a decrease in the percentage, approximately they are halved (Figure 7) of public spaces in raport of the total urban area. The most affected areas are those located in the center of the city and along the main roads, where the pressure of urban growth and economic interests has been stronger. This situation is not occurring only in Durres, but also as Huang et al. (2023) and Odhengo et al. (2024) recommend in their studies; the rapid urbanization has led to the reduction of ecological and public spaces.

The public space fragmentation is another result of this study. The spaces that once formed a continuous network are nowadays divided into isolated fragments, often detached from one another and from the urban structure around them as well. This situation reflects that of Kärrholm and Wirdelöv (2019), who describe it as “public space fragmentation”, where the urban continuity is substituted by a series of independent and weakly functioning spaces. In Durres, this fragmentation is evident in the absence of clear connections between public squares and the dominance of sporadic interventions.

From another point of view, the social perspective, these transformations have a wider impact on urban life. The reduction of public spaces and their transformation into transit areas has led to the weakening of social interactions and a lowering of the quality of urban life. As Arriazu-Ramos et al. (2025) argue, the absence of public and green spaces negatively affects the mental and physical health of inhabitants, making the city, in this way, less livable.

Meanwhile, the transformation of the public space is closely related to the economic and political processes that, at the same time, developed the city. Although the uncontrolled boom in the building sector after the ‘90s, accompanied by private interventions, has brought a new configuration in the urban space, it has often been at the expense of public interest. This situation is compatible with the analysis of Mela (2014) and Narciso (2017), who highlight the fact that the existence or nonexistence of the public space is constantly a result of the relationship between jurisdiction and economic interests.

However, regardless of these transformations, some elements of the urban structure continue to play a crucial role in the spatial organization and collective memory as well. These elements could be remembered as landmarks, as Lynch (1960) suggests, offering a great potential for urban regeneration and the bringing to life of old and new public squares.

In this context, the results of this research suggest the need for a new approach in urban planning, which includes public spaces as important elements in the well-being of a city. Contemporary concepts of “spatial stitching” (Li,2024) offer possibilities to link the divided parts and make them part of the whole city, while shaping a cohesive and more sustainable city.

Last, these analyses represent the fact that the transformation of these squares is not only a physical change, but a complex process that affects the manner in which the city functions. From an urban structure rich in open spaces and social interoperability, the city has transitioned toward a more rigid form, fragmented and less oriented toward its users. This process puts the city of Durres in a wide debate about the rapid urban growth challenges and the need to maintain and reappraise the public spaces as key elements of urban life.

5. CONCLUSIONS AND RECOMMENDATIONS/ IMPLICATIONS

This study shows that the transformation of public spaces in the city of Durres is not a random and neutral process, but a result directly linked with the manner in which the city has been developed over the last decade. From an urban structure characterized by a sequence of open spaces that work well with one another, the city has transitioned toward a more dense form, fragmented and less oriented toward the user or its inhabitants.

The loss of public spaces must not be interpreted as only a physical reduction of free areas within the city, but as a crisis of the public function of the city. The spaces that once served as interoperability nodes and commercial squares are being replaced by movement corridors and isolated interventions, changing the city into a structure that gives priority to transit rather than stay (Figure 8). In this way, Durres is no longer the city of public squares, but the city of interruptions and inarticulate gaps.



Figure 8: In this image, one of the main doors of the entrance inside the castle walls (historic center of the city) named “Porta e Jallise”, with the city hall on the left side, 1900-1910.
This area served as a public space, even if it was located outside the reinforced city walls. Source: Unknown (Web).

The urban space fragmentation is one of the most clear results of this study. The public spaces are not articulated as a continuous system, but as fragments, often without a correlation with one another and without a clear role in the urban organization. This fragmentation is not only morphological, but also social, as it affects the possibilities for interoperability and the creation of a social collective life directly.

In this context, the way the city is developed after the ‘90s raises serious questions about the role of urban planning and about the priorities taken in environmental development. The dominance of economic interest and uncontrolled growth has led to a situation where the public space is seen in the second position, and not as a basic structure of the city. This approach has brought an urban form that functions to meet economic needs, but is poor in the social and spatial dimensions.

However, this study suggests that there still exists the potential for intervention to recover the lost identity. The presence of some urban elements and the historical structure of the city offer possibilities to rebuild the spatial connections and bring back an urban coherence. But this asks for rapid changes in the manner in which the public space is thought, conceptualized, treated, and lived.

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Spontaneous Architecture as Adaptive Metabolism in Post-Socialist Cities

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Abstract

Post-socialist cities have gone through fast socio-economic changes which have resulted in urban growth, weak regulation and informal architecture. Often this is seen as failed planning or illegal activity, but at the same time it can be understood as adaptive responses to spatial needs, economic uncertainty and changes of everyday life. The study of this phenomenon argues how informal architectural production reshapes the built environment and public space, and how these processes can be part of contemporary urban planning and strategies.

The aim is to examine spontaneous architecture as expression of urban metabolism and self-organizing processes through which cities grow and shape over time. This study explores the possibility that these transformations can be understood as a form of adaptive reuse and intelligence rather than disruptions to formal planning systems. It is hypothesized that informal architecture is a manifestation of private necessity and collective urban life by producing resilient and inclusive transformations to existing structures.

The methodological approach combines field documentation, spatial mapping and architectural analysis of informal interventions across multiple urban scales, with a focus on post-socialist contexts. Visual surveys, diagrammatic interpretations and typological classification are used to identify recurring patterns of transformation, supported by conceptual frameworks related to complexity theory and ecological relationships.

The analysis indicates that the informal reuse and adaptation of existing structures extend building life and activates underutilized public space through intuitive and responsive transformations. By using these alternative research methods, we can observe and analyse the city based on new paradigms to fill the gap between collected data and reality. Recognizing urban metabolism as an analytical framework and design tool can produce usable knowledge for architects and planners on how to better understand the built environment and propose strategies for more adaptive, inclusive, and resilient urban planning.

Key words: *Urban metabolism, Informal architecture, Adaptive reuse, Living Heritage, Post-socialist cities*

1. INTRODUCTION

1.1 Background and Rationale

The transformation of post-socialist cities, such as Tirana from the early 1990s, is one of the most complex urban transitions in recent history. The collapse of centralized planning systems and the sudden shift to market economies created a gap in governance, regulation and spatial control. In this context, urban environments did not just grow, they began to reorganize themselves through informal processes that reshaped the physical form and social life.

This phenomenon has often been described as disorder, illegality or chaotic growth. Informal settlements, building extensions, rooftop additions and the enclosure of public or semi-public spaces are usually seen as problems or deviations from proper planning. However, these interpretations ignore the adaptive logic of these interventions. Rather than being anomalies, they often respond directly to people's needs, showing how cities can adapt and self-regulate under uncertain conditions.

In the case of Tirana, the built environment has become a result of formal and informal processes. Buildings are no longer static objects but evolving organisms going through modifications to accommodate new functions, economic growth, and social needs. This condition challenges traditional architectural and urban theories that understands the city as static, stable and coherent.

1.2 Research Problem and Question

The main issue lies in the limited way informal architecture is currently understood and interpreted. Recent planning paradigms tend to categorize such interventions as illegal or chaotic, thereby excluding them from meaningful integration into urban development strategies. This has led to the public opinion to perceive this reality as negative and harming to the city.

The lack of understanding of this process has pushed current urban planning strategies and interventions to adopt a radical approach on dealing with these structures. Either they are left untreated, in a degraded state, often disrupting everyday life of citizens, or going to the extreme by taking initiatives to demolish informal settlements without a proper analysis of the impact that these actions have on the context, whether it is harming or not the environment, and with no concern on the impact and consequences that these demolitions have on the spatial, economic and social level.

This raises the question of whether informal architectural transformations might be understood as expressions of an adaptive urban metabolism, reflecting how cities reorganize themselves under internal and external pressures, and what we can learn from them.

1.3 Aim and Objectives

The aim is to critically examine informal architecture as a manifestation of self-organizing urban processes. The objectives include:

- Visit and observe areas in post-socialist cities that have gone through socio-economic transition and fast urban growth.
- Documenting changes and transformations that happened to the city's urban texture.
- Identifying recurring patterns of informal interventions across different spatial scales.
- Evaluating their role in extending building lifecycles and activating urban space.
- Reframing informal architecture as a form usable knowledge to better understand and plan cities that have gone through spontaneous architecture activities.

2. LITERATURE REVIEW

2.1 Informality and Urban Theory

The concept of informality has been discussed in urban studies, often in relation to economic conditions and governance structures. It has often been seen as a deviation from formal planning systems, something temporary, irregular, or even problematic. More recent perspectives shift this understanding by positioning informality as a mode of urbanization rather than an exception. In this view, informality shows the ability of cities to function beyond rigid regulatory frameworks, shaped by necessity, adaptability, and everyday innovation.

This shift in perspective allows for a clearer understanding of informal architecture. Bernard Rudofsky's book "Architecture Without Architects" highlights the intelligence embedded in vernacular and spontaneous forms of construction, suggesting that design knowledge is not exclusive to professionals. In a similar way, research on self-built environments emphasizes the active role of inhabitants in producing and transforming space. Rather than passive users, individuals become important actors who shape spatial, social, and economic conditions through their interventions.

In his book "How the Other Half Builds", Vikram Bhatt focuses his study on about how informal settlements and low-income housing actually develop in cities, especially in developing countries. Rather than treating slums as problems, the book looks at them as organic systems of building and living shaped by the people who live there.

The book analyses how people with limited resources choose, shape, and build their own homes and neighborhoods, often in ways that are efficient, functional, and adapted to their daily needs, even if they don't follow formal architectural rules. It argues these settlements work in ways that conventional planning often ignores. To better illustrate these spontaneous solutions to lived space, the publication contains a series of diagrams and drawings of these built environments. These illustrations map different scales, from neighborhood to detailed unit or room representations of ingenious solutions that come from users with no knowledge

on building techniques or policies.These approaches challenge the usual divide between formal and informal, showing that cities are shaped in more dynamic and participatory ways over time.

2.2 Complexity and Self-Organization

Complexity theory provides a useful lens for understanding informal urban processes. Cities can be seen as complex adaptive systems composed of multiple interacting agents. Rather than being centrally controlled, they evolve through decentralized interactions that produce emergent patterns.

Christopher Alexander's distinction between "tree" and "semi-lattice" structures highlights the importance of overlapping relationships in urban systems. Informal architecture often operates within such semi-lattice conditions, where spaces serve multiple functions and boundaries are fluid.

In the work of Michael Batty, cities are described as dynamic systems characterized by non-linearity, self-organization, and emergent behavior. Small actions can lead to large-scale spatial transformations, often in unpredictable ways. This perspective is useful in understanding informal architecture, where interventions, extensions, enclosures, additions etc. accumulate to produce recognizable patterns across the city.

"*As the technological revolution continued, cities were becoming ever more complex. The understanding that had been gleaned from their earlier study became rapidly dated and less relevant. Planners found it hard to keep up with this increasing complexity and in terms of techniques and tools, had a hard time running to keep standing still. The focus changed radically to one where cities could no longer be regarded in analogy with machines - they were more like organisms, evolving from the bottom up in ways that were surprising and often counter-intuitive.*" – Batty, M. (2022). *The emergence of a science of cities. Urban Solutions*, (20), 39–45.

Sotir Dhamo in his book "Understanding Emergent Urbanism" further explores the parallel of the city as an organism:

"*This self-organization tends to self-regulate in a cyclical casual fashion, based on a combination of bottom-up and top-down individual and group behaviors generated within the hierarchical structure of the system, out of which the system reproduces itself.*

If we want the model to be adaptable to change and to self-generate, it must be able to "understand" and develop using a similar cognitive process to that of living organisms." – Dhamo, S. (2021). *Understanding Emergent Urbanism*. *The case of Tirana*.

Within this framework, informal architecture can be seen as a process of urban self-organization. Spatial configurations are not fixed but continuously adjusted, allowing buildings and urban spaces to respond to changing needs. Boundaries become flexible, functions overlap, and the built environment evolves through a series of adaptive modifications rather than urban plans.

2.3 City as an organism and ecological relationships

Following the analogy of "city as an organism", we can draw comparisons from natural ecosystems and ecological interactions to further explore this hypothesis. Based on the article "Relationships in nature" by Dr. Biology (2025), there are five main types of ecological relationships: predation, competition, commensalism, parasitism, and mutualism.

Spontaneous architecture can be understood through ecological relationships that describe how elements coexist and interact. In **symbiosis**, informal additions and host buildings have a long-lasting relationship for a considerable amount of time, enough to draw conclusions whether this interaction is harming or not to the host. **Mutualism** appears when both the original structure and the intervention benefit, such as increased space and activity. **Commensalism** occurs when additions use existing structures without significantly affecting them. **Parasitism** describes cases where interventions rely on the host while potentially overloading or degrading it. Other relationships, such as **competition, predation** or **adaptation**, also emerge, revealing how urban elements negotiate space, resources, and survival within a constantly evolving environment.

2.4 Metabolism in architecture

Adaptive metabolism refers to the way a city changes and adjusts over time to meet new needs. Like a living organism are part of an ongoing cycle affected by internal and external factors, built environment grows, adapts, and reuses what already exists. Buildings and spaces are modified through changes which come organically from the actions of common individuals with little to no knowledge of formal planning and building practices. Over time these small changes add up and shape the city in a continuous way.

The idea of metabolism in architecture, first developed in Japan during the 1960s, emerged from the need to rethink cities after war, destruction, and rapid urban growth. Instead of seeing buildings as fixed objects, Metabolist architects understood architecture as a living system, able to grow, adapt, replace parts, and regenerate over time. In this sense, architecture was not complete once built, but remained open to transformation.

This way of thinking is useful for reading informal architecture as a living organism. In many cities, especially in contexts of uncontrolled or spontaneous growth, buildings do not remain static. They receive balconies, extra rooms, rooftop additions, extensions, enclosures, and improvised structures. These additions can be interpreted as smaller organisms that attach to a host building and interact with it. Sometimes they support the host by giving it new functions; sometimes they overload it; and sometimes they create a form of coexistence between the original structure and the new intervention. Kisho Kurokawa's idea of replaceable and adaptable parts can help explain this condition. Rather than demolishing entire structures when they no longer respond to social or spatial needs, informal additions show how architecture can be modified, reused, and reactivated through partial transformations. This gives buildings a continuous social and spatial life.

3. METHODOLOGY

3.1 Research Design

The study focuses on the analysis of informal architectural interventions within post-socialist urban contexts. The methodology integrates field observation, spatial analysis, and conceptual interpretation.

3.2 Data Collection

Data is collected through:

- **Field documentation:** photographic surveys and on-site observations have been performed on a selected lot in the city of Tirana. A total of 700 images has been divided into categories by typology of intervention.
- **Spatial mapping and study:** identification of informal interventions at building and neighbourhood scales by re-drawing the patterns of transformations.
- **Case selection diagrams:** Creation of drawings and diagrams that map informal transformations, including extensions, enclosures, and rooftop additions.

3.3 Analytical Framework

The analysis is structured around three key dimensions:

1. **Spatial configuration:** how interventions modify existing structures.
2. **Functional adaptation:** how new uses emerge through informal processes.
3. **Relational dynamics:** how interventions interact with public space and surrounding context.

Diagrammatic representations are used to identify patterns and relationships, while typological classification helps organize recurring forms of intervention.

3.4 Conceptual Tools

The interpretation is guided by:

- Complexity theory (self-organization, emergence).
- Ecological analogies (symbiosis, parasitism).
- Urban metabolism (adaptive reuse, modularity and transformation).

4. RESULTS AND DISCUSSIONS

As a result of the data collection, field documentation and spatial mapping, a series of diagrams have been produced and put in a transformation typology classification framework.

4.1 Selected area

The focus of the field documentation is an area of 1.16 km^2 in the city of Tirana (marked in red in the map). This territory is located inside the central ring of the city and is composed mainly by collective buildings built in the years 1960-1970 which have been subject to transformations that started in the year 1990.

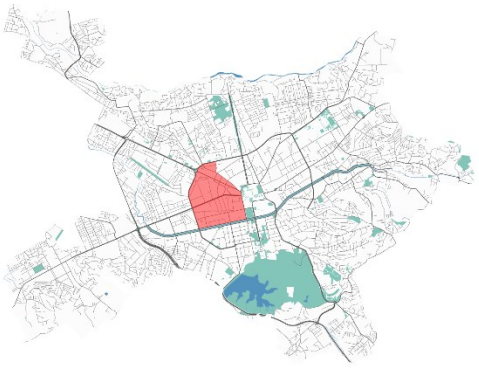


Figure 1. Map of Tirana. Source: Renis Batalli

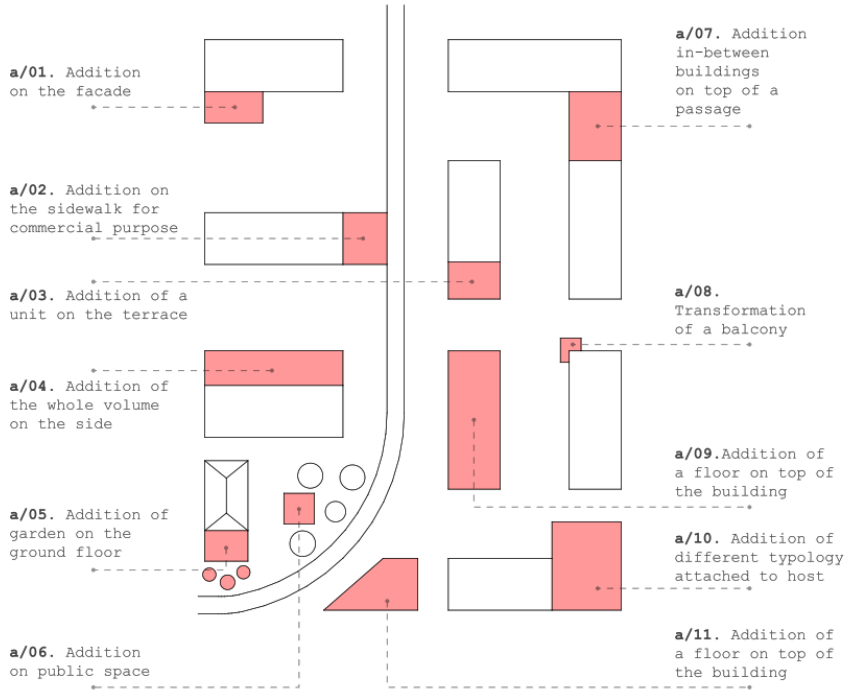
4.2 Photographic documentation

Through the visiting of the area, photographs of the transformations have been taken and grouped to show the differences of interventions as well as recurring patterns and similarities.



Figure 2. Collage of images from Tirana's buildings. Source: Renis Batalli

4.3 Urban scale transformations (top view)



Urban scale interventions show how spontaneous architecture has been spread across public space and circulation paths.

Several examples focus on additions **attached directly to existing structures**, such as façade extensions, rooftop units, or side expansions.

Figure 3. Top view diagram. Source: Renis Batalli

These interventions increase built volume while maintaining a connection to the original building. In some cases, entire new floors are added on top, resulting to a more unpredictable and dynamic top view of the area.

Other interventions are positioned more on the **public areas**. Additions on sidewalks for commercial use, small gardens at ground level or extensions into open space show how private needs lead to occupation of shared urban space. These changes often activate empty or underused spaces and provide a new function or service to the neighbourhood.

There are also more complex scenarios, such as **in-between additions** built over passages or connections between buildings. These interventions tend to maximise the use of space by creating new units on top of pathways by not disrupting circulation.

In some cases, new typologies are introduced attached to existing structures which creates an eclectic and vibrant built landscape.

4.4 Urban scale transformations (front view)

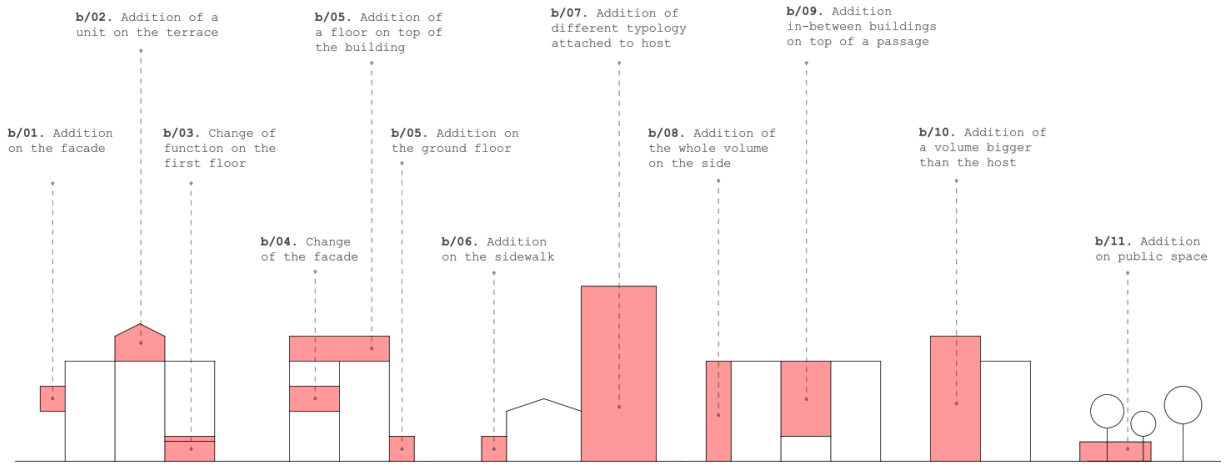


Figure 4. Front view diagram. Source: Renis Batalli

From a vertical perspective, the diagram shows how the original building (the host) and the intervention (added organism) interact by transforming the cityscape.

Many of these interventions occur on the **façade**, where changes include both the transformation of openings, such as windows and balconies, and the addition of new volumes at different levels. In some cases, multiple small interventions are merge together, creating entirely new compositions and changing the original view of the elevation.

Rooftop additions are a recurring pattern that often result in the addition of one or more floors. This process increases the number of units and produces a new and taller building typology.

At the ground level, interventions mostly happen due to **functional change**, such as a shift from private to public use. A common modification involves the openings, windows become doors, while elements such as shelters, platforms, vegetation, and urban furniture are added to allow new commercial functions to operate and give services to the area. In some cases, entirely new units are added, extending into sidewalks or public space.

4.5 Building scale transformations (vertical section)

The diagram presents a series of recurring informal interventions that modify existing buildings through adaptive changes. These interventions can be understood as **additions, transformations, and extensions**, each operating at different scales and positions within the structure.

The first group includes **additive interventions**, where new volumes are attached to the building. They are located on the ground floor, façade, or rooftop, showing how unused or accessible surfaces become opportunities for expansion. These additions often respond to spatial needs, increasing usable area without replacing the original structure.

The second category involves **transformations**, where existing spaces are altered rather than expanded.

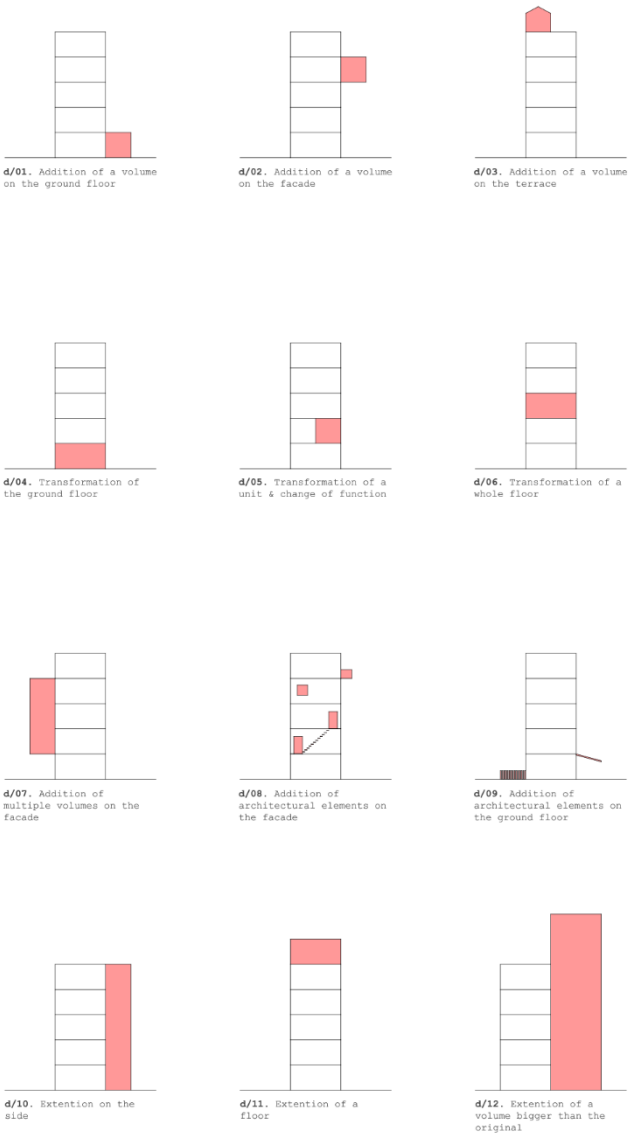


Figure 5. Building diagram. Source: Renis Batalli

This includes the conversion of ground floors, the modification of individual units or the reconfiguration of an entire floor. These changes often happen due to changes of function, such as residential spaces turning into commercial use.

The third group consists of **extensions**, which enlarge the building's footprint or volume. These can appear as side expansions, vertical floor additions, or large-scale extensions that exceed the original structure in size. Unlike smaller additions, these interventions have a more drastic visual effect by reshaping the identity of the building.

These types of interventions show a continuous process of adaptation, where buildings evolve over time through modifications driven by socio-economic changes.

4.6 Unit transformations (isometric view)

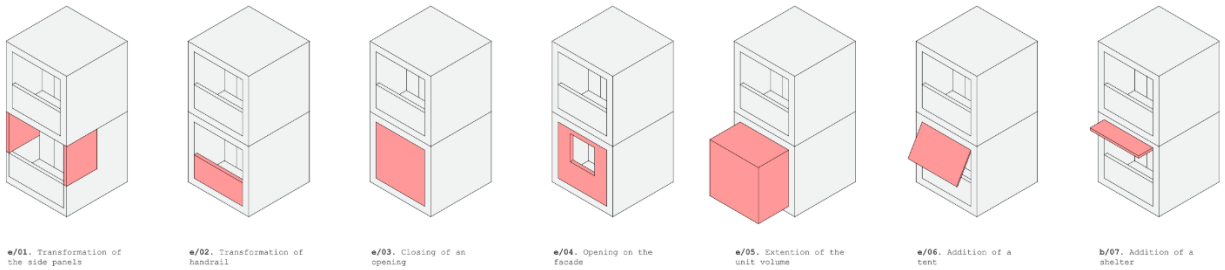


Figure 6. Unit diagram. Source: Renis Batalli

This analysis focuses on smaller scale modifications made directly to individual housing units. Unlike larger building transformations, these changes happen on a more intimate level, reflecting immediate needs and personal preferences of the user.

The first set of interventions involves **surface transformations**, such as modifying side panels or altering railings. They are often made to improve privacy, safety or environmental comfort. Similarly, the **closing or opening of façade elements** shows how residents adjust light, ventilation, and visibility according to their needs. A closed opening can create more usable interior space, while a new opening can provide a better connection to the outside.

Another group includes **volumetric additions**, where small extensions are added on the outside of the existing unit. These interventions increase usable space without altering the building structure, often used for storage, living functions or commercial activities.

Temporary elements such as **tents and shelters** are flexible adaptations that provide shading and privacy with lighter structures that can be easily modified or removed.

4.7 Surface level transformations (perspective view)

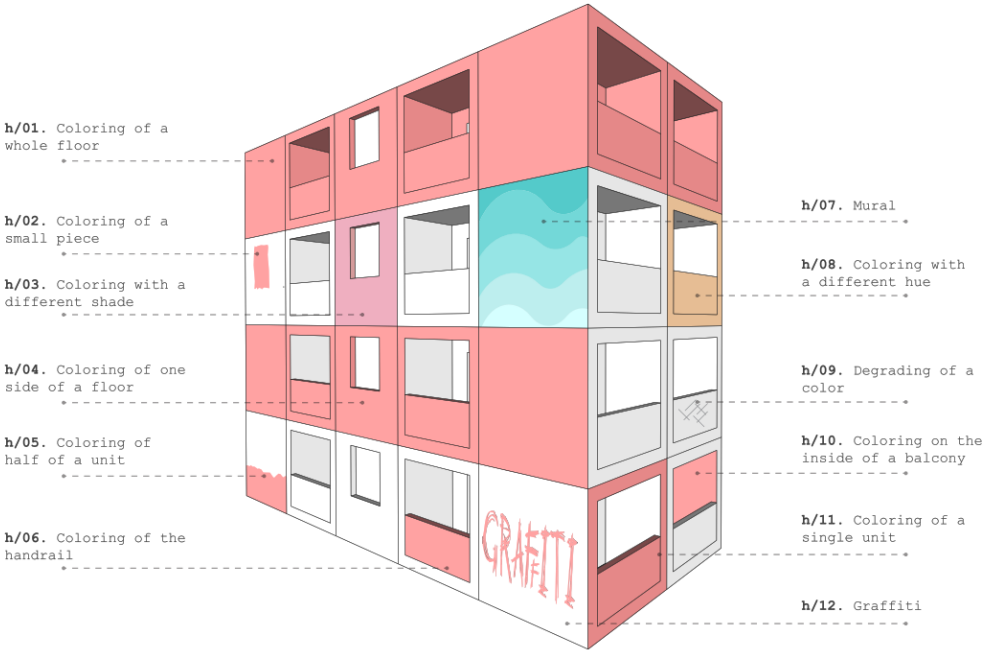


Figure 7. Surface transformation diagram. Source: Renis Batalli

Surface-level interventions focus on how color and visual elements are used to transform the appearance and identity of a building. Unlike volumetric additions, these changes do not change the physical structure but they happen on the façade surface.

Color alteration is one of the main ways that facades are modified. On a bigger scale, entire floors or sides of the building are **recolored**, creating strong visual contrasts that redefine the overall composition. In some cases, only parts of a façade are painted, such as a small area, half of a unit, or a single element. This results in a fragmented and not unified composition which contributes to the chaotic feeling that is perceived while visiting these areas. By recoloring the degraded façades one unit at a time, on different periods and with colors that are matched only by intuition and visual observations there are variations in tone, shade, and hue that make the visual appearance even more diverse.

Other interventions are more expressive and symbolic, such as **murals and graffiti**, which introduce narrative, identity, or personal expression into the urban environment. These elements often reflect social, cultural, or individual messages, turning the façade into a communicative surface, even though in the case of Tirana these types of artistic expressions are less common, and the messages that are drawn more often involve information or “do not park here” warnings.

Smaller interventions, such as coloring the inside of balconies handrails show how even small change can contribute to the overall visual transformation.

4.8 Façade material transformations (front view)

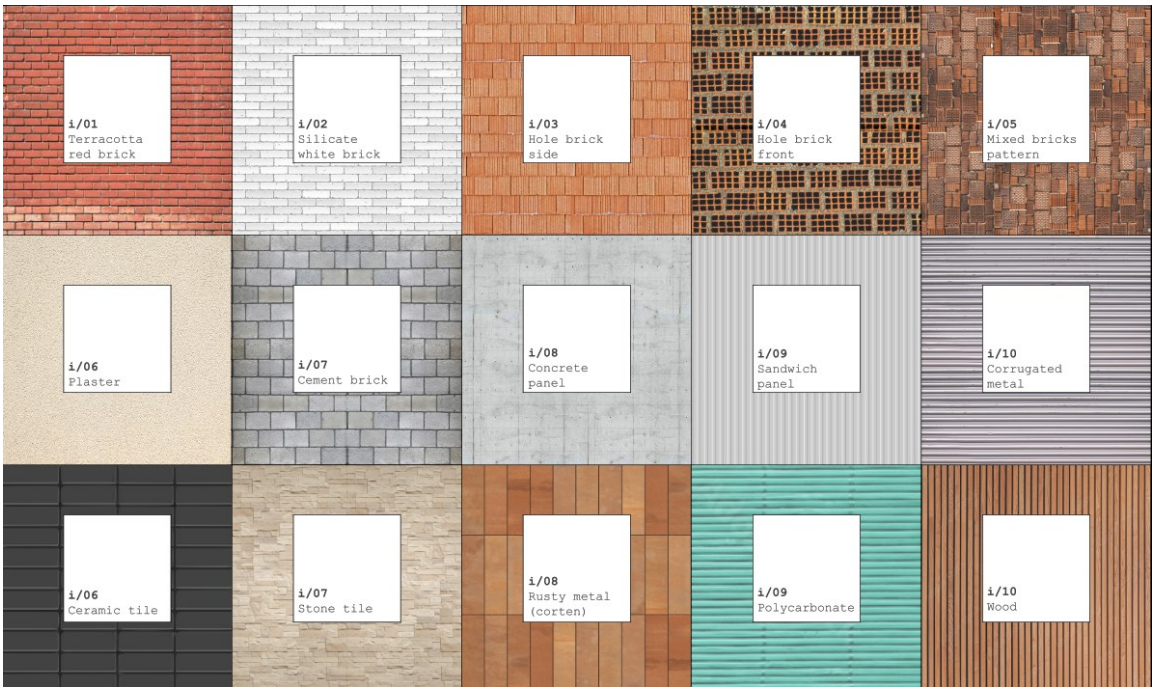


Figure 8. Material transformation diagram. Source: Renis Batalli

The diagram presents samples of façade material transformations, showing how different materials are applied to existing buildings as result of spontaneous interventions. These

transformations operate at the level of surface redefining the visual identity as a result of reconstruction and improvement of insulation to provide comfort to the indoor unit.

A large group of materials is based on **brick variations**, including terracotta, silicate, and perforated bricks, used both structurally and as covering. These often reflect locally available resources and construction practices, while also allowing for patterns, textures and sometimes transparency. Mixed brick compositions show how citizens often do their interventions in patches over a period of time, where materials are combined rather than applied uniformly.

Other interventions involve **industrial or prefabricated materials**, such as concrete panels, sandwich panels, corrugated metal, and polycarbonate. These are typically lightweight, affordable and easy to install, making them suitable for quick adaptations or extensions giving priority to speed and efficiency over permanence.

Finishing materials like **plaster, ceramic tiles, stone, and wood** introduce another layer of transformation, often related to aesthetics, protection, or insulation. In some cases, materials such as rusted steel or metal sheets are signs of improvised solutions.

4.9 Ground floor urban furniture and infrastructure (perspective view)

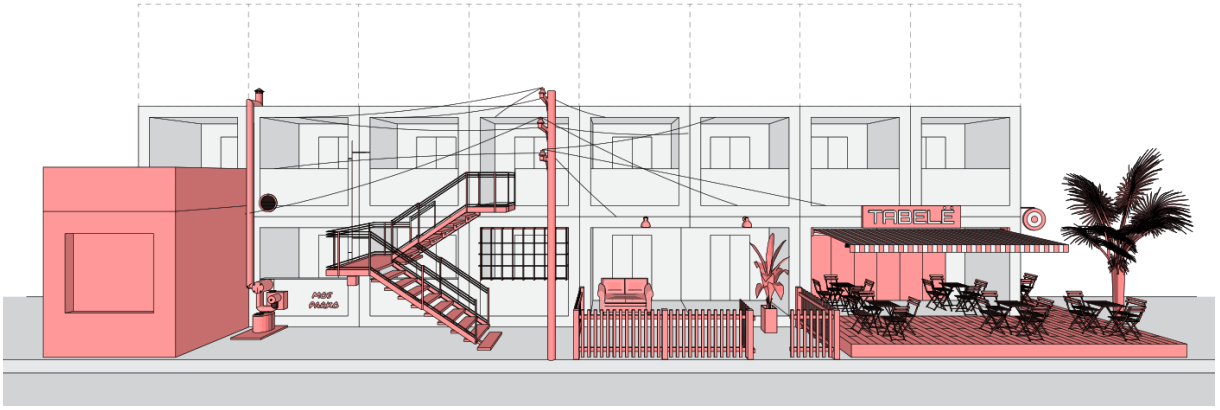


Figure 9. Ground floor diagram. Source: Renis Batalli

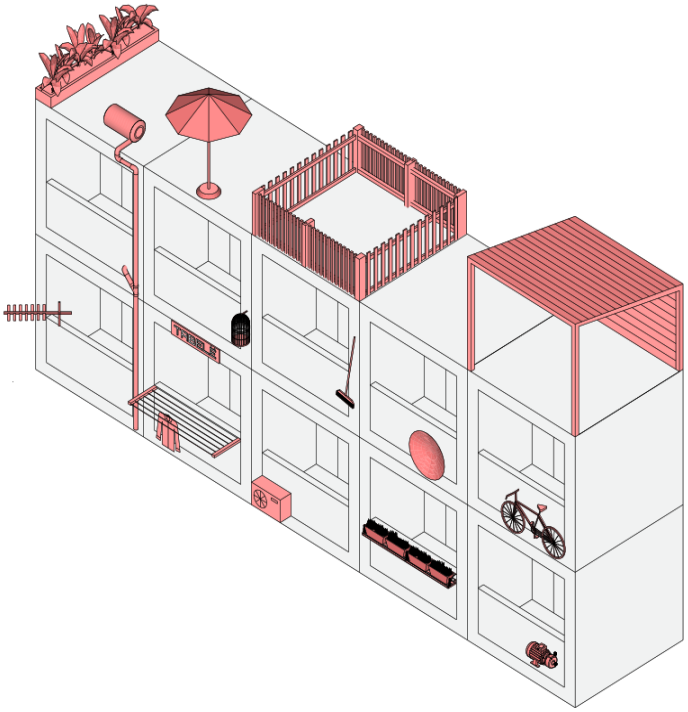
The diagram shows a series of **ground floor interventions** that combine urban furniture, infrastructure, and small architectural additions to transform the relationship between the building and the street. These interventions are positioned directly on the line between private and public, making them very visible and present in social life.

Several elements focus on **access and circulation**, such as the addition of external staircases and platforms. These introduce new vertical connections and redefine how the building is used, allowing for new alternative entrances, often on upper floors. **Infrastructural components** like poles, cables, lighting, and mechanical units allow for new commodities such as electricity and ventilation to improve the living conditions and become part of the visual landscape.

Other interventions activate the ground floor through **semi-private extensions**, including fences, small gardens, seating and enclosures. These create an in-between state between

inside and outside, balancing private life and public space.

Commercial activity is also present, with the addition of **shopfronts, signage, and outdoor seating**, turning the ground floor into a social and economic space. Elements such as terraces, shading elements and vegetation contribute to a more comfortable environment.



4.10 Upper floors urban furniture and infrastructure (perspective view)

In the upper floors, façade and rooftop, elements of urban furniture and infrastructure are less present than the ground level interventions, but visually they occupy a considerable amount of the building's surface. These additions show how everyday needs and technical systems emerge on the outside of the building which is treated like storage space, while upper floors become active and functional areas at service for the inhabitants.

Figure 10. Upper floors diagram. Source: Renis Batalli

Some interventions relate to **domestic use**, such as plants, laundry racks, shading devices, and small storage elements. These introduce showcase everyday life into the façade, making private activities visible from the outside. Objects like bicycles, satellite antennas or hanging equipment show how residents adapt available space to meet practical needs.

Other elements are linked to **infrastructure**, including pipes, cables, lighting fixtures, and drainage systems. These components are not placed by design but convenience, creating a network of visible connections on the building's surface.

At the **rooftop level**, interventions become more spatial, with the addition of terraces, pergolas, fencing, and vegetation. These spaces are often appropriated as extensions of the dwelling or private use, where one unit uses the space on top to extend their living area or areas for leisure. At times they can be common areas for social interaction or cultivation.

4.11 Typologies of transformation

The analysis reveals several recurring typologies:

- **Vertical additions:** Expansion of existing buildings through rooftop extensions, resulting in additional floors and increased height.
- **Horizontal additions:** Extension of existing units along the façade, increasing usable space outward.
- **Ground floor additions:** Expansion at street level through the introduction of structures, extensions or urban furniture.
- **Enclosures:** Conversion of balconies or semi-public areas into enclosed private spaces.
- **Openings:** Modification of existing openings, often enlarged to improve access, light, and ventilation.
- **Change of function:** Transformation of residential units into commercial spaces.
- **Modification of internal layout:** Reorganization of interior spaces by adding or removing walls to create new layouts.
- **Occupation of public space:** Installation of kiosks, structures or extensions within shared or public areas.
- **Infrastructure improvements:** Addition or upgrading of systems such as utilities, drainage, wiring, or mechanical equipment.
- **Changes in color and materials:** Surface interventions with the purpose of improving insulation, repairing façades or altering the building's visual identity.

These typologies demonstrate a consistent logic of maximizing the use of space and improvement of infrastructure within similar conditions.

4.12 Ecological relationships of spontaneous architecture

Just as ecosystems consist of interdependent organisms, informal architecture exists in a system of **spatial interdependence**. This interpretation adopts ecological classifications to interpret architectural relationships, among others:

● A rooftop house blocking a neighbor's light may be **parasitic**.

● Two families sharing a newly built staircase is **mutualism**.

● A kiosk benefiting from foot traffic without disrupting others is **commensalism**.

● An informal shop extension that provides income to the resident while serving the daily needs of the neighborhood could be interpreted as **symbiosis.**

Ecological analogies shift the language from legality/illegality to **coexistence**, **adaptation** and **impact**, allowing a new lens of analyzing these interventions and affect planning decision making whether to reconstruct or demolish the structure.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary of Findings

Informal architecture in post-socialist cities represents more than a lack of formal planning norms. It can be understood as a form of urban metabolism through which cities adapt to changing conditions.

Informal interventions often repurpose existing structures rather than replacing them. This process extends building lifecycles and reduces the need for new construction. In this way, informal architecture operates as a form of adaptive reuse which comes as a direct response to the citizen's needs.

Many interventions merge together private and public space. Street-level additions, kiosks and extensions bring facilities and increase urban activity. Besides the cases when these structures disrupt circulation, when they are not harming their surroundings, the community can benefit from such additions.

5.2 Informal architecture challenges

Informal architecture can often create serious problems because additions are made without proper planning, structural control, or respect for the original building. These interventions may overload the existing structure, reduce natural light and ventilation, block public space, damage the urban image, and create unsafe living conditions for residents. While they may respond to real social and economic needs, their uncontrolled growth can produce fragmented, chaotic, and vulnerable urban environments.

The purpose of this study is not to define informal architecture as a positive or negative phenomenon, but see it objectively and understand what can be learned for future planning.

5.3 Implications for Urban Planning

Despite their adaptive qualities, informal interventions are rarely included in regulatory frameworks. This highlights the need for more flexible planning approaches that can accommodate evolving urban conditions.

The emergent and adaptive nature of informal architecture can be translated as a form of intelligence. Decisions are made by individuals while they collectively produce coherent patterns. This challenges the notion that effective urban design must be centrally planned.

Recognizing informal architecture as a source of spatial knowledge can inform more adaptive planning strategies. Rather than attempting to eliminate informality, planners can engage with it as a resource for innovation and resilience.

5.4 Future Research

Further research could explore:

- Analysis of informal growth patterns.

- Comparative studies across different post-socialist contexts.
- Producing a conceptual framework of filtering interventions through ecological relationships.
- Integration of digital simulations and modelling tools.

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The ground floor as an urban interface: the human-building relationship and the Loss of Urban Contact

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Abstract

Urban design and planning often treat the city as an abstract composition seen from above, giving priority to form, order, and large-scale spatial organization. This is the reason why the experience of the city at street level remains in the background. Within this condition, the ground floor becomes particularly important, since it forms the point of direct contact between the street, the pedestrian, and building. The ground floor in this study is treated as an urban interface by examining how spatial and morphological factors affect the urban environment, the legibility of public spaces and the perception of the pedestrian.

This study focuses on some selected segments in the city of Shkodra, Albania. Shkodra is shaped by the coexistence of several historical layers, transitional conditions, and contemporary interventions. This allows the selected segments to be read comparatively across different urban periods. Based on this, we understand how the building influenced by different periods builds or weakens the relationship with the street and the urban environment. The methodology focuses on direct observation, morphological analysis, photographic documentation. Attention is focused on some specific elements that create an active urban front. These elements have to do with rhythms, relationships between the interior and exterior, the articulation of thresholds, relationships between the building and the public space. These enable some conditions that enable interaction, daily use, stopping, communication.

The analysis suggests that urban fronts characterized by frequent subdivisions, multiple entrances, articulated thresholds, and stronger building street relations tend to support more intense forms of urban contact and public continuity. The urban fronts that belong to contemporary and post-socialist interventions are characterized by monotonous, continuous facades, with edges dominated by services and parking. These conditions weaken the mediating role of the ground floor and reduce the street to a corridor of passage However, the value of the ground floor lies not in its historical from itself, but in its capacity to support presence, legibility at the human scale, exchange, and interaction. In this sense, a more legible, more experiential, more inclusive urban environment comes from the revaluation of the ground floor.

Keywords: *pedestrian experience, urban interface, human scale, street-level urbanism, active front*

1. INTRODUCTION

Modern, post-socialist, contemporary cities focus on presenting the city as a structure seen from above, being designed and organized through plans, schemes and maps. This has led to a neglect of the human scale to see the relationship between people, roads, space, buildings. Attention is focused on the organization of blocks, the road network, the division of services and functions, the density of construction, etc. Of course, these elements also have their importance in urban planning, but this has led to forgetting how the city is experienced by people at street level. An essential part of the quality of urban life is determined precisely by the direct contact that the urban environment has with architecture between human interaction and the conditions that architecture creates for humans.

Brasilia is taken in this case as a significant example of this tension. It is a case known for its strong organization on a large scale. It is read very clearly through the controlled urban structure, the division of plots, functions, major axes, so it is a city that is read through a strict organization of an urban environment (Figure 1). However, the experience of a pedestrian in this case remains weak. This is because architecture and space do not have an intermediate element such as the experience that an active ground floor offers (Figure 2). This means that the city does not always guarantee a connection with everyday experience.

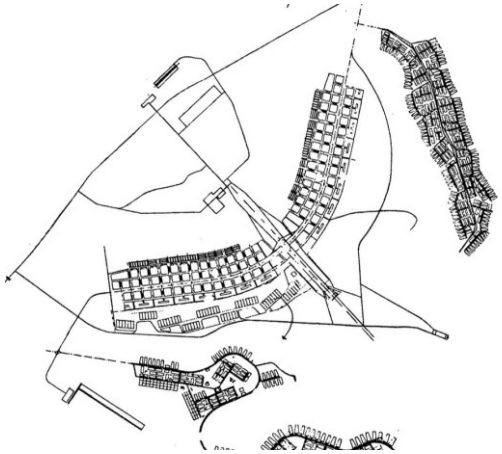


Figure 1. Brasília as an example of large-scale planned urban order.



Figure 2. Brasília urban life

The ground floor is the intermediary point between architecture and the street. It is the moment where the person, the pedestrian, experiences entrances, shop windows, thresholds, activities, porosity, signs of habitation, etc. It is also the moment when the importance or quality of public space is understood. The street becomes more legible when the ground floor takes on meaning through active use. When the ground floor serves only as the base of the architectural structure, with a blind, simplified, closed facade, the street becomes simply a moving corridor, losing the all-encompassing character that it can have when there is active communication with the building.

The idea of this study is based on the idea that the quality of urban life is not only understood by the organization or design of the city and that it looks good when drawn and seen from above, but also by the way it is lived and experienced in everyday life. This is why it should be analysed through micro-relationships, the human scale, daily movement and architectural boundaries. This emphasizes the fact that the ground floor should be a primary architectural element and a very strong part of the urban structure. It plays an important role because it mediates the interior and the exterior, making the building participate in the public life of the city.

In contemporary urban environments, this phenomenon is seen as a problem in this study because through the approach that these cities follow, they have brought about a loss of contact, man-building. The ground floor in these cities is conceived as a passive floor composed of privatized spaces, borders dominated by parking, blind walls. All of these reduce the intensity of the man-building relationship. This effect affects the visual character, comfort, urban readability and the level of activity that is conditioned by the approach that these designed cities follow.

This study focuses on three main objectives: first, to identify the spatial characteristics of active ground floors. Second, to interpret or analyse how these spatial characteristics of these ground floors affect the pedestrian experience and also the daily use of public space. Third, to compare the conception of these ground floors at a time level, i.e. in historical and contemporary conditions, to understand how urban transformation has affected the relationship between street, public space, and building.

Bologna is another significant case in this regard. There the ground floor functions as an important part of the urban structure. The relationship between the building and the public space, in this case, is conveyed through the system of porticos, part of the active movement of pedestrians (Figure 3). UNESCO describes the porticos of Bologna as architectural elements that play an equally important role for the building to which they belong but also for the public space. In this way, Bologna offers a strong typical example of how the ground floor of buildings becomes a mediating element between architecture and public life.



Figure 3. The porticoes of Bologna as a continuous urban interface.

The study is developed more specifically by taking into account the case of the city of Shkodra in Albania. Since Shkodra is a city that consists of a coexistence of inherited and transformed

urban forms, it offers a suitable context due to its strong historical urban structure. This city allows a comparison between road segments where the road-building relationship is intense but there are also road segments where this relationship is weakened.

2. LITERATURE REVIEW

Ground floor as an interface

The ground floor is considered as part of the architecture, with a mediating role that comes into direct contact with the street and the public space. The fact that it has a mediating role between architecture and the urban environment is because there the relationship between the exterior and the interior occurs, there the building addresses the public space, and precisely there it takes material form. For this reason, the character of the ground floor should be understood not only at the functional level but also as an architectural element interacting between the daily life of the city and architecture.

This urban interface does not take meaning only from the presence of various activities. Its quality is determined by the way in which this interface is organized by several mediating activities. Transparency, passages, entrances, stances, thresholds, permeability are those elements that form the scale with which architecture participates in the public aspect. A ground floor becomes part of the urban environment not only because it consists of functions but also because it enables service conditions. When these conditions are not and are missing, the building is disconnected from the street, making it present but not cooperative with the urban environment.

The urban interface also depends on the way the border is negotiated with everyday life. The thresholds that are used, the open doors, the different commercial practices, the forms of overlapping between the interior and the exterior increase the urban contact. This means that the lack of a building should not be perceived as a solid line, but as a zone of passage. In this way, the street is not considered only as a corridor of passage and movement but becomes a point where architecture and public life are placed in a relationship.

Bodily and perceptual experience

Urban space and environment are not perceived the same from above and below. At the level of the human scale, it is perceived by the movement of the body, different distances, visual sequences, etc. This means that the role of the ground floor is to shape what the pedestrian sees, understands and anticipates while walking.

This experience should not be focused on the abstract figure of the pedestrian, as if all pedestrians experience the city in the same way. This is because the street is read and experienced differently by an elderly person, a child, a person with disabilities, or someone who has different needs while walking. This is to show that the ground floor should not be evaluated only by visual vividness but also by the way it functions for different individuals. It should be ready to accommodate different rhythms of movement, presence with different

durations and different forms of bodily comfort.

Another element that is also important is time. An urban front does not function the same at different times of the day. There are fronts that are active only during the period when the shops are open, some are active because they support more continuous forms of presence. This means that urban relationships and contact are not only a spatial condition but also a temporal condition, because not only the form of the urban surface must be taken into account but also the rhythms through which it gains, maintains or loses urban importance at different times.

Speaking of another dimension of this experience, it is also the sensorial one. The street and its edges are perceived through sight, light, shadow, temperature, sound, proximity, texture, etc. Although the ground floors may have similar functions, they create different urban effects depending on the atmosphere they create. There are fronts that are open but perceived as harsh, there are also more modest fronts that are more inviting and welcoming. These are determined by sensorial conditions as they are also what determine whether the path is described or even actually lived.

Urban floor morphology

The ground floor and the street create a relationship through morphology. When an urban edge is articulated through changes, frequent openings, transparency, short intervals, transitions between public and private, diverse depths, it becomes more attractive and interactive. These conditions create moments where attention can be drawn, movement can be slowed down, can be accelerated, where contact can occur. On the other hand, long, monotonous, uninterrupted facades, simplified boundaries, tend to weaken the intensity of the street.

What matters in this comparison is not the age and historical values in this principle but the degree of fragmentation with which the urban front is composed and organized. If we talk about contemporary conditions, edges with fine fragmentation, structured according to smaller plots, produce a better rhythm of use, experience and perception. But the lack of these features in contemporary interventions where urban fronts function as continuous surfaces, where there are few openings and a weak communication with the pedestrian, make this front difficult to perceive, creating a division between architecture and the urban environment. All this means that the discussion is not about the fact of old or new, but about the morphology that creates readability possibilities in urban engagement.

Another specific case is those cases where urban fronts are read through activities but that they are simply service fronts. In some contemporary cases, the ground floor consists of the technical infrastructure of the buildings. These are mainly: ramps, warehouses, garage entrances, service areas, etc. Of course, in these cases the ground floor meets the street physically but not perceptually. These functions serve the building within it, automatically transforming the ground floor into a technical barrier.

The fact that cases belonging to the past are taken as good examples is because they preserve

more suitable conditions in the relationship between the road and the building. Their quality and value are seen in the articulation of entrances, small plots, the presence of various activities and services, making the urban front more legible and descriptive. This means that historical forms do not need to be copied, but it is suggested that contemporary urbanism should recover these principles without falling prey to nostalgia. This becomes a challenge, not to reproduce historical images but to produce ground floors that strengthen the urban role of the road.

3. METHODOLOGY

This study aims to analyze and examine how the ground floor principle creates the relationship between the street, the person, the building and the urban everyday. The methodology focuses on how the urban interface affects the legibility and use of public space through its morphological, spatial and perceptual character.

The research focuses on different segments in the city of Shkodra. These segments belong to different historical periods and this is a way to see and visually compare these periods. The relationship in these segments is presented as strong, intermediate and weakened.

The analysis consists of four complementary methods:

The first method is concerned with the selection of segments and their morphological reading, in order to identify the spatial characteristics of the ground floor. Attention is focused on the rhythms of the plots, frequent entrances, the degree of continuity or discontinuity of the facade, the articulation of thresholds, and the relationship between the edge of the building and the public space. Through this, we understand which fronts are more fragmented and which are less, as well as which ground floors play an intermediary role and which are dominated by functions and services.

The second method is concerned with the direct observation of pedestrian use. This is to understand how urban fronts are experienced in practice. The observation focuses on movements, stops, stances, expectations, interactions and how people select or avoid a certain street edge. This is a way to understand that the ground floor is not only valued through the form it offers but also through the ability of this urban front to invite or to expect different rhythms of use.

The third method has to do with temporal observation, this to understand that the urban role of the ground floor is different in different periods of time. The selected segments are also read through the rhythm of daily activity. This allows the distinction between fronts that maintain a social presence and those whose social presence depends on specific commercial hours.

The fourth method has to do with photographic documentation in different periods of time to support the analytical reading in this way. Actual photography and photographic documentation are read in relation to each-other; to see how different conditions of urban

interfaces offer different levels of urban legibility, public contact and continuity. This comparison is not made to idealize historical form, but to identify those morphological principles that articulate a strong connection between architecture and street life.

4. RESULTS AND DISCUSSIONS

Since Shkodra was taken as a case study for this concept, then the analysis begins in the early period of the city, where based on some old photographs found, especially those of the bazaar but also of different segments in the city, it is clearly understood that the ground floor has been a very important part of the city, active and constituent of the urban structure. In this very important intermediate area, the exhibition of goods, entrances, observations, stops, interactions took place (Figure 4). The presence of shelters and large covered spaces, the high frequency, rhythm and energy, create a describable and quite readable urban front. It is clearly visible how economic and social life develops in direct contact with the street. It is understood that in this early period the building enters public life. From this, the street does not function only as a passage corridor but as a space where movement, posture, interaction coexist organically.

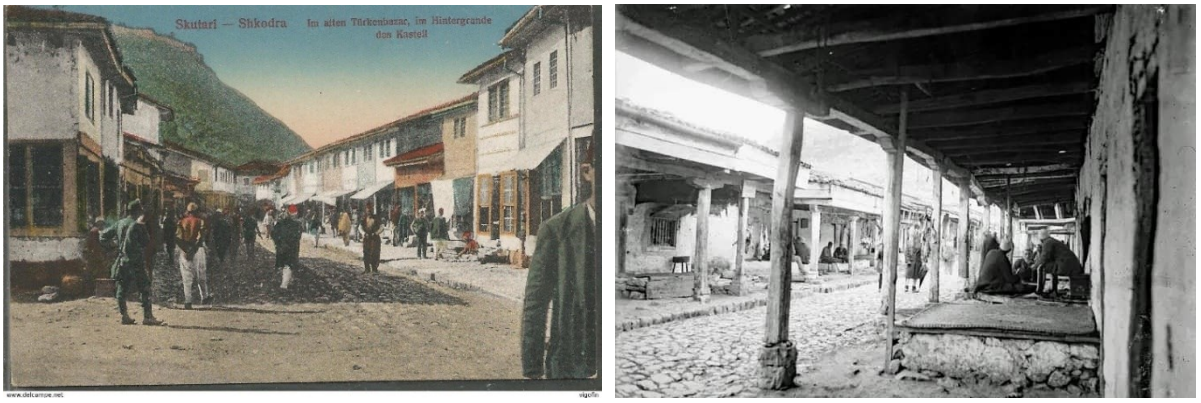


Figure 4. Ground floor activity in the historical fabric of Shkodra.

Active curtain floors and urban continuity

The presence of historical streets in Shkodër, preserved and lived every day, makes this analysis easier to understand all the typologies of street segments that we can place opposite each other. Historical streets show that the ground floors continue to be active. These streets are characterized by active facades, where the street is not simply a passage line but is like a livable border, often inviting to stop and interact. Small stairs, exposed double-sided fronts, old house courtyards, small urban rooms, thresholds, help and influence the mediation between public and private spaces. These elements remove the border between the building and the street, allowing an urban contact that is both spatial and social. The effect of this concept is not only related to the commercial effect but also to the feeling that the street is inhabited. The streets studied for this case are 2 historical streets. Kole Idromeno Road and Gjuhadoli Road (Figure 5).



Figure 5. Ground floor activity and relationship with public space on Gjuhadol Street.

Passive fronts and loss of contact

On the other hand, the new street conditions offer a weaker relationship between architecture, street and people. Long monotonous facades, with fewer openings, very few activities, borders dominated by parking lots, or ground floors simply as residential spaces but with zero contact with the street, have reduced the relationship between architecture and pedestrian life. These are signals given to the pedestrian that he simply has to walk, that there is no reason to stop and fewer opportunities for socialization or interaction (Figure 6).

This weak contact has several consequences. This weakens the continuity of the public sphere, allowing a separation between the built form and circulation and movement. Secondly, urban legibility becomes more difficult, because the street does not communicate with the use. Thirdly, it reduces the capacity of the ground floor to accommodate informal social life. In this way we have less pedestrian involvement. Selected road segments: Lushnje Congress Street and Baja e Vogel Street, Shkoder.



Figure 6. Selected street segments on Congress of Lushnje Street and Baja e Vogël Street, Shkoder, showing more passive ground-floor

The role of adjacent open spaces

Active ground floors are strengthened when they come into contact with small squares, open spaces and extended sidewalks. These spaces are important because they create opportunities and conditions for stopping, extended use, meetings. The combination of the two elements of active facade and small spaces gives meaning to both, and while one without the other often remains underused and simply transient.

Beyond nostalgia

All this is not to blindly evaluate a historical city. The value of the ground floors does not lie in the fact that they belong to the past but rather in showing the relationship that has been more direct and stronger between man, the street and the building. All those elements mentioned above that make a public space more lively and expansive, favor a pedestrian who reads, perceives and experiences the city. These are the qualities that must be re-evaluated today. This means that the goal is not the copy of historical forms as an image but rather the understanding of logic and re-application today in ways that belong to the time. Therefore, for contemporary construction this is a challenge, since these principles must be applied in new social, architectural, and economic conditions. Then this principle plays a very important role so that the road is no longer just a transit element, or passage corridor, but rather a lived space and an extended public space.

5. CONCLUSIONS AND RECOMMENDATIONS/IMPLICATIONS

This study analyzes and argues that the ground floor should be understood as a fundamental urban interface. This to strengthen an important relationship for the city, man-street, building. Taking into study 3 different segments in the city of Shkodra, makes us understand the important role that the ground floor gives to the street, the liveliness and above all the contact man-building when he is on the street. So, this principle contributes to urban continuity, the inclusion of the pedestrian in the urban environment, to the legibility of the public space. On the other hand, passive fronts only produce monotony, separation, loss of contact and simple passability.

Contemporary urbanism must definitely aim at building livable, more humane, more inclusive spaces by paying more attention to the articulation of fronts, the quality of thresholds, and the relationship between buildings and the adjacent public space, to understand that the city must be made of the cooperation that all elements have with each other and not simply fill the void without an intermediary element, leaving man uninvolved.

Several design approaches are understood from the study. First, legible entry points should be frequently highlighted. Second, private and public spaces should definitely be mediated and not live separately and disconnected from each other. Third, street-level design should be connected to daily use in a very active way. Fourth, open spaces should be connected to the boundaries that surround them by creating a common reading language, so that they do not simply appear as isolated gaps.

Further study regarding this principle will involve expanding the number of segments that will be taken as case studies, including interviews with passersby, but also making comparisons between Shkodra and other cities in Albania and abroad. That is, with cities that have undergone transformations, in order to see the role that these transformations have had in the way the city was formed. This would help to understand how different models of development or transformation affect the contact that the street has with the building.

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Urban Blueprint and Compatible Growth:

A Multi-Scalar Morphological Method for Sustainable Transformation in Erseke, Albania

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Abstract

Urban transformation can weaken a town when expansion interrupts the spatial relationships that support its identity, accessibility, and everyday functioning. This paper develops a multi-scalar morphological method for Erseke, Albania, aimed at converting inherited urban structure into generative rules for compatible growth. The study reads the town through network hierarchy, public and functional systems, landscape edges, and building grain. These layers are interpreted through urban granularity, morphological continuity, and bounded fractal diagnostics. Fractal analysis is used only where scaling or self-similar tendencies can be identified; other differences are treated as changes in grain, density, hierarchy, or aggregation. The extracted relations are organized as a morphological grammar composed of nodal hierarchy, connective lines, grid alignments, proportional fields, and seed structures. Rhino and Grasshopper are used to implement the rules and generate alternative scenarios of urban growth. The scenarios are compared through morphological continuity, connectivity, accessibility, and functional balance. The results suggest that the method is strongest when it acts as a translation framework between urban analysis and design rather than as a universal mathematical model. It allows future growth to remain connected to the inherited spatial structure while admitting variation, programmatic change, and controlled densification.

Key words: *Urban Morphology, Urban Blueprint, Granularity, Morphological Grammar, Compatible Growth, Spatial Accessibility*

1. INTRODUCTION

Urban change is not problematic because cities transform. It becomes problematic when transformation breaks the spatial relationships that allow a settlement to remain legible, accessible, and functionally balanced. This problem is especially visible in smaller towns, where inherited street structures, plot rhythms, public spaces, landscape edges, and built grain are still readable as a coherent system. In these contexts, even modest expansion can produce rupture if it ignores the logic of the existing urban fabric.

Erseke, Albania, offers a useful case for this question. The town has a recognizable relation between street hierarchy, block structure, public-space distribution, building grain, and surrounding landscape. These components are not isolated features. They operate together as an urban structure that has accumulated through time. The issue is therefore not only how to describe the town, but how to translate the observed structure into design rules that can guide future growth.

This paper uses the term urban blueprint to describe a documented set of recurrent spatial relationships within the settlement. The term is used operationally: it refers to the measurable and interpretable relations among streets, plots, public spaces, landscape edges, and built fabric. It does

not imply a fixed essence. The aim is to identify which morphological relations support continuity and can be extended, transformed, or recombined in future scenarios.

The research is positioned between urban morphology, scale-sensitive analysis, and rule-based design. Urban morphology provides the basis for reading inherited form as an active structure rather than a passive background [1]–[4]. Granularity and urban grain provide a clearer vocabulary for describing differences of size, density, texture, and aggregation across scales [5], [6]. Fractal analysis is used more narrowly as a diagnostic method for identifying scaling behaviour and possible self-similarity where such properties are actually present [7]–[10]. Shape grammar and procedural modelling then provide a way to translate the reading into generative rules [11]–[13].

The central research question is: how can the inherited morphological structure of Erseke be translated into a rule-based framework for compatible and sustainability-oriented urban transformation? Three supporting questions organize the paper: which multi-scalar morphological relations define the town's urban blueprint; which of these relations can be read through grain, hierarchy, and bounded scaling; and whether scenarios generated from the extracted rules perform better than unguided expansion in terms of continuity, connectivity, accessibility, and functional balance.

The contribution of the paper is methodological. It does not argue that urban form is mathematically fractal in a strict sense. Following the caution that cities can be treated, at most, as pre-fractal systems within limited scaling ranges [10], the paper uses fractal diagnostics only as one layer of interpretation. The main contribution is the translation of

multi-scalar morphological reading into a computational grammar that can generate and compare alternative growth scenarios.

2. LITERATURE REVIEW

2.1 Urban morphology, urban grain, and granularity

Urban morphology offers the most direct foundation for this study because it treats urban form as an accumulated structure composed of streets, plots, buildings, blocks, and open spaces. Conzen's town- plan analysis showed that the plan of a town can be read through the relationship among streets, plots, and building arrangements, and that earlier frameworks continue to influence later change [1]. Moudon extended this view by defining urban morphology as the study of the form of human settlements and the formation and transformation of their components across time and scale [2].

The concept of urban grain is important because it describes the texture and resolution of the built fabric. Fine grain, coarse grain, parcel rhythm, block size, building spacing, and street spacing all influence how a city can absorb new programs. Granularity is therefore a more accurate term for many of the phenomena examined in this paper: it refers to how urban elements are distributed and differentiated at different levels of resolution. It is not simply a visual attribute. It affects walkability, adaptability, access, density, and the capacity of the urban fabric to change without losing coherence [4]–[6].

Kropf and Oliveira show that morphological analysis becomes operational when it moves from visual description to structured comparison of urban tissues, types, and scales [5], [6]. This supports a method in which Erseke is not treated as a single outline or image, but as a layered system. The relevant units are the street network, plot and block structure, built grain, functional nodes, green spaces, and landscape edges. Their relationships provide the material from which the urban blueprint is constructed. Recent morphometric work further supports this shift from description to measurement, showing how street-network complexity and urban tissue characteristics can be compared through computational indicators [21], [22].

Urban continuity in this framework does not mean formal imitation. It means preserving or extending the hierarchy, grain, access structure, and spatial relationships that allow the town to function as an integrated whole. Lynch adds a perceptual dimension to this argument through paths, edges, nodes, districts, and landmarks [3]. Jacobs adds a functional dimension through mixture, short blocks, fine grain, and distributed activity [4]. Together, these works show that compatible growth must be evaluated through spatial relations rather than visual resemblance alone.

2.2 Scaling and bounded fractal diagnostics in urban form

Fractal geometry entered urban studies because cities often contain irregular yet organized spatial patterns. Mandelbrot introduced fractal geometry as a way to describe forms that are complex, nested, and resistant to simple Euclidean measurement [7]. Batty and Longley

applied this reasoning to urban form and argued that settlement structures can show measurable scaling properties in their physical and functional distributions [8]. Frankhauser further developed the use of fractal approaches for analysing the spatial organization of urban agglomerations and the distribution of activities across scales [9].

The relevance of fractal analysis is therefore diagnostic, not rhetorical. It can help identify whether certain layers of urban form show scaling behaviour, hierarchy, clustering, or self-similarity within a specified range. It should not be used as a general label for all multi-scalar analysis. A change from the town scale to the block scale, by itself, is a question of granularity. It becomes a fractal question only when there is evidence of self-similar or scale-related structure across levels.

This distinction is central to the present method. Tannier et al. use fractal approaches to identify urban boundaries and to compare fractal and non-fractal urbanization scenarios in terms of accessibility [14], [15]. Their work is valuable not because it treats all urban space as fractal, but because it tests what fractal organization can and cannot improve. Their accessibility study shows that fractal scenarios may improve access to open spaces while producing different outcomes for shops and services depending on land-use configuration [15]. This supports a cautious interpretation: fractal logic can be useful where it is linked to explicit spatial performance, but it does not automatically produce better urban design.

Chen similarly argues that urban form should be treated as pre-fractal rather than perfectly fractal, and that fractal properties are valid only within certain scaling ranges [10]. This paper follows that position. Fractal dimension is used as a bounded diagnostic indicator for scaling and complexity; it is not treated as a score for urban quality. Where self-similarity is not demonstrated, the paper uses the more appropriate concepts of grain, hierarchy, aggregation, density, and spatial resolution.

2.3 Morphological grammars and rule-based design

The step from analysis to design requires a rule system. Alexander's pattern language framed spatial knowledge as recurring relations that can guide design without prescribing a single form [11]. Stiny's shape grammar formalized a related logic through rule-based transformations of shapes [12]. In both cases, the important point is that design knowledge can be expressed through relations and operations rather than copied forms.

Procedural modelling extends this logic computationally. Parish and Müller's work on procedural city modelling shows how streets, parcels, and buildings can be generated through rule systems that combine global goals and local constraints [13]. In urban design, this is useful because growth rarely depends on one rule. It depends on multiple constraints: topography, inherited roads, access, density, public space, functional distribution, and development priorities. Duarte's study of Siza's Malagueira housing further demonstrates that continuity in a large project can be achieved through a consistent grammar of relations rather than repeated formal copying [20].

For Erseke, the grammar is not imported from an external model. It is derived from the town's own morphological reading. The extracted relations become point rules, line rules, grid rules, and seed rules. Point rules define nodal hierarchy and intensity. Line rules define continuity, connection, and movement. Grid rules define proportional fields and orientation. Seed rules define local growth structures that can be expanded, rotated, and recombined. This makes the grammar testable and adjustable rather than merely descriptive.

2.4 Spatial sustainability, accessibility, and functional balance

Sustainability in this paper is addressed through spatial organization. This does not replace environmental simulation, but it provides a relevant set of proxies for early urban design scenarios. Hillier and Hanson showed that spatial configuration shapes movement, encounter, and social use [16]. Sevtsuk and Mekonnen developed Urban Network Analysis measures such as reach, gravity, closeness, straightness, and betweenness, which make it possible to compare accessibility and connectivity across design alternatives [17].

Transport and land-use research also supports the use of spatial criteria. Cervero and Kockelman showed that density, diversity, and design influence travel behaviour [18]. Ewing and Cervero's meta- analysis confirmed that the built environment affects walking, vehicle travel, and accessibility outcomes [19]. In the present study, scenario performance is therefore assessed through morphological continuity, connectivity, accessibility to public and green functions, and balance among residential, collective, commercial, and open-space uses.

The literature suggests a clear methodological position. Urban morphology provides the base reading; granularity explains differences of grain and aggregation; fractal diagnostics are used only where scaling or self-similarity can be supported; and rule-based modelling translates these readings into design alternatives. This is the framework used for Erseke.

Table 1. Conceptual position of the method

Concept	Role in the paper	Main use	Risk if misused
Urban morphology	Base analytical framework	Reads streets, plots, blocks, public spaces, and building grain	Can remain only descriptive if not translated into rules
Granularity / urban grain	Primary vocabulary for scale differences	Describes grain, density, aggregation, and spatial resolution	Can become vague if not tied to observable elements
Fractal diagnostics	Bounded analytical layer	Tests scaling, hierarchy, and possible self-similarity within limits	Can become overclaim if used as a universal metaphor
Morphological grammar	Generative translation tool	Converts observations into point, line, grid, and seed rules	Can become arbitrary if rules are not derived from site evidence

3. METHODOLOGY

3.1 Research design

The research is case-based and mixed-method. It combines qualitative morphological reading, scale- sensitive interpretation, bounded fractal diagnostics, and computational scenario generation. The purpose is not to prove that the town is fractal. The purpose is to test whether a structured reading of inherited morphology can be translated into a rule system for compatible growth.

The work follows four stages. First, the urban structure of Erseke is read across network, system, landscape, and building-grain layers. Second, the relationships among these layers are interpreted through granularity, hierarchy, and bounded scaling. Third, the extracted relations are translated into a morphological grammar. Fourth, alternative scenarios are generated in Rhino and Grasshopper and compared through spatial-performance criteria.

3.2 Case study selection: Erseke

Erseke was selected because its urban structure remains legible. The settlement is small enough for street hierarchy, block structure, public-space distribution, building grain, and landscape edges to be read together. At the same time, the town is not static. It faces the same planning problem common to many smaller settlements: how to accommodate growth and functional change without weakening the inherited spatial structure.

The case is useful because inappropriate expansion in such contexts becomes visible quickly. When the existing grain is clear, a rupture in hierarchy, block rhythm, access, or landscape relation can be identified directly. This makes Erseke an appropriate setting for testing a method based on compatibility rather than maximum expansion.

3.3 Data sources and base mapping

The study uses historical maps, current cartographic information, satellite imagery, field-based observations, and project-based drawing material. The base mapping is organized into four analytical layers: network structure, public and functional systems, landscape and green-space relations, and building grain. Each layer is read separately and then compared with the others to identify overlaps, discontinuities, and structural dependencies.

The network layer includes primary and secondary routes, local access streets, directional continuities, and points of convergence. The public and functional layer includes civic spaces, activity nodes, commercial concentrations, collective uses, and public-space hierarchy. The landscape layer includes topographic edges, green spaces, and the relation between built fabric and open territory. The building-grain layer includes parcel rhythm, building spacing, block size, and density concentration.

3.4 Urban blueprint extraction

The urban blueprint is extracted from recurrent spatial relations rather than from visual

appearance. At the network level, the analysis identifies branching tendencies, connective hierarchy, and directional continuities. At the public-system level, it identifies the distribution of activity nodes and the relation between public spaces and movement. At the landscape level, it identifies edges, thresholds, and green continuities. At the building-grain level, it identifies parcel rhythm, block size, density clusters, and changes in spatial resolution.

The purpose of extraction is selective. Not every existing condition should be preserved. Some inherited relations may support continuity, while others may restrict future accessibility or functional balance. The method therefore distinguishes between relations to extend, relations to adapt, and relations to correct.

3.5 Granularity and bounded fractal diagnostics

Granularity is used to describe how the town changes in resolution across scales. This includes the shift from territorial landscape to urban block, from block to parcel, from parcel to building, and from street hierarchy to local access. These shifts are evaluated through grain, spacing, clustering, and aggregation.

Fractal diagnostics are used only after the granular reading has identified candidate relations that may display scaling or self-similar behaviour. The diagnostic layer tests whether certain patterns repeat, transform, or cluster across scale ranges. Fractal dimension is treated as a calibration aid for spatial complexity and not as an independent measure of urban quality. A high or low value does not automatically validate a design scenario. It only helps interpret how intricacy and occupation are distributed across the mapped field.

3.6 Translation into morphological grammar

The extracted relations are translated into a morphological grammar composed of four rule families. Point rules define nodal hierarchy and programmatic intensity. Line rules define connectivity, movement continuation, and edge relation. Grid rules define base organizational matrices, orientation, and proportional fields. Seed rules define local growth structures that can be expanded, repeated, rotated, or combined.

The grammar is not a fixed design. It is a set of operations. The same grammar can produce different outcomes depending on the priority assigned to continuity, accessibility, density, public space, or functional mix. This is important because a compatible planning method should not produce only one future. It should produce a controlled field of alternatives that remain tied to the same inherited structure.

3.7 Computational execution

The grammar is implemented in Rhino and Grasshopper. Base grids and proportional fields are aligned with the town's existing orientations and landscape conditions. Selected grids are rotated, scaled, and overlapped to locate point concentrations and latent connective structures. These point concentrations are interpreted as possible hierarchy: civic nodes, green nodes, mixed-use anchors, or transition points between old and new fabric.

Line structures are then generated from the point hierarchy and tested against the existing network. The model does not deliver an optimized masterplan. It produces a set of spatial frameworks in which the same morphological rules can be weighted differently. This allows the design process to compare alternatives rather than defend a single predetermined result.

3.8 Scenario construction

Three scenarios are constructed from the same rule base. Scenario A, continuity-first growth, prioritizes extension of inherited hierarchy and grain with minimal disruption. Scenario B, accessibility-first growth, prioritizes redistribution of public, green, and civic nodes to improve reach across the settlement. Scenario C, balanced mixed-use expansion, combines continuity, functional diversification, controlled densification, and public-space distribution.

Using the same grammar for all three scenarios makes the comparison more meaningful. The difference among scenarios is not the source of the rules, but the weighting of priorities. This allows the study to test whether the method can support different planning choices while preserving morphological compatibility.

3.9 Evaluation criteria

The scenarios are evaluated through four criteria. Morphological continuity assesses how well inherited hierarchy, grain, landscape relation, and settlement logic are preserved or extended. Connectivity assesses whether the generated network strengthens movement structure without producing isolated fragments. Accessibility assesses the reach and distribution of public, green, and mixed-use functions. Functional balance assesses the relationship among housing, collective uses, commercial activities, civic functions, and green spaces.

These criteria are spatial proxies for sustainability. They do not measure energy performance, carbon impact, or environmental comfort. They evaluate whether the spatial structure of growth supports walkable access, coherent movement, functional distribution, and continuity of urban fabric.

3.10 Methodological limits

The method has three limits. First, extracting an urban blueprint involves interpretation; another analyst might select or weight the relations differently. Second, fractal diagnostics are bounded and cannot replace morphological analysis. Third, sustainability is addressed through spatial performance, not through full environmental simulation. These limits define the scope of the paper and prevent the method from claiming more than it can demonstrate.

4. RESULTS AND DISCUSSIONS

4.1 Reading Erseke's inherited spatial logic

The analysis identifies Erseke as a settlement with a clear inherited spatial order. At the network level, the town is organized by a branching and partly radial connective logic rather

than by an orthogonal grid. Primary routes structure access and orientation, while secondary and local streets form a finer layer of distribution. The hierarchy is visible enough to guide expansion, but vulnerable to disruption if new growth is imposed without reference to existing movement patterns.

At the public and functional level, activity is not evenly distributed. Civic, commercial, and public- space functions concentrate around recognizable nodes and corridors. This produces a readable structure, but it also creates areas where access to collective functions can be improved. At the building-grain level, parcel rhythm and built density show enough consistency to define a recognizable urban fabric. Changes in grain are present, but they occur as transitions rather than random breaks.

The landscape relation is also significant. Erseke's built fabric is not detached from its topographic and open-space context. Edges, views, green spaces, and the surrounding terrain influence how the town can expand. Growth scenarios that ignore these relations risk producing spatial rupture even if they preserve street alignment.

4.2 Granularity, hierarchy, and bounded scaling

The granular reading clarifies which aspects of the town should be understood as differences of resolution rather than as fractal properties. The shift from main routes to local streets is primarily a hierarchy of movement. The shift from large blocks to smaller parcels is a question of grain. The distribution of public nodes is a question of clustering and accessibility. These elements are multi- scalar, but they are not automatically fractal.

Bounded fractal diagnostics are most relevant where repeating tendencies and proportional relations appear across different layers. For example, branching network tendencies, nested node structures, and repeated transitions between built density and open space can be tested as scaling phenomena. Where such evidence is weak, the analysis remains within the vocabulary of granularity and morphology. This distinction improves conceptual clarity and makes the method easier to defend academically.

4.3 Translation into a generative system

The translation from reading to generation is the main methodological step. The morphological blueprint is converted into a grammar composed of points, lines, grids, proportional fields, and seeds. Points define possible centres of intensity. Lines define connection, continuation, and movement. Grids define orientation and proportional structure without imposing a rigid external order. Seeds define local growth units that can be adjusted according to site conditions.

In computational terms, overlapping and rotated fields generate differentiated point concentrations. These are not treated as automatic design answers. They are interpreted through the existing hierarchy, landscape relation, and functional needs of the town. The resulting grammar acts as a controlled design scaffold: it limits arbitrary expansion while still allowing multiple futures to be generated.

4.4 Scenario generation and spatial outcomes

Scenario A, continuity-first growth, extends the inherited movement structure and protects the existing grain. It performs strongly in morphological continuity because new growth follows recognizable alignments, edge conditions, and hierarchical relations. Its limitation is that it does not sufficiently redistribute public and green functions toward underserved areas.

Scenario B, accessibility-first growth, reorganizes the public-space and green-space system through a more distributed nodal structure. It improves reach to civic and open-space functions and creates a stronger network of public anchors. Its limitation is that some new connections create tension with the inherited grain and require careful design to avoid fragmentation.

Scenario C, balanced mixed-use expansion, combines continuity, accessibility, functional diversification, and controlled densification. It does not produce the highest performance in every single criterion, but it performs consistently across all four. Housing, public functions, commercial activity, and green infrastructure are distributed in a way that remains connected to the inherited town while increasing programmatic intensity.

Table 2. Comparative reading of the three scenarios

Scenario	Morphological continuity	Connectivity	Accessibility	Functional balance
A. Continuity-first growth	Strong. Extends inherited hierarchy and grain.	Medium to strong. Follows existing movement logic.	Medium. Limited redistribution of public and green functions.	Medium. Conservative growth limits programmatic diversity.
B. Accessibility-first growth	Medium. Some friction with inherited grain.	Strong. Creates new links and nodal reach.	Strong. Improves access to civic and green nodes.	Medium to strong. Depends on land-use calibration.
C. Balanced mixed-use expansion	Strong. Maintains main inherited relations.	Strong. Reinforces network without major rupture.	Strong. Distributes public, green, and mixed-use anchors.	Strong. Combines housing, collective uses, commerce, and open space.

4.5 Comparative discussion of performance

The comparative reading shows that the value of the method is not the identification of a single best form. Its value is the capacity to generate different alternatives from the same inherited logic. Scenario A demonstrates how continuity can be protected. Scenario B demonstrates how accessibility can be improved. Scenario C demonstrates how continuity and functional performance can be combined through balanced weighting.

The results also show why methodological caution is necessary. The scenarios cannot be justified by a fractal value alone. Their performance depends on how network continuity, grain, access, public- space distribution, and land-use balance interact. Fractal diagnostics help identify scaling tendencies and structural hierarchy, but the design argument is ultimately morphological and spatial- performance-based.

This position aligns with the literature. Tannier et al. show that fractal scenarios can improve

some forms of accessibility while producing trade-offs in others [15]. Similarly, the Erseke scenarios suggest that spatial structure must be evaluated through multiple criteria. A scenario can be coherent morphologically and still weak in functional distribution. Another can improve access while creating tension with inherited grain. Compatible growth requires the balancing of these criteria rather than the maximization of one.

4.6 Discussion in relation to the research questions

The first research question asked which morphological relations define Erseke's urban blueprint. The answer is a combination of branching network hierarchy, public and functional clustering, building grain, landscape edges, and transitions between dense and open structures. These relations form the basic structure that any compatible growth scenario should address.

The second research question asked how these relations can be translated into rules. The method translates them into point, line, grid, and seed rules. These rules make the reading operational. They allow morphological observations to become design instructions that can be tested, adjusted, and recombined.

The third research question asked whether the generated scenarios perform better than unguided expansion. Within the limits of spatial proxy evaluation, the scenarios show stronger coherence than an externally imposed or arbitrary growth pattern. They maintain a relation to inherited hierarchy, improve or preserve connectivity, and make functional distribution explicit. The results therefore support the method as a planning framework for compatible transformation.

5. CONCLUSIONS AND RECOMMENDATIONS

This paper developed a multi-scalar morphological method for sustainable transformation in Erseke, Albania. The study began from the problem of compatible growth: how a town can accept new

programs, densities, and spatial demands without breaking the structure that makes it legible and functional. The answer proposed here is not formal imitation, but rule-based continuity.

The analysis showed that Erseke has a recognizable urban blueprint composed of network hierarchy, public-space distribution, building grain, landscape relation, and functional clustering. These relations can be read through urban morphology and granularity. Bounded fractal diagnostics can add value where scaling, hierarchy, or self-similar tendencies are observable, but they should not replace the morphological reading or be used as a universal explanation.

The main contribution is the translation of the reading into a morphological grammar. By converting observed relations into point, line, grid, and seed rules, the method creates a bridge between analysis and design. The resulting scenarios are not copies of the existing town. They are variations generated from its spatial logic. This allows growth to be structured

from within the inherited system while still allowing new functional and spatial possibilities.

The scenario comparison suggests that compatible transformation depends on balancing four criteria: morphological continuity, connectivity, accessibility, and functional balance. Continuity-first growth protects inherited structure but may underperform in functional redistribution. Accessibility-first growth improves public reach but can create tension with inherited grain. Balanced mixed-use expansion performs most consistently across the criteria because it combines continuity with programmatic and public-space distribution.

The research has clear limits. The extraction of an urban blueprint includes interpretation. Fractal diagnostics are partial and bounded. Sustainability is addressed through spatial proxies rather than full environmental simulation. Future research should therefore add quantitative network analysis, comparative testing against non-rule-based expansion models, and environmental performance evaluation. The framework could also be tested in other Albanian towns to understand whether similar methods can support growth in settlements with different histories, landscapes, and urban grains.

The broader conclusion is that small-town growth does not need to be treated as a choice between preservation and rupture. A carefully interpreted morphological structure can become a generative framework. In Erseke, compatible growth can emerge as controlled variation within inherited spatial logic.

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Examining the Internal Anatomy of Socialist-Era Hotels in Albania:

Spatial organisation, Geometry, Structure, Circulation, and Function

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Abstract

In Socialist Albania, the hotel facilities were created under a controlled planning and design process. The aesthetics of exterior, the ideological significance and the development of these accommodation structures, built between 1945 and 1990 have been a subject of studying by scholars and professionals, while the internal organization and spatial layout has been perceived as separate and in the territory of Albania, remains underexplored. This study sheds attention to the architectural anatomy of selected case studies of socialist hotels, with the purpose of comprehending the distribution of functions, circulation spaces, the communication with the access points and examine the relation of the presented geometry with the spatial configuration. The study focuses on understanding the correlation of the analytical component of geometrical configuration, structural matrix, space utilization, access and circulation, with their impact on shaping the spatial configuration of hotels. In order to achieve this, the research proceeds with a comparative diagrammatic method that abstracts the plans into logical analytical schemes, including geometry, structural grids, access and entrances, circulation paths and functions. This approach allows structures of different sizes and designs to be compared while preserving the fundamental logic of each project.

The results show a common rational design strategy based on functional differentiation, modular structural systems, and regulated geometries. the three cases do not conform to a single standardized spatial model. While the structural matrices exhibit varying degrees of regularity and adaptation to the architectural form, their geometrical arrangements produce unique spatial and organizational patterns. Accessibility and the distribution of functions are directly impacted by entrance and circulation systems, which vary from centralized layouts to branched and primarily linear networks. The examination of space usage also exposes many methods for dividing housing, public, service, technical, and circulation areas as well as for concentrating or distributing served and serving spaces.

The paper shows how comparative diagrams can expose both recurrent principles and design variants throughout socialist hotel architecture by refocusing attention from architectural image to underlying spatial logic. The proposed framework provides a systematic method for documenting and comparing twentieth-century Albanian hotel architecture and may support future conservation, restoration, and adaptive-reuse strategies.

Keywords: *socialist-era hotel architecture, geometrical configuration, structural matrix, entrances and circulation, space utilization, served and serving areas.*

1. INTRODUCTION

Accommodations, public amenities, services, technical processes, and circulation systems must all be incorporated into a logical spatial and structural arrangement in hotel buildings, which constitute a complex architectural typology. Hotels require a clear hierarchy among guest, staff, service, and circulation areas. Unlike buildings organized around a single dominant function, they combine repetitive accommodation units with collective and specialized spaces. Therefore, the internal interactions between geometrical arrangement, structural matrix, entrances, circulation systems, and spatial use, as well as outward form and façade composition constitute their architectural identity.

Between 1945 and 1990, Albanian hotel architecture evolved under specific political, economic, and technical circumstances. Previous studies have documented the historical development and principal typologies of Albanian hotels constructed before 1990 (Thomai, Nepravishta, & Hoxha, 2019). City hotels, which started to occupy prominent sites within urban centres, became one of the most identifiable types of lodging for tourists.

The Majority of Albanian Socialist Architecture is related with the Rational Period of Architecture, which was characterized by minimal ornamentation, solidity, repetition of structural and architectural elements which presented a noticeable rhythm and uniformity.

Altogether they represented a uniform architectural language on the exterior design, based on similarities, which was not necessary translated in the internal spatial organization. The difference in scales, program, context and structural solutions, provided space for architectural interpretations in the interior, despite being created within a centralized planning system and construction framework.

This study aims on setting aside the formal expressions of socialist hotels, the ideological significance and the connection with their urban image, which has been mainly the scope of prior research, to focus on the on the internal architectural organization which have had relatively little attention. As a consequence, the study aims also to open a vaster discussion and address the gap on the comparative evaluation of the connections of geometry, structural and utilitarian systems and interconnected spaces through analytical analysing, despite the limitations on the documentation.

The research is structured around five analytical dimensions examined through comparative diagrams: *geometrical configuration, structural matrix, the relationship between entrances and circulation, served and serving spaces, and spatial use and functions.*

2. THEORETICAL AND ANALYTICAL FRAMEWORK

2.1 Diagrams as analytical instrument

The hotel may be understood as a hybrid typology in which accommodation, collective activities, circulation, and service functions are combined within a single architectural system

(MacDonald, 2000). The theoretical and analytical underpinnings for investigating the internal structure of Albanian hotels from the socialist era are established by this study of the literature. In addition to taking into account the diagram as a comparative analytical tool, it integrates research on architectural form, geometrical configuration, typology, structural order, circulation, functional distribution, and served–serving relationships. These viewpoints offer a common framework for detecting recurrent organizational principles and case-specific variances among the chosen hotel buildings, and they also support the study's five assumptions.

2.1.1 Architectural form, geometrical configuration, and typological analysis

It is necessary to distinguish between a building's visible shape and the organizational principles that underpin it while analysing architectural designs. A basic framework for analysing architectural form through primary geometries, formal transformations, spatial linkages, and organizational systems is offered by Ching (2007). Because it enables complex configurations to be reduced to identifiable spatial structures, his classification of centralized, linear, radial, clustered, and grid organizations is especially pertinent to the comparative examination of hotel layouts. Ching also shows how the arrangement of spaces, volumes, circulation components, and structural systems produces architectural form, which is not a stand-alone visual characteristic.

The general arrangement, shape, proportion, symmetry, directionality, and compositional relationship of the main spaces and volumes that make up a building are all considered aspects of geometrical configuration within this framework. It has to do with how the plan is put together as a cohesive geometric whole as well as how different parts are put together, repeated, changed, or expressed. Therefore, the prominent figure of the building, its axis, regularities, extensions, recesses, courtyards, wings, and the connections between central and peripheral parts are all taken into account while analysing geometrical layout. Although the two may have a significant impact on one another, this category is separate from the structural matrix.

By concentrating on the geometrical and topological characteristics of building plans, Steadman (1983) advances this understanding through the idea of architectural morphology. He contends that cell arrangement, rectangular subdivisions, symmetry, adjacency, continuity, and connectivity may all be used to analyse plan layouts. This method is crucial for the current study because, despite having different overall geometrical arrangements, the three hotels that were chosen are mostly made up of connected rectangular units. The analysis is also made possible by Steadman's difference between geometry and topology, which allows it to go beyond the individual room shapes and take into account the connections that unite them into a cohesive layout.

A hotel's geometric layout can take the form of a radial composition, a courtyard layout, a compact block, a linear bar, an L- or U-shaped arrangement, or a combination of multiple geometric systems. The distribution of bedrooms, public spaces, service facilities, entrances,

and circulation routes are impacted by these configurations. They also have an impact on the building's orientation, views, natural lighting, interior hierarchy, and relationship to its setting. Because of this, rather than being a simply formal description, geometrical configuration is considered as a primary analytical category in the current work.

Building reproduction of a stable model is not always implied by typological analysis. Rather, it can highlight recurrent organizational principles in addition to variances brought about by program, setting, structure, and architectural interpretation. This approach is based on the diagrammatic precedent studies created by Clark and Pause (1996), where analytical components such as geometry, construction, circulation, massing, natural light, and the relationship between units and the whole structures are used to identify similarities between structures. This establishes an important methodological precedent which is used to analyse the three selected hotels.

2.1.2 Structural matrix and spatial order

In this study, the structural matrix in this study is recognized both as an organizational framework and a technological system that shapes the proportions, rhythm, repetition and distribution of places or buildings. In addition to demonstrating how grids can be altered by interruption, addition, subtraction, or direction changes, Ching (2007) links grid organization to the regular reading and positioning of structural and spatial elements. This relationship is especially crucial to the architecture of hotels, since accommodation units require the structural regularity and encourage repetition, while public space and service areas require a diverse arrangement.

In a similar approach, Clark and Pause (1996) view the structure as one of the primary analytical levels that make the comparison of buildings possible. These methods allow the detection of each component separately and as a functioning system independently of other elements. This fragmentation also facilitates the understanding of the repetitious modules in hotel structures like restaurants, service areas, entrance halls, and technical spaces.

By showing that the same space requirements may result in diverse geometrical configurations and that distinct plans may yet have comparable topological properties, Steadman's morphological method (Steadman, 1983) adds another dimension. As a result, this study does not make the assumption that a standardized layout is automatically produced by a regular or standardized structural grid. Rather, it looks at how each structural grid interacts with, supports, or alters the structure's functional and spatial order.

2.1.3 Entrances, Distribution, and Circulation

One of the main factors that indicates the how accessible and comprehensible a building's spatial arrangement is, is the circulation. This component is defined by Ching (2007) as movement through space and is analysed using approach, entrance, path configuration, path-space interactions, and circulation space form. As a result, circulation establishes the order in which the building is perceived, while the entry points are viewed as the transition point

between the exterior and interior.

This viewpoint is especially essential for hotels, considering the crucial need for coordinating the activities, the needs of guests and requirements of workers which usually need a set of mobility systems, as emphasized in the Principles of Hotel Design, where the essential focus is put on the circulation, as one of the primary problems to be taken in consideration in this type of architecture (Architects' Journal, 1970). The entry, lobby, vertical circulation core, corridors, service access, and loading facilities all directly affect a hotel's operational efficiency, according to the above-mentioned research.

Examining whether the chosen Albanian hotels implement centralized, branching, or linear circulation patterns and how these patterns connect to their overall architecture is therefore made simple by employing this functional difference.

Through space syntax, Hillier and Hanson (1984) present a more comprehensive theoretical framework, stating that relationships between spaces—rather than just their particular features—determine spatial organization. Concepts like connection, accessibility, and spatial sequence can be used to understand how a design can establish hierarchy and control and influence movement. Nourian, Rezvani, and Sariyildiz (2013) then demonstrate how diagrammatic representations and connectivity diagrams can be used to transform functional linkages into different geometrical plan configurations. Even though the current study does not do a comprehensive quantitative space-syntax analysis, these concepts support the qualitative interpretation of access, circulation, and internal spatial hierarchy.

2.1.4 Spatial Use and Served–Serving Relationships

In order to understand the conceptual framework and functional hierarchy analysis, also the ideas and architectural designs of Louis Kahn were refereed to during this study. On his theories on architectural designs, there was a specific distinction between served and serving spaces although without the implication that serving areas are to be considered secondary in architecture. In the same line, McCarter (2005), addressed the auxiliary systems as requirements to support a building's primary operations, including circulation, storage, sanitation, technical installations, and service functions, are housed in serving areas.

On the other hand; Penner, Adams, and Robson (2013) demonstrate that the coordination of these categories and the efficient division or regulated intersection of visitor and service flows are essential to a hotel plan's performance.

By challenging the idea that circulation is a residual or just transitional area, Hertzberger (2000) broadens the conversation. When incorporated into the larger structure of the building, corridors, stairs, halls, thresholds, and intermediary spaces can take on new social and spatial roles. This knowledge is helpful in determining whether circulation in the chosen hotels adds to spatial hierarchy and community use in addition to serving as a source of connection.

As a result, the current study uses two complementary classifications to look at spatial use.

Accommodation, public, service, technical, staff, recreational, sanitary, and circulation spaces are identified in the first. In the second, these roles are reduced to the more general link between served and serving areas. The comprehensive functional program and the underlying organizational logic of any hotel can be compared thanks to this dual reading.

3. METHODOLOGY

The study adopts a qualitative, comparative case-study methodology based on the architectural and diagrammatic analysis of three hotels built in socialist Albania between 1973 and 1982. The cases were chosen because they exhibit variations in scale, form, structural organization, and spatial distribution despite falling within the same functional category and historical era. The availability of genuine architectural documentation played a significant role in their selection. The drawings and diagrams of this study are generated through the original plans, elevations and sections which have been obtained from the Central Technical Archive of Construction of Albania. In light of the Vitruvian principles of *firmitas, utilitas,* and *venustas,* the study is extended at an iconographic and planimetric level, taking into account the relationship between structure, function, and form, through finding typological parallels and architectural differences between the chosen projects.

There are two primary phases presented in this research. The first one is related to choosing the three notable case studies and prototype hotel projects from the Albanian Socialist Era. To comprehend each building's overall composition, interior structure, and key design elements, the original architectural drawings are analysed. Creating a logical set of analytical diagrams from the original designs is the second step. Five interconnected layers—geometrical configuration, structural matrix, entrances and circulation, served and serving areas, spatial use, and functions—are used to analyse each scenario. The geometrical analysis identifies dominating forms, proportions, alignments, and relationships between volumes by breaking down each plan into its primary compositional elements.

The structural matrix is replicated by monitoring the position, rhythm, and direction of the main structural elements and examining how they correspond with the spatial arrangement. Mapping external entry points, hallways, distribution routes, and the relationships between various building sections allows for the analysis of entrances and circulation. The areas supporting circulation, services, sanitation, storage, and technical operations are separated from those supporting major hotel activities through the analysis of served and serving spaces. Finally, functional zoning is examined at the selected plan level by identifying accommodation, public, administrative, service, technical, recreational, sanitary, and circulation areas. A direct comparison of buildings with various plan configurations is made possible by using the same analytical sequence to all three scenarios. Geometrical order, structural regularity, circulation pattern, functional distribution, and the degree of concentration or dispersion of served and serving spaces are all taken into consideration while evaluating the diagrams. Despite their formal disparities, the chosen buildings are compared to see if they have an underlying typological logic.

Formal ethical approval was not necessary because the study did not involve human

participants, interviews, personal data, or experimental procedures, and the archival drawings are only utilized for academic examination. One of the main drawbacks is that the available drawings fluctuate in scale and graphic quality, and they depict several floor levels. As a result, the analysis through diagrams, places more emphasis on organizational principles and qualitative spatial links than on precise dimensional or quantitative comparison. An initial sequence of original plans, geometrical configurations, structural matrix designs, circulation diagrams, served-serving diagrams, and functional zoning was established by the previous analysis of the three Albanian hotel projects (Koliçi Istrefaj, 2017; 2021). Nonetheless, this content was mostly offered as an initial graphic analysis. The current study transforms it into a methodical comparison framework that is backed by notions related to space syntax, architectural morphological and spatial organization, and hotel planning literature.

4. CASE STUDIES AND DISCUSSION

The Tirana Hotel, designed by Valentina Pistoli in 1973; Hotel Turizmi–Enkelana in Pogradec, designed by M. Mitrojorgji in 1973; and the Hotel in Mjeda, near Shkodër, designed by A. Kuçani in 1982, are the three hotels that are examined in this comparative research. The cases vary in scale, location, geometrical composition, structural organization, and spatial distribution, but they are all part of the same historical era and functional category. They were chosen due to the Central Technical Archive of Construction in Tirana's original architectural designs as well as their representative significance.

Tirana Hotel represents one of the principal works associated with architect Valentina Pistoli and with the development of modern architecture in socialist Albania (Dhamo, 2011). It is a large urban hotel designed as a prominent landmark within the capital. It is composed of a horizontal pedestal with collective and supporting functions and a high-rise accommodation tower. A more well-thought-out option created in connection with Pogradec's lakefront setting is Hotel Turizmi–Enkelana. Several modules are gathered around a central organizational area to construct its plan. The hotel in Mjeda is smaller in size and has an L-shaped layout with two connected wings for circulation and functions. Therefore, the three scenarios offer a suitable foundation for assessing how various spatial models were used to interpret a common hotel programme.

The published diagrams are based on the ground-floor plans of the hotels in Pogradec and Mjeda, whereas the diagram of the Tirana Hotel is derived from its basement plan. Therefore, the study concentrates on qualitative organizational concepts such as served-serving connections, access and distribution, dominating geometry, structural rhythm, and functional zoning. Plans of various scales and levels can be compared without losing sight of their fundamental architectural logic by using the same diagrammatic categories.

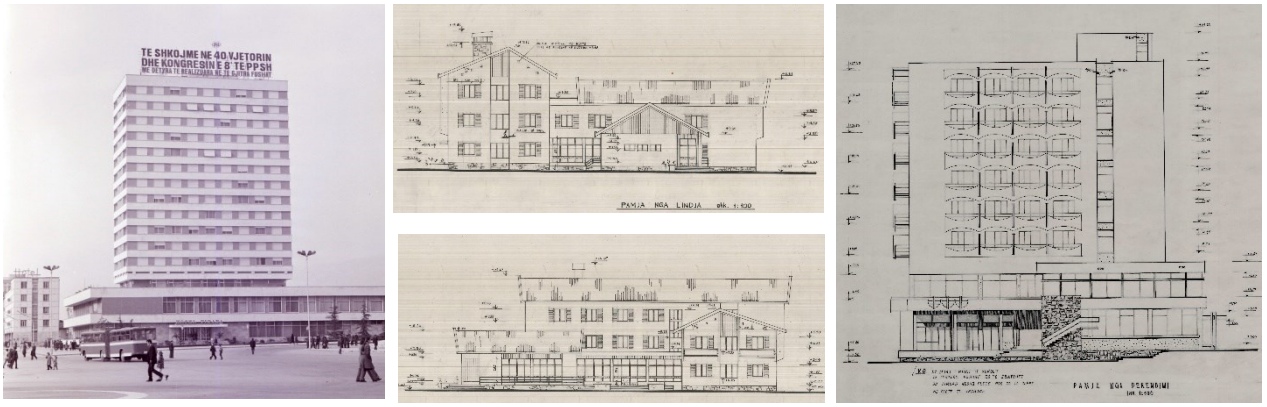


Figure 1: The three selected socialist-era hotels: archival photographs, elevations, and sections. From left to right: a) Perspective of Tirana Hotel, b) Eastern and Western View of Hotel in Mjeda, c) Western View of Hotel Turizmi Pogradec. Source: Central Technical Construction Archive

4.1 Comparative analysis through five diagrammatic layers

4.1.1 Geometrical configuration

Although the three buildings are primarily composed of simple rectangular shapes, these shapes produce three different geometric models. The Tirana Hotel is defined by a tower-and-podium configuration. Its horizontal podium accommodates public, administrative, technical, and service functions, while its vertical volume supports the hotel program's repeating elements. Through its volumetric composition, the building's functional divide is made visible by the contrast between the two elements, which also creates a strong vertical–horizontal hierarchy.

An aggregated-module setup is created by Hotel Turizmi in Pogradec. The plan is composed of rectangular and quadrilateral elements arranged around a central space rather than being dominated by a single vertical body. The use of controlled geometry is evident in several modules that approximate 1:1 or 1:2 proportion. A series of interactions, spatial orientations and connections derive by the layout.

The hotel in Mjeda presents an L-shaped layout with connected rectangular volumes. Their intersection serves as a geometrical and organizational articulation, and its two main side plans define perpendicular directions. This hotel distributes its program linearly along the two axes of the building, in contrast to the vertical configuration of the Tirana Hotel and the multidirectional agglomerate of the one in Pogradec. The comparison indicates that a logical language of modular organization, clean proportions, and simple forms is shared by the three scenarios. In Figure 2, it is illustrated specifically the configuration as a centralized collection of modules in the Hotel of Pogradec, a vertical tower-podium form in Tirana, and a directed L-shaped type in Mjeda.

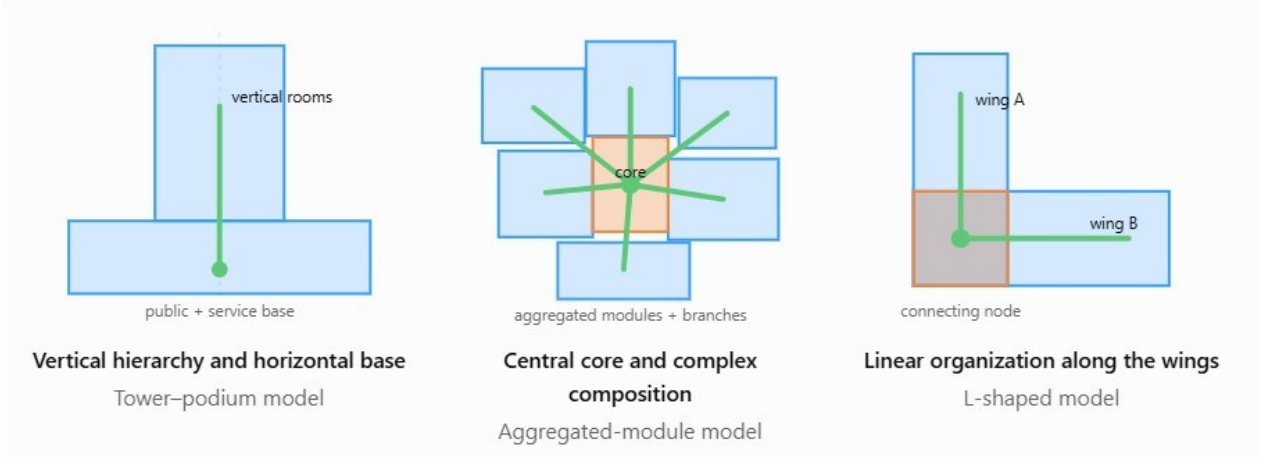


Figure 2. Schematic spatial diagrams of the three case studies. Author's elaboration based on archival drawing.

4.1.2 Structural matrix

Despite variations in the matrix's uniformity, density, and connection with the plan in each of the three scenarios, the structural diagrams show that the matrix functions as an ordered system. Instead of using a single homogenous matrix, the Tirana Hotel's layout makes use of many connected orthogonal grid fields. The right-hand segment introduces a denser and more repeating subdivision, whilst the middle and left-hand sectors show a relatively regular succession of structural axes and larger intervals. Where these fields line up, there are interruptions and modifications that enable the grid to accommodate locations of various sizes and purposes. As a result, the structure preserves structural continuity, distinguishes recurring spatial units from larger communal or technical sectors.

The largest, most dispersed, and most uniquely shaped matrix is found at Hotel Turizmi- (today known as Enkelana Hotel). Its diagram consists of a number of neighbouring orthogonal areas with different spatial spacing, density, and coherence but typically coordinated axes. Even though they do not form a uniform grid throughout the entire plan, regular structural sequences can be recognized within specific sectors, especially if spatial repetition is in place. As a result, the matrix functions as a coordinated set of grids, following the plan's aggregation while also defining the dimensions and potential connections of its component spaces.

The structure of the hotel in Mjeda is more concentrated and refined. Denser subdivisions are introduced by narrower or functionally different portions, with the main plan sectors placed along comparatively regular axes. When the two primary parts converge, changes in spacing, continuity, and orientation are most noticeable. By joining the multiple grid fields and facilitating the transition between bigger areas and smaller repeated rooms, this junction serves as the main hub for structural cohesion. Because the matrix is made up of linked structural sequences coordinated by a common linking area, it behaves simultaneously as uniform but also fragmented.

In all three cases, structural regularity is more apparent in regions with spatial repetition (figures 2, 3), and it varies when greater flexibility is needed due to bigger dimensions or a

diversity of roles. The Hotel in Mjeda adopts a compact matrix centred around a centrail point, the Hotel Turizmi in Pogradec creates a more dispersed system of coordinated local fields, and Tirana Hotel integrates interconnected grids of varying densities. The comparison demonstrates that the structural matrix functions as a bridge between spatial dimensions, geometrical configuration, repetition, and functional distribution rather than as a distinct technical layer.

4.1.3 The relation between entrance and distribution

The three circulation models displayed in the entrance-distribution diagrams mostly corresponds to the blueprints' geometric layout. The hierarchy and centralization of the Tirana Hotel's organization are predominant. From the main entrance, movement is directed toward the plan's primary sectors. Whereas secondary branches cater to specific spaces, additional external and service entrances offer direct access to periphery sections. Access, mobility, and spatial hierarchy are clearly associated, as seen by the circulation's organization around the distributive lines, despite several direction changes. The circulation network of the Hotel Turizmi in Pogradec is the most dispersed and branched. Internal circulation is not centred over a single main axis but rather develops through a number of corridors, crossroads, and auxiliary arteries. In addition to increasing spatial variation, this layout makes the interaction between access, orientation, and internal depth more intricate.

The system used by the hotel in Mjeda is primarily straight and partially branching. Two main routes connected to the major plan sectors are followed by movement, and the intersection of these routes serves as a distributive and linking point. Additional entry points connect directly to various areas of the building. As a result, the system combines distributed access with directional clarity, making it less multidirectional than Hotel Turizmi–Enkelana and less centralized than Tirana Hotel.

The comparison as presented in the diagrammatical matrix of figure 3, reveals a linear, node-based system in Mjeda, a branching and dispersed network in Pogradec, and a centralized and hierarchical architecture in Tirana. Rather than operating as separate layers, entrances and circulation in all three scenarios are derived from the plan's geometry. While corridors, intersections, and distributive nodes convert the plan configuration into patterns of movement, direction, and spatial hierarchy, entrances create the first points of access.

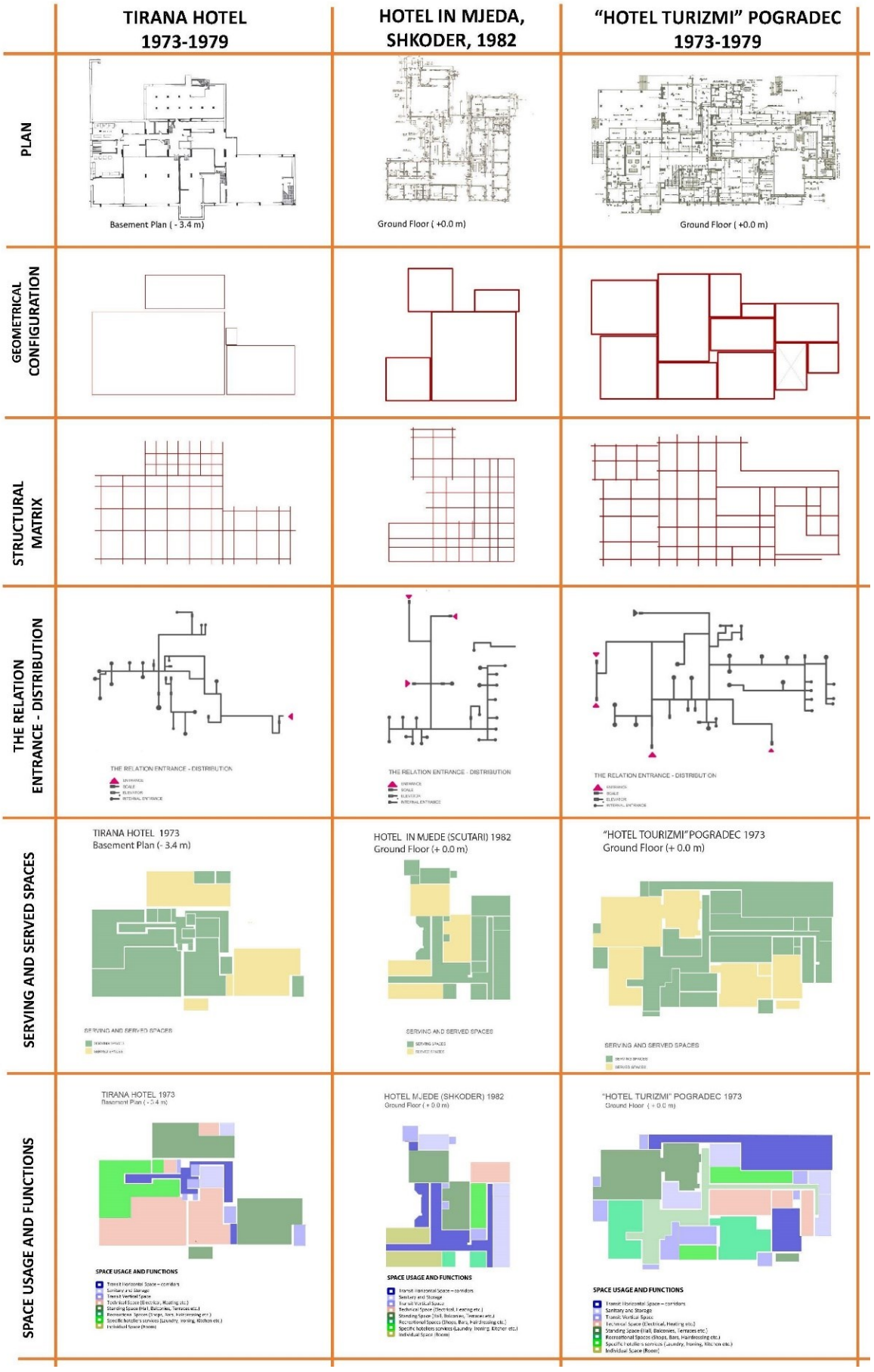


Figure 3: Comparative analytical matrix of the three case studies. Author's drawings and elaboration.

4.1.4 Served and serving spaces

Large, continuous served areas and more concentrated serving zones are clearly separated in the Tirana Hotel's served-serving diagram. The supporting spaces are not evenly distributed; instead, they form distinct clusters that are linked to the internal distribution system.

In Hotel Turizmi in Pogradec, the relationship between served and serving spaces is more distributed and interwoven than in Tirana Hotel. Serving spaces do not constitute a single compact core; instead, they occupy numerous adjacent zones and span several peripheral and centre sectors. Simultaneously, a more complex arrangement is produced by the increased number of interactions between the two categories. As a result, the system relies on multiple serving clusters coordinating with the surrounding served spaces and the circulation network.

A largely linear and partially clustered structure is used to arrange served and serving areas in the Hotel in Mjeda. Serving spaces are located within smaller peripheral zones, along their boundaries, and close to the connecting region, whereas larger served areas are located within the primary plan sectors. Although the serving areas are not concentrated exclusively around the central intersection, this junction helps coordinate the two spatial categories.

Three distinct spatial strategies are identified by the comparison: a largely linear, node-related layout in the Hotel in Mjeda, a scattered and interwoven serving system in the Hotel Turizmi–Enkelana, and concentrated supporting clusters in the Tirana Hotel (figure 3). Served and serving spaces remain interdependent in all three cases. The main distinction is the extent to which serving regions are located at the borders and intersections of larger serviced zones, or they are scattered or concentrated.

4.1.5 Space use and functions

By differentiating circulation, sanitary spaces, technical, public, service, recreational, administrative, and other individual or communal spaces, the functional diagrams offer a more thorough classification than the served–serving analysis. The comparison reveals that while the three hotels have similar functional categories, they are arranged differently.

The program at the Tirana Hotel is distinguished by vertical and horizontal division. While the tower is connected to the repeated accommodation component, the horizontal base supports a wide range of public, administrative, technical spaces, circulation, and supporting services. Larger functional zones are divided inside the examined basement level, although they are still connected by a central distributive space.

The highest level of functional interweaving is shown at Hotel Turizmi in Pogradec. The aggregated modules are divided into public, service, technical, sanitary, circulation, and other areas. A number of functional zones are connected in the centre of the design, while larger regions with more specialized functions are found in the periphery. Thus, functional diversity directly adds to the plan's geometrical complexity.

The Hotel in Mjeda uses linear sequencing to arrange its operations. The wings are arranged

with circulation zones, smaller individual rooms, larger public or community spaces, and supporting areas connected by the centre junction. Functions can be spatially distinguished while yet remaining continuous thanks to the L-shaped geometry.

Three functional techniques are identified by the comparison: linear sequencing in Mjeda Hotel, central aggregation and functional interweaving in Pogradec Hotel, and vertical–horizontal separation in the Tirana Hotel as presented in figures 2 and 3. All three plans show a purposeful distinction between public, operational, technical, circulatory, and more regulated regions despite these variations.

5. RESULTS AND CONCLUSIONS

Despite not adhering to a single planimetric or typological paradigm, the comparative analysis shows that the three hotels were constructed within a common rational architectural culture. Three separate organizational systems were developed based on their shared concepts of basic geometry, modular coordination, structural ordering, functional differentiation, and spatial hierarchy.

Analytical component	Tirana Hotel	Hotel Turizmi–Enkelana	Hotel in Mjeda
Geometrical configuration	Tower–podium	Aggregated modules	L-shaped configuration
Structural matrix	Differentiated and regular	Fragmented and adaptive	Directional and node-based
Entrance–distribution	Centralized	Branched/distributed	Linear
Served–serving relationship	Concentrated	Distributed	Linear
Space usage and functions	Vertical–horizontal separation	Functional interweaving	Linear sequencing

Figure 4: Comparative Framework of the three case studies. Author's elaboration

The tower-podium structure of the Tirana Hotel, the collection of modules in the Hotel Turizmi of Pogradec, and the L-shaped arrangement of the Hotel in Mjeda are all identified by the geometrical diagrams. These configurations represent more than just formal components because they provide the main spatial frameworks that each building's other systems are situated within. Hotel in Mjeda is based on two directional wings joined by a common junction, the Hotel in Pogradec is based on the interaction between core and peripheral modules, and Tirana is based on the distinction between key plan sections.

These variations are reinforced by the structural matrices. Interconnected orthogonal grid fields with differences in density and interval are combined in the Tirana Hotel. With its coordinated local grids that adjust to its aggregated layout, Hotel Turizmi in Pogradec, offers the most dispersed and unique matrix. With its main modifications centred at the connecting node, the Hotel in Mjeda employs a more directed and compact structural system. In each of

the three scenarios, structural regularity is altered when dimensions, functions, or orientations change and is more pronounced in repeating spatial zones. Thus, structure functions as a layer of ordering that operates as a mediator between spatial distribution, geometry, and repetition.

Three corresponding circulation models are shown by the entrance-distribution diagrams: linear and slightly branched in Mjeda, branching and scattered in Pogradec, and centralized and hierarchical in Tirana. While corridors, intersections, and distributive nodes convert the geometrical arrangement into patterns of movement, orientation, and spatial hierarchy, entrances set the starting places of access. Therefore, rather than being implemented as a stand-alone system, circulation is produced by the plan's organization.

The served-serving analysis reveals a linear, node-related organization in Mjeda, a dispersed and interlaced system in Pogradec, and concentrated supporting clusters in Tirana. The circulation, sanitary, technical, and service sectors that support primary spaces can be connected to them in many ways, as demonstrated by these strategies. Through linear sequencing in Mjeda, functional interweaving in Pogradec, and vertical–horizontal separation in Tirana, the functional diagrams further support this differentiation.

Overall, the results show that rather than using the same solutions repeatedly, standardization in Albanian socialist hotel architecture primarily functioned through common architectural concepts. By focusing on internal organizational logic rather than the external architectural image, the diagrammatic approach makes this relationship apparent. The study offers a reproducible framework for recording and analysing different hotels from the same era by separating and contrasting geometry, structural matrix, access and distribution, served–serving connections, and functional use.

Because the available drawings represent different building levels and vary in scale and graphic completeness. Therefore, with archival and field verification, future study should expand the comparison to include equivalent floors, vertical circulation systems, sections, structural technologies, and present physical conditions.

Author's note:

During the preparation of this paper, Quill Bot and Grammarly were used exclusively for English-language editing and proofreading. The author reviewed and approved all revisions and assumes full responsibility for the final content of the paper.

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Urban Construction Through Destruction

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Abstract

The metropolis possesses a powerful attractive force, enabling a nostalgic reflection on what it has become in relation to what it once was (Calvino, 2007). In this perspective, this paper addresses a fundamental issue of the built environment: the relationship between construction and destruction. Urban transformation does not occur solely through processes of building, but equally through acts of demolition. Cities never cease adapting to new forms of life; they grow or shrink responding to social, political, and economic forces.

This article argues that architects and urban planners tend to emphasize how cities are constructed, while devoting considerably less attention to what is erased in the process of urban development. The question lies in how and to what extent. The experience of urban evolution reveals extreme positions regarding the continuity or elimination of physical and social contexts, ranging from large-scale nineteenth-century transformations and modernist anti-city approaches to postmodern contextualism.

The paper examines the concept of "urbicide", used by various authors, as a framework for understanding violence against architecture and the urban fabric. It argues that the rhetoric of total erasure or absolute preservation is overly simplistic and risks isolating urban contexts from the broader city and its social life. Instead, the paper advocates a view of the city as a system in evolution, shaped by transformative processes grounded in an ontology of becoming. Tirana is analyzed as a representative case of development driven by demolition. The ongoing erasure of social and architectural contexts linked to the city's origins—such as the Old Bazaar, religious monuments, and other key architectural landmarks—demonstrates various active and passive forms of urbicide. While politically framed as a strategy of renewal or starting anew, this paper emphasizes the need to further explore more nuanced and complex approaches beyond such extremes.

Keywords: *transformation, erasure, context, urbicide, Tirana*

1. INTRODUCTION

Cities constitute inherently dynamic systems, continuously shaped by processes of adaptation and transformation, and never reaching a definitive form. The transformation of urban environments occurs through both construction and destruction, depending on complex socio-political and techno-economic conditions specific to particular historical and geographical contexts. This article examines a spectrum of theoretical and practical perspectives associated with these processes, with particular emphasis on the relationship between architecture, place, and context. Such perspectives range from violent interventions in the urban fabric to strategies of contextual reconstitution through abstraction and reinterpretation, rendering cities ideological texts as well.

As Berman (1996) observes, the annihilation of cities, presented in the article through the concept of *urbicide*, represents a persistent historical phenomenon — a cultural and political constant rather than a modern anomaly. References to urbicide can be identified in early historical and religious narratives, including the Old Testament, while events such as the Roman destruction of Jerusalem and Carthage illustrate the enduring interrelation between urban space, power, and conflict.

1.1 **Methodology**

In this regard, the article presents an inquiry into questions of transformability and the preservation of context, drawing on postmodern authors and on scholars addressing urbicide and related concepts from an international perspective, and illustrating them in the Albanian context through concrete examples. Methodologically, it relies on synchronic comparisons from the history of architecture, examining both emblematic cases of demolition and the preservation of context. It argues that neither of these extremes adequately captures the complexity of contemporary realities. Instead, it suggests that experiments and practices grounded in the philosophical concept of an ontology of becoming represent a relevant yet insufficiently explored direction.

Accordingly, the methodology distinguishes two complementary levels of analysis: (1) a historical description of transformative processes across different temporal sequences, capturing their nuances and framing urbicide as a broad concept related to violence in and through the city and architecture; and (2) a theoretical interpretation informed by the ontology of becoming, applied to the case of Tirana to examine the dynamics of transformation. This sequence keeps theoretical interpretation grounded in empirical observation, avoiding premature generalization.

2. DIFFERENT APPROACHES

2.1 Percements, Urban Dissolution, and Continuity

One of the most emblematic examples of large-scale urban demolition, commonly described by the term *"percements,"* can be traced to the *"plan of the artists,"* which proposed the creation of straight thoroughfares in Paris in 1793 (Frampton, 1993). The painter Jacques-Louis David led a commission of revolutionary artists who formulated the boulevard strategy later employed in the reconstruction of Paris during the reign of Napoleon III. This strategy exerted a significant influence beyond Paris, shaping comparable urban transformations in other French and Central European cities throughout the second half of the nineteenth century. In 1853, Haussmann, acting as Prefect of the Seine, implemented these operations in response to severe urban deficiencies, including contaminated drinking water, inadequate sewerage systems, deteriorated housing conditions and insufficient public spaces. The *"percements,"* which cut across the urban fabric to connect principal nodes and districts, constituted a radical response to this complex set of challenges. These interventions fundamentally reconfigured Parisian urban structure, transforming the city from an organization centred on traditional neighbourhoods into a spatially integrated metropolis, driven by the "fever of capitalism" (Choay in Frampton, 1993).

With regard to transformations, it is worth mentioning the position of the first phase of the modern architectural movement, most typically represented by Le Corbusier. His urban proposals sought to respond to the *new spirit of the industrial age*, characterized by a radical reconfiguration of the relationships between people, dwellings, and the city, and by the ambition to "re-found" architecture on the basis of function. As Rowe and Koetter (1978) observe, the architects of this period appeared to believe they had discovered universal laws governing nature. Their determinism rested on a combination of firm faith in scientific truth and a humanistic myth. From this emerged an objective, absolute, mechanical, abstract, and functional tendency (Saggio, 2010), which imbued the modern architect with a quasi-"messianic" passion (Rowe & Koetter, 1978) to act in the service of a more just society. This orientation fostered a paradigm of urban intervention symbolized by the "Phoenix", wherein the "new world" rises upon the ruins of the old. A paradigmatic example is Le Corbusier's *Plan Voisin* for Paris (1925), where, extending beyond Haussmannian *percements*, the city is conceived as subject to total dissolution. One recalls, moreover, the early modernist motto, *il faut tuer la rue corridor*, reflecting the underlying impulse to negate the historical city that lay at the core of these manifest interventions (Rowe & Koetter, 1978).

In contrast to these ideas stands the effort to sustain social and urban continuity. The stark

divergence between the two models becomes evident when comparing the *Plan Voisin* with the nearly contemporaneous Royal Chancellery project in Stockholm (1922) by Asplund. The former exemplifies a general, universal mode of intervention, while the latter reflects a specific, context-responsive approach. Rowe and Koetter (1978) interpret Asplund's case as the deployment of multiple design strategies, where the response to place integrates empirical sensitivity with an idealist stance articulated through normative conditions. Simultaneously, the project "responds", "adjusts," "translates," and "emphasizes," operating both as a passive recipient of context and as an active agent of reinforcement.

2.2 Years of Reflection

Not without reason, Rowe and Koetter, authors of Collage City, examined such cases in the late 1970s, when approaches advocating the city's reinvention from scratch were being critically reassessed. The postwar decades coincided with one of Europe's most extensive waves of urbanization, stimulating the construction of large-scale, mass housing districts often lacking identity, where the principles of the modern movement progressively deteriorated. The disheartening landscapes produced by this model prompted further reflection in the 1980s, as the crisis of the industrial paradigm of urban development became increasingly apparent. The city could not expand indefinitely by consuming new territories while erasing existing urban structures (Saggio, 2015). Consequently, two parallel trajectories emerged: new interpretative frameworks for architecture's relationship with the historical city, and growing criticism of the large housing complexes built in earlier decades.

This period of reflection on context—ranging from classical revival to more abstract interpretations—was accompanied by an unprecedented emphasis on integrating the specific site into the architectural project. Priority shifted toward uncovering the particular geometries from which architecture might emerge, as opposed to adopting homogenizing and universal solutions. Within this tendency, context became the central concept, understood as the specific morphology of the articulation of existing buildings in the project area; as the socio-historical-cultural framework of the site; and as the urban fabric formed through the interweaving of these dimensions, conceived as a generative network from which new architecture arises (Saggio, 2015). This reflection renewed attention to the historical city, promoting reparative interventions that relate the new to the existing rather than erase it—an approach far from the symbolism of the phoenix.

One of the most influential events through which this concern was articulated was *Roma Interrotta* (1978), where twelve architects were invited to reinterpret Nolli's map of Rome

(Saggio, 2015). Within this framework, Rowe gave concrete form to the principles of the *Collage City*, conceiving the city as a coexistence of fragments whose reciprocal relationships generate meaning and enable a unifying yet complementary recomposition. Processes such as reordering, mimetic continuity, and evocation emerged as key operative concepts within the collage methodology. Portoghesi, supported by Norberg-Schulz, introduced an approach that was exceptional for its time in the reading of history. He sought to explain aspects of Rome's urban morphology through a phenomenological interpretation of nature, linking urban form to processes of geological formation and to the latent structures of the tuffaceous hill landscapes of northern Lazio. This perspective not only clarified the formation of the Baroque urban fabric but also provided a conceptual basis for generating new urban textures. In contrast to functionalist doctrines, Portoghesi's position articulated a distinct methodological orientation, paralleling Rossi's typological investigations grounded in the rules of the nineteenth-century city. For Anselmi, Rome's stratification, superimposition, and reuse of inherited traces evolved from a historical condition into a mode of architectural thinking and a contemporary design paradigm (Saggio, 2015).

Key concepts of this period—most notably "aesthetic autonomy" (independence from function), "context," and "city"— generated two distinct approaches. On one side emerged the classical and neo-decorative interpretations associated with Johnson, Venturi, Graves, Stern, and Krier. Frequently regarded as lacking substantive innovation, this orientation instrumentalized "context" to produce nostalgic environments, reviving forms, styles, and modes of life derived from disparate historical and social conditions (Saggio, 2015).

Conversely, the concepts of history and memory, widely disseminated within international postmodern discourse, did not remain confined to nostalgia but became operative material for the architectural project (Saggio, 2015). During the 1980s, more complex interpretative frameworks appeared, extending beyond earlier experiments such as *Roma Interrotta*. Eisenman, for example, advanced a non-mimetic understanding of "place," rejecting classicism, symmetry, stylistic revivals, and the return to figurative language. His approach reengaged the history of sites through lost, latent, or even imagined geometries, encapsulated in the notion of "archaeological excavation" or tracing. This logic of layered networks led to the concept of the palimpsest, wherein superimposed mappings—analogous to overwritten parchment—revealed overlapping spatial orders and concealed geometries. From this abstract interaction with site conditions emerged both an interpretation of place and a reordering matrix from which the project could originate (Saggio 2015).

Alternative modes of contextual interpretation also developed. Gehry explored what may be

termed a "*cheapscape*" context, foregrounding the landscapes of neglected peripheries in contrast to refined urban settings. Hadid, articulated a "*landscape-context*" approach, conceiving architecture as an extension of dynamic topographical and spatial systems. Across subsequent decades, these trajectories reaffirmed a central premise: architecture cannot be conceived independently of its relationship to site and context (Saggio 2015).

These years of reflection were also marked by the emergence of a radical stance toward the large housing estates hastily constructed after the Second World War according to the principles of the Modern Movement. The symbolic demolition of the Pruitt–Igoe complex in St. Louis, United States—completed in 1955 and entirely destroyed by 1976—was interpreted by Jencks as symbolically signaling the end of the modernist architectural era. In the Bijlmermeer housing complex in Amsterdam, comprising 13,000 apartments in "honeycomb"-type units built between 1963 and 1975, the project was initially promoted as the city of the future. However, due to mounting social and urban problems, approximately half of the apartments were demolished between 1990 and 2010, with renovation processes continuing until 2017. In both cases, demolitions were justified by the excessive costs of maintenance and by social segregation, which ultimately transformed these complexes into the opposite of the ideals for which they had been conceived. Large-scale, standardized building typologies were replaced by smaller and more varied housing forms intended to foster social diversity. In the latter case, several buildings were preserved as part of the historical narrative of Bijlmermeer.

In France, similar demolition policies were applied to the *grands ensembles* constructed between the 1950s and 1970s to address the housing shortage but which entered into social crisis during the 1980s. At *Le Haut-du-Lièvre* in Nancy, buildings were partially or fully demolished from the early 2000s within urban renewal programs. *La Muraille de Chine* in Saint-Étienne, built in 1965, rehabilitated in 1985, and completely demolished in 2000, constitutes another emblematic case. The northern districts of Marseille, including the demolition of *Tour B des Cyprès* in 2016 and interventions in *La Castellane*, offer further examples. This approach itself generated a model of intervention for situations considered urban anomalies.

2.3 Urbicide

The forms and purposes through which cities are dismantled or destroyed reveal the ways in which societies function. Decisions concerning the destruction of specific objects or urban sectors are frequently driven by political actions justified in the name of the public interest. When such "cleansing" assumes the character of violence against organized space and urban

memory, it corresponds to what Moorcock first termed *urbicide* (*urbs*+*occido*) in the novella *The Dead God's Homecoming* (1963), a science fiction allegory.

For Moorcock, urbicide signifies not merely the physical destruction of the city but the negation of urban life as a living system: the eradication of the city's symbolic and social role—historically grounded in collective purpose—and its reduction to an empty shell devoid of memory and meaning. His conception of urbicide, perpetrated not by external enemies but by absolute power and bureaucratic authority that erode public representation and suppress urban complexity, resonates strongly with subsequent architectural and urban theory and remains highly relevant today.

Huxtable (1970) and Berman (1987) employed this term to critique the urban restructurings of the 1960s in American cities, interventions that, by dismantling their internal structures, disrupted cultural continuity through planning policies and redevelopment schemes. Huxtable (1970) elaborated this argument in her collection of essays, where she condemned the destructive effects of technocratic planning and market-driven speculative redevelopment, as well as highway construction and zoning practices that displaced communities and eroded the historic fabric and architectural heritage understood as a complex organism. For Huxtable, such processes constituted not merely an aesthetic violation but, above all, an ethical crime. Berman (1987), in turn, employed the notion of urbicide as a critical reflection on modernist urbanism and violent renewal policies in which efficiency and abstraction prevailed over lived communal experience. In his view, the devastations in the Bronx amounted to the annihilation of vibrant urban life in the name of progress and rational planning.

Coward develops the concept of urbicide within a political–theoretical framework (2009). He argues that urbicide targets the conditions of urban plurality through the destruction of architecture and urban infrastructure, insofar as buildings materially instantiate coexistence and collective life (2009). Such destruction operates as an organized political strategy and may intersect with genocide (2009), as evidenced in cases including Mostar and Sarajevo during the Bosnian war, as well as in Chechnya and Israel/Palestine (2009), underscoring the continuing relevance of the issue. Similarly, Bogdanović (1993) reflects on the destruction of multicultural urban and architectural identities during the Yugoslav wars, interpreting it as an assault on memory, meaning, and cultural continuity.

Millard (2004) likewise documents attacks on cultural monuments and infrastructure from Lagos, where in 1956 state-led housing demolitions tied to land policies became a primary instrument of control, and from Jerusalem, the West Bank, and Gaza Strip, where since the 1990s–2000s urbicide has unfolded—and continues to unfold—through cycles of construction and destruction.

Graham (2010) further elaborates the concept of urbicide within the framework of the militarization of urban space, siege warfare, and infrastructural conflict, emphasizing the strategic fragmentation and dismantling of cities. Rendering cities ungovernable except through coercive force becomes, in this account, a central instrument of political control. He references both earlier forms of urban annihilation and more recent cases, including Sarajevo, Gaza, Fallujah, and Baghdad. Weizman (2007), in the context of Israeli military operations, conceptualizes urbicide as a form of spatial governance enacted through selective destruction and spatial reconfiguration of roads, walls, and housing. His notion of the "politics of verticality" illustrates how a spatial regime is exercised above ground, on the surface, and below it. Finally, Rotbard (2015), referring to Palestine, argues that the physical and historiographic erasure of Arab cities enables the construction of a new political and spatial order, transforming urbicide into an instrument of nation-building.

Similarly traumatic operations involving the erasure of entire urban districts occurred in cities of the former communist bloc. One of the most emblematic cases was that of Romania under Ceaușescu. The construction of the Civic Centre and the House of the People required the demolition of approximately 380 hectares of historic urban fabric, while the broader zone affected by the intervention reached around 500 hectares within a short period (Danta, 1991; Iosa, 2013). The scale of destruction led to the term *Ceaushima* (*Ceaușescu+Hiroshima*), a sarcastic neologism linking the state-directed urban demolitions of the 1977–1989 "systematization" campaigns to devastation comparable to the atomic bombing of Hiroshima. The term underscores the traumatic suddenness, totality, violence, irreversibility, and top-down imposition, highlighting how state power can annihilate a city through planning and ideology rather than bombs.

The popularization of the term is closely associated with the historian Giurescu (1989), who documented the demolition of historic neighborhoods, churches, and urban fabric in 29 cities—destroyed at a rate of 85–90 percent—and the severe mutilation of 37 additional cities, including Bucharest. Verdery (1996) situates this phenomenon within the logic of ideological spatial domination, arguing that urban planning was transformed into an instrument of political control aimed at socio-spatial reconfiguration. In this reading, the city became an ideological text designed to produce conformity and obedience. Ioan (1999) interprets the systematization of Bucharest as a sacrificial act in which the historic city was offered up to materialize an abstract and monumental authority, thereby linking architectural form, political ideology, and collective trauma. Finally, Harhoiu (1997) underscores the long-term cultural and mnemonic consequences of demolition, arguing that cities, once structurally rendered amnesiac, persist

only in fragments, photographs, and oral memory. This framework provides a lens through which to understand Tirana and other Albanian cities during the dictatorship and beyond.

3. TIRANA AND VIOLENCE AGAINST ARCHITECTURE

Present-day Tirana reveals, among other dimensions, its ongoing confrontations with violence in architecture and urban planning. During the communist period, urbicide functioned as a politico-ideological strategy targeting the social, symbolic, and spatial fabric of places deemed incompatible with the consolidation of total power. As noted by Vehbiu (2003), the bulldozing of old neighborhoods destroyed a communicative system, marking the onset of an offensive against the social stratum that had characterized Tirana since its foundation. As Goitia (1996) observes, the structure of the city is grounded in human nature, of which it is an expression; yet, once formed through lived processes, this structure in turn "works" upon and shapes its inhabitants.

The first signals of destruction in Tirana were the demolition of the old mosque that marked the city's foundation in 1614 (Frashëri, 2004), immediately after the Second World War, and the razing of the Old Bazaar at the end of the 1950s. The removal of structures that embodied the city's origins and the very rationale of its existence announced a campaign that would soon unfold nationwide. The ideological premise—that their architecture symbolized ties to a repudiated past and, in its name, had to be eradicated—drew legitimacy from the verses of the *Communist Internationale*: "We'll sweep away the old world from its foundations, We'll build a new world in its place; We who have been naught shall be all." (Pottier, 1871). Meanwhile, regulatory plans, as legal instruments, systematically designated areas to be transformed through demolition, to the extent that the expression "the plan struck/fell upon us" entered everyday language. These were typically neighborhoods composed of one- to two-story traditional dwellings, erased without any prior assessment of their historical and cultural values, and replaced by anonymous four- to five-story collective housing blocks.

"Barricades Street," an integral part of the Old Bazaar, was regarded as one of Tirana's earliest commercial arteries. It survived until the early 1980s, when it was demolished to make way for the "Barricades Street Towers." The underlying objective was the erasure of the former merchants' quarters extending behind the Old Bazaar—an organic morphological system in which labyrinthine streets sustained a lifestyle rooted in a commercial-capitalist past. Although aligned along the roadway, the new apartment blocks remained alien to the residual urban backstage, generating an amoeboid vacuum that remains unresolved to this day. It was no longer "Barricades Street."

During the same period, another emblematic demolition occurred in Tirana's central square. Instead of completing the square designed in 1931 by Florestano Di Fausto with the buildings that had remained unrealized, one of the structures considered to disrupt its symmetry—the "Old Municipality of Tirana"—was demolished. Nowadays, the dynamiting of the Municipality, the "*Kafe Kursal*," and the cutting down of the old chestnut trees behind them, in order to construct the National Historical Museum, is widely regretted. The erasure of these urban memories enlarged the central void, depriving it of elements that had identified it as a concrete place (Schulz, 1992). Elevated on a pedestal, the Museum behaved as a "space occupier," yet failed to act as a space definer (Rowe and Koetter, 1978).

During the three decades following the 1990s, the aggression of destruction through construction persisted. Not coincidentally, anarchy in construction flourished within anonymous spaces, expressing a new moral imperative: rapid profit to recover lost years. The euphoria of freedom, experienced as a total absence of control, eroded the city internally and externally, consolidating its dominance. Unlike the immediate erasure of neighborhoods through regulatory zoning, this phase attacked the city through a construction-site urbicide, gradually clearing areas equivalent to one or several building plots. Infiltrating the city's cellular structure through buildings up to twelve stories high, choreographed within historic fabrics, it spread widely and insidiously, atrophying these fabrics to the point of complete disintegration. Typical examples include areas behind the *Pazari i Ri* and between *Myslym Shyri* and *Kavaja* streets. These small interventions were justified by normative rules that treated space solely in geometric terms, without analyzing the real quality of light, ventilation, and greenery, under the alibi of absent plans. The actual damage proved even greater, as Urbicide re-entered the legal instrument, increasing building intensity through the urban plan and eroding sports areas and existing parks.

Another case occurs when neglect and deliberate non-intervention lead to the degradation of a building—whether a historic villa or a public structure—leaving demolition as the only path. One need only recall Tirana's cinemas: *Partizani*'s once-mondane foyer, *Republika*'s open-air cinema, and *17 Nëntori*'s ticket colonnade, now a simulacrum inside the shopping center that replaced it. No effort was made to integrate them into new urban life. On the contrary, their neglect was intended to facilitate their demolition.

In recent years, spectacular and unexpected demolitions have not been absent. One need only recall the failed attempts to demolish the *Pyramid of Tirana*, as well as the demolition of the Stadium and the National Theatre, events accompanied by intense debate and opposition. In fact, they signaled the beginning of a new era for Tirana: a reorganization marked by high-rise

projects promoted by internationally renowned studios and abruptly inserted into the urban fabric. This intensification is taking place in the total absence of public infrastructure. If what is presented as the new vision for Tirana proves to be the actual one, the question arises: for whom is this city being built? Whose reality counts? As Verdery (1996) suggests in a different context, might the use of towers function as an instrument of political control in socio-spatial reconfiguration? Are we deepening the "amnesiac trauma" described by Harhoiu (1997), transforming Tirana into a collection of "former" sites—former railway station, former theatre, former exhibition hall? To this series of demolitions, one may also add those accompanied by evictions for the construction of infrastructure, without providing the affected residents with access to social housing.

4. CONCLUSIONS: TOWARD AN ONTOLOGY OF BECOMING THROUGH TRANSFORMATIVE PROCESSES

The article examines the city as a system in continuous transformation, focusing on the relationship between architecture and context and the range of positions on this issue. It begins by addressing violence against the city, analyzing *urbicide* and *ceausim*a as strategies that extend beyond physical destruction to erase socio-cultural values, purpose, and meaning, producing long-term trauma. It also considers opposing approaches that interpret or reconstruct context—through evocation or more abstract strategies—opening possibilities for new relationships between architecture and context. Within this framework, the article proposes that cities can be understood as ideological texts, both in contexts of deliberate destruction and in practices of contextual preservation.

Williams (2000), interpreting the ontology of Deleuze, presents the concept of *becoming* as a fundamental ontological category of the nature of reality. In this reading, *being* is understood not as stability or fixed identity, but as a continuous process. Becoming is not merely the transformation of existing forms, but the essence of reality itself, always in flux. Within this framework, Williams emphasizes that creativity—including architectural creativity—should be understood as modulation and intervention within already active processes of transformation. The architect, in this sense, does not create ex nihilo, but operates upon a reality that is constantly in flux, combining the enduring passive component of variability with an active component. This perspective offers an alternative to the notion that forms maintain fixed relations, since the city is not simply an object to be designed, but a system in evolution.

These ideas of Deleuze differ not only from the modernist notion of *tabula rasa*, where the figure–ground contrast—according to functionalist and ahistorical principles—stood in a

dichotomous relation to the city, but also from the figure–ground contextualism of postmodernists, which emphasizes uniform historical continuity. Postmodern contextualism is rarely informed by social and technological change and seldom achieves social cohesion, often suffering from the same problem of isolation as modernist spaces. The concept advanced by Deleuze, also explored by Eisenman, stresses the evolution and transformability of context, since the success of a space does not lie solely in fixing its scenography in time (Williams 2000). Its application is also linked to innovative complexity-based methodologies for analyzing urban patterns, capable of unpacking interactions—including aspects of self-organization—through which cities operate as processes in flux.

In this sense, we speak not only of continuity of form, but also of the transformation of a basic form, considered as one of the stratifications of the territory that enrich its meanings. This occurs not necessarily through erasure or preservation, but through the "welcoming" of transformative processes that give the object a new meaning in altered relations with the context. Eisenman avoids the discontinuity of the modernists without returning to the nostalgia of postmodern contextualism. He understands evolutionary development through the relationships between the old and the new. Thus, instead of the figure–ground contrast, he introduces the concept of "blurring." The "new" is not perceived as different from the old, but as if it were blurred. This softens sharp boundaries, and the richness of lines and perceptions arising from this condition of "defocusing" enables reconciliation with the whole and the continuity of form (Williams 2000).

In this article, we compare international architectural discourse on context with that developed in Albania, particularly in Tirana. We argue that, although forms of urbicide have been systematically employed in Albania, critical reflection on context has been largely absent from both academic debate and professional practice. This limited sensitivity is often justified through a simplistic normative–technicist logic that has inadvertently normalized urbicidal practices within the architectural mindset. Despite recent changes in architectural education, a stronger ethical awareness is still needed among younger architects to recognize that the city is not a neutral object but a complex assemblage of relationships. Severing human ties to place thus constitutes a form of violence.

Tirana, like other Albanian cities, exemplifies what Harhoiu terms a structurally amnesiac city, where the traumas of past urbanism persist as a long-term cultural condition. Many neighborhoods survive only as fragments—toponyms, written and oral accounts, and photographic traces—signaling a sustained loss of identity. The prefix "ex-" applied to numerous sites evokes mutilation rather than transformation, fostering alienation and the

abandonment of place within anonymous urban agglomerations. Meanwhile, global pressures and the pursuit of visibility continue to erode the urban context and its ties to place. As Calvino (2007) observes, the central challenge is whether cities can still shape human desires through successive transformations, or whether those desires instead erase the city—or are themselves erased by it.

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SESSION II

Sustainable Materials, Resilient Construction & Smart Design

Sustainable and resilient construction: Innovative construction systems / Sustainable building materials / Resilient structural solutions / Environmentally responsible construction.

Climate-responsive and energy-efficient design: Passive design strategies / Energy efficiency / Climate adaptation / Environmental performance.

Smart construction and material innovation: Lightweight construction / Prefabricated building systems / Advanced material applications / Resource-efficient technologies.

Human-centered design: Structural design for human needs / Performance-oriented architecture / Adaptable building systems / Integration of architecture and engineering.

Human Centered Design in Civil Engineering

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Abstract

Civil engineering has long been presented as an objective discipline governed by codes, calculations, and material laws. Yet, as structural failures, unexpected contingencies, and cultural shifts reveal, design is never isolated from human values, social practices, or temporal change. This paper adopts a conceptual and theoretical approach, drawing on interdisciplinary literature and illustrative case studies, to explore the intersection of contingency and human-centered design in civil engineering. Through examples ranging from Albania's reinforced concrete villas to monumental works like the Sagrada Familia and the Leaning Tower of Pisa, the study demonstrates that structural design emerges as both a technical and a social activity. It argues that structures should be understood not as static objects but as evolving entities shaped by users, environments, and cultural contexts. The main contribution of the paper lies in reframing contingency as a productive force in structural design and proposing a situated, participatory approach that integrates technical rigor with human experience. By placing people—their needs, perceptions, and lived experiences—at the center of design, civil engineers can create structures that are not only safe and efficient, but also resilient, adaptable, and meaningful over time.

Key words: *Contingency, Human-Centered Design, Structural Engineering, Resilience.*

1. INTRODUCTION

Structural design is frequently referred as a rational and objective discipline, where engineers apply codes, calculations, and material laws to produce reliable and safe structures. Yet practice reveals a more complex reality: design is contingent, shaped by uncertainties, cultural shifts, and the lived experiences of people who build and inhabit structures. From the adaptive use of reinforced concrete in Albanian villas to monumental works like the Sagrada Familia, structural engineering demonstrates that buildings are not merely technical artifacts but social products, embedded in the dynamics of time, place, and community.

The recognition of this interplay between the technical and the social has been explored by several authors. Jeremy Till (2009) in Architecture Depends argues that architecture—and by extension structural design—cannot be separated from contingency, since it is always shaped by external forces, from politics and economics to everyday human practices. Similarly, Juhani Pallasmaa (2012) emphasizes the sensory and experiential dimensions of built form, suggesting that structures shape not only space but also human perception and emotion. In the field of engineering ethics, scholars like Caroline Baillie (2006) advocate for a human-centered approach to engineering education and practice, where social responsibility and cultural awareness are as important as technical efficiency.

Human-centered design principles, originally rooted in product and interaction design (Norman, 2013), are increasingly being applied in civil engineering. Rather than focusing solely on problem-solving and optimization, this approach emphasizes the needs, behaviors, and lived experiences of users. John Forester (1999) introduces the idea of “sense-making” in planning and design, which prioritizes dialogue, negotiation, and shared meaning over purely technical solutions. In structural engineering, this suggests a reorientation: from designing idealized static objects toward designing adaptable and resilient systems that can accommodate human change, uncertainty, and participation.

Moreover, Anthony Giddens’ (1991) reflections on trust and modernity highlight the ambivalence people hold toward technical expertise: both reliant on and skeptical of it. This underscores the importance of integrating human-centered methods into engineering practice—not only to improve technical outcomes but also to build legitimacy and trust within communities. Recent scholarship in participatory design (Sanoff, 2000; Sanders & Stappers, 2008) further demonstrates that involving users in the design process generates ownership, resilience, and adaptability in built environments.

This paper situates structural design within this evolving conversation. It argues that contingency should not be dismissed as a flaw in engineering practice but embraced as an opportunity for creativity, adaptability, and social engagement. By combining human-centered design principles with the technical rigor of civil engineering, we can produce structures that are resilient in the face of uncertainty, meaningful to their communities, and responsive to cultural and temporal change. In doing so, civil engineering moves beyond problem-solving toward sense-making, integrating technical knowledge with the complex

realities of human life. This paper aims to critically examine the role of contingency in structural design and to explore how human-centered design principles can reshape civil engineering practice by i) analyzing how contingency manifests in structural design beyond purely technical parameters, ii) investigate the relationship between structural engineering and other social factors and iii) by proposing a situated and participatory approach that integrates human-centered design with engineering practice.

2. LITERATURE REVIEW

There are many instances of similar contingencies in the building industry, and the most successful engineers are those who, first, confront these circumstances head-on and, second, offer answers. However, contingency is a phenomenon that occurs at every level of construction. Because structural design is heavily reliant on factors outside of science and the profession, it becomes a social activity. First of all, the definition of failure genuinely varies depending on the situation. Even though a structure may need to collapse or be restored later, it can be deemed to have failed during an earthquake if everyone within and outside is unharmed. For other structures, such those of hospitals, non-failure refers to their ability to be used immediately following an earthquake; that is, they shouldn't have significant residual deflections or cease to function.

The building must be safe throughout its lifetime, which is another design requirement. The one-hoss shay in Oliver Wendell Holmes' book (Holmes, 1891) was constructed to survive 100 years, yet it fell after that number of years—neither more nor less. For structures, however, this cannot be assumed. The exact amount of time a structure will last before collapsing cannot be predicted. As a result, there are general projections that rely on the material and structural system employed in place of this. Nevertheless, these predictions are obviously highly approximative. The bearing capacity issues are also limited to statistical considerations. As a result, when we build a structure for a typical lifespan, we also have to acknowledge that there is a chance, no matter how tiny, that the structure will fail before the period assumed for its lifespan.

Additionally, there are potential hazards that are so improbable that they shouldn't be taken into account when designing. For instance, structural designers in Spain do not account for earthquakes. In a similar vein, only a small number of unique buildings—such as those used by the military, the government, and high-level institutions—are made to withstand explosions. Design does not have a final answer; there are simply better and worse options, even though an analysis may have a right conclusion.

Additional instances of contingency in design originate from design methodologies, which are regarded as undeniable and perfect. Because of its design, the dome of Saint Peter's in Rome was unable to withstand the tensile stresses pressing on its horizontal sides. Consequently, steel rings were eventually required to reinforce it. Later on, those rings were strengthened once more. The architect concealed the presence of all these reinforcements, which are not

visible. Therefore, the dome's shape actively misleads the observer by implying that it is self-supporting even though its form does not adapt to structural requirements. Michelangelo knew that this shape's structural performance was weak. However, in this instance, Eduardo Torroja states that "that does not detract from the beauty of the cupola." (Torroja, 1962) Therefore, the dome of Saint Peter is regarded as a design success, despite apparent mistakes in the application of the structural design methods of that era.

Another illustration of how design errors and contingencies have actually contributed to success is the Leaning Tower of Pisa (fig. 4). Originally intended to be a vertical tower, its foundations experienced differential displacements as a result of the base's different layered formations.



Figure 1: Tower of Pisa. Source: Alliaj, 2025

The tower moved as a result, giving it the current appearance. Initially viewed as a systemic failure, the differential displacements eventually emerged as the primary feature of this structure's identity, drawing millions of tourists annually. As was previously stated, the issues of bearing capacity and stability are poorly defined as entirely formalizable. The same is true for durability-related issues. These issues include things like steel corrosion in concrete, issues with freeze-thaw cycles, issues with wood deterioration, material fatigue, creep and shrinkage. The solutions to these problems are also based on statistical data that cannot precisely determine the lifespan of the structure against these cases because time plays a major role in this case and most of these processes require a relatively long time to cause significant damage to the structure—referring to over twenty years.

“The problem of steel corrosion has no simple solution” (Claisse, 2016), admits Peter Claisse, in his book Civil Engineering Materials. However, the idea of durability, as Kenneth Frampton

points out, is not only tied to space and form but also to place-making and the passage of time, brought to completion through the presence of light, water, wind, and weathering. “In as much as its continuity transcends mortality, building provides the basis for life and culture. In this sense, it is neither high art nor high technology” (Frampton, 1995). The structure is viewed as a time-independent object that starts when the job is finished and is meant to remain unchanged until its expiration date, which is established in a relationship based on the endurance parameters, which can be as long as 120 years. The idea that the building will stay fixed, unaffected by anything, over many years is ludicrous.

On the contrary, it interacts with living things and is changed by outside forces. When time is viewed as a dynamic agent, design is associated with ongoing paradoxes. Colonel T. E. Lawrence claimed that while the Romans attempted to construct their cities for eternity, they only succeeded in reminding the next generations of their ridiculous power, which was ephemeral and fleeting like everything in this life (Torroja, 1962).

Moreover, Eduardo Torroja challenges the wisdom of spending too much money on durability. He questions why spending money on longevity is worthwhile because it is impossible to forecast future transportation systems, industrial processes, or lifestyle choices. He notes that although many bridges are still technically good, they have been demolished since locomotive weights increased in a matter of years. Designing with a margin of reserve to account for anticipated increases in load is fair in some situations. In other cases, however, it could be more prudent to construct almost temporary buildings if they are significantly less expensive and if future functional requirements are still unknown (Torroja, 1962).

Auguste Perret, on the other hand, proposes another way of thinking by arguing that ruins are a necessary component of the process and should therefore be taken into account when designing. "Versailles is badly constructed, and when Time will have exerted its mastery over this palace, we shall not be left with a ruin, but with a mass of unidentifiable rubble," he argues in his critique of Renaissance architecture. This is not architecture; beautiful ruins are the result of architecture (Frampton, 1995).

Contingency in design appears not just as a reaction to loads but also as ornamentation in the structure's design. A structure must be ambiguous in order to be both load-bearing and beautiful; Robert Venturi refers to this as "a both-end" object (Venturi, 1966).

However, human error on the part of the designer is frequently the primary cause of a design blunder. Because design flaws can be concealed and claims made by designers as if they happened for causes outside of their control—that is, as victims of the environment or the social system—care must be taken. Based on his work experience, Torroja notes that mistakes frequently resemble what was formerly referred to as "sin." Throughout his lengthy career researching the strength of materials and structures, he looked at many accidents—many of which were fatal—and came to the conclusion that relatively few happen in a way that is morally neutral. In fact, he discovered that the great majority (nine out of ten) are the consequence of human flaws, often verging on open neglect or even wickedness, rather than hidden technological problems (Torroja, 1962).

The distinction between an error and an accident becomes hazy, though, if it is assumed that designers shouldn't be held accountable for mistakes made outside of their domain and the structural design profession is full of outside powers. Thus, the uncertain zone of contingency has become a haven for all those dishonest designers whose errors have resulted in the creation of subpar structures that have even caused human casualties.

Frank Lloyd Wright also feels this problem in the construction profession and calls for integrity as follows:

What is needed most in architecture today is the very thing that is most needed in life—Integrity. Just as it is in a human being, so integrity is the deepest quality in a building...If we succeed, we will have done a great service to our moral nature—the psyche—of our democratic society...Stand up for integrity in your building and you stand for integrity not only in the life of those who did the building but socially a reciprocal relationship is inevitable (Wright, 1954).

Regarding professional integrity, Torroja also insists that the standards of the past be challenged when the time comes (Torroja, 1962). If there is a brief period of normality, it is found in the relationship between the environment and the mind rather than in the abstract concepts of thought. This implies that if we are working with a normative, we ought to be able to challenge it at all times and take comfort in a situational approach. Above all, we have to be careful not to reverse values, which might imply, for instance, that structural performance is neglected and economic issues are given more priority. This does not imply that we should completely disregard the economic aspect and build incredibly costly structures, but it also does not indicate that we should avoid doing so in some situations. We just have to be honest, especially with those who will be impacted by our product.

Torroja then insists that society understand designers (Torroja, 1962), although this goes against even his earlier claims when he clarifies that a structure's creation need not be seen by its observers or regarded as an essential value. He asserts that no great work of art has ever been fully understood by uncultured people (Torroja, 1962). However, the reality is that urban art is not limited to museum walls. The majority, whether they be academics or common people, are nonetheless impacted by the messages that buildings carry because they reflect their authority over all of us. The structure no longer depends on the designer after the construction contract is signed. Colin Rowe reminds us that even though modernist architects constructed without a theory of architecture by rejecting the ideals of form, their structures nevertheless display some architectural values since they have the authenticity of time (Rowe, 1982). Therefore, it is a mistake to ask that society needs to attain a specific level of professionalism in order to better appreciate the merits of the structural designer profession.

The opposite, however, seems more feasible. It is this connection between form and our human consciousness that makes structural design inseparable from social aspects. Juhani Pallasmaa says: "The architecture of Michelangelo does not present symbols of melancholy; his buildings actually mourn. When experiencing a work of art, a curious exchange takes place;

the work projects its aura, and we project our own emotions and perceptions on the work" (Pallasmaa, 2005). The melancholy in Michelangelo's structures is entirely from the observer's personal experience, initiated by the authority of the work. We become part of the work. Our consciousness takes us to images of the city of another, much older time. The rooms, streets and squares are transformed and our imagination experiences life in Ancient Rome. This happens every time we encounter a structure. "We become citizens of mid-19th-century St Petersburg through the incantations of Dostoyevsky... We are in the room of Raskolnikov's shocking double murder, we are among the terrified spectators watching Mikolka and his drunken friends beat a horse to death, frustrated by our inability to prevent the insane and purposeless cruelty." (Pallasmaa, 2005), says Pallasmaa.

People are led to believe that structural design domain is also a reality by the potent metaphor of structural design as a separate field. The risk arises when structural designers themselves hold this belief. Consequently, structures themselves are dominated by structural design as a metaphor. Jeremy Till cautions, "We have already seen what happens when one starts to confuse the metaphorical for the real: the deluded belief that architecture can be autonomous," (Till, 2009) a stance that produces self-referentiality and suppresses contingency (Till, 2009).

Giddens notes that public perceptions of science and technical proficiency are characterized by ambiguity in relation to structural design's propensity to lurk within the realm of science. He contends that in situations when knowledge is insufficient, trust becomes essential, but this ignorance also permits uncertainty and careful reserve (Giddens, 1990). He contends that as a result, people negotiate with the modern spirit in terms of the trust they place in "symbolic tokens" and the human need for knowledge and assurance. However, there is a mixture of comfort and anxiety, deference and distrust, throughout the entire bargaining process.

Across the above perspectives, a common theme emerges: structural design operates within a field of uncertainty shaped by technical, social, and temporal factors. While traditional engineering emphasizes control and precision, the literature increasingly points toward adaptability, participation, and experiential meaning.

The key gap identified in this review is the lack of integration between technical rigor and human-centered approaches. Addressing this gap provides the foundation for rethinking structural design as both a scientific and a social practice.

3. METHODOLOGY

This study adopts a qualitative, theoretical, and interpretative methodological approach, grounded in conceptual analysis rather than empirical measurement. It draws on interdisciplinary literature from structural engineering, architecture, philosophy, and design theory to critically examine the role of contingency in structural design and to explore the

integration of human-centered principles within engineering practice.

This study begins by a narrative of giving examples of factors that dictate structural design that do not come from the domain of structural design. Then, an assessment of this field is made so as not to ignore this contingent mass, but rather to see it as an opportunity to introduce the respective field of study as an activity that deals with social values. Then, based on the studies of norms and normatives, conducted by George Canguilhem, it will be judged how it can be evaluated the norms of structural design to deal with irregularities.

4. CONTINGENCY IN STRUCTURAL DESIGN

Among young architects and engineers, there is a recurring joke about structural design: whenever someone asks how a difficult structure was resolved, the playful answer is, “With a spatial truss.” The humor lies in the fact that this solution is often revisited later in professional practice, where steel systems and spatial trusses indeed become reliable fallbacks for overcoming unexpected design challenges.



Figure 2: Skanderbeg Head Building, spatial truss for “Skanderbeg’s shoulder”. Source: Alliaj, 2025

The case studies demonstrate that structural design is shaped not only by technical requirements, but also by regulatory, social, cultural, and temporal contingencies. Across diverse examples—from the Sagrada Família to everyday Albanian construction practices—design solutions emerge as adaptive responses to changing and often unpredictable conditions. Collectively, they reinforce the paper’s central argument that embracing contingency through a human-centered approach leads to more resilient, meaningful, and context-responsive structures.

In many cases—both in academic exercises and real construction scenarios—complex conditions are ultimately managed through the versatility of steel construction and the adaptability of spatial truss systems. In complex architectural projects, spatial, legal, and contextual constraints often dictate structural decisions in ways that extend beyond purely

technical considerations. The project engineer noted that delays in obtaining the building permit for a specific portion of the site significantly affected the progress of a structure in Tirana that features the stylized form of Skanderbeg's head (fig. 1).

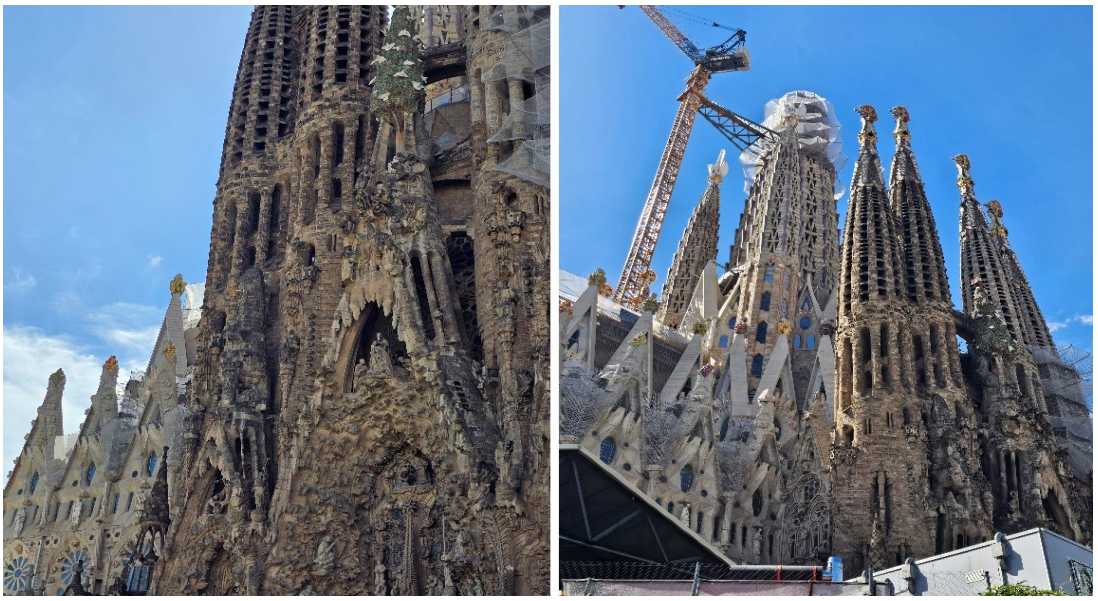


Figure 3: Sagrada Família; the old facade, the new facade, the 'yet' to be build facade, and the facade in restoration. Source: Alliaj, 2025

In this case, the unapproved area coincided with the location of Skanderbeg's "shoulder," a component of the design whose geometry could not be altered without compromising the project's conceptual integrity. As a result, conventional adjustments to the layout were not feasible. The engineering team therefore adopted a solution involving a substantial steel spatial truss projecting as a cantilever from the main structural body—an intervention that functioned almost as an autonomous, parasitic element. Despite its complexity, the approach successfully resolved the imposed constraints.

In contrast, the Sagrada Família is incomplete and unbalanced. The "under construction" designation has been in place for about 150 years, which is longer than what is often thought of as a structure's lifespan (fig.2). However, because of its ambitious design, it is regarded as a wonder of the world. The events of around 150 years of full time have unfolded there. It is sufficient to see how one area has changed and how other, more recent areas lack the aura that the passage of time provides. Paradoxically, one section is being constructed while others are being restored because they have reached the end of their useful lives.

The majority of Albanian villa buildings feature exposed rebar above the terraces with the intention of adding a second level in the future (fig. 3). In this instance, the structure may be able to sustain more floors than it actually does since the designer—whether an engineer or, as is typically the case, the villa's resident himself—was aware of this possible change and took it into consideration at the outset of construction. But it can take years for it to happen, and in many situations, the structure might live its whole existence in that form in an effort to realize its full potential.



Figure 4: Bars and unfinished structures over terraces. Source: Alliaj, 2025

The switch from masonry constructions, which were once common in Albania, to reinforced concrete frame structures for villas is another example of structural contingency. The causes are totally cultural. Since masonry is less expensive than frame structures for low-rise buildings, these are not economic justifications. Both of these systems are capable of carrying common loads in the case of villas and covering common spans in the case of houses. Additionally, the use of brick constructions is better considering constructability and construction duration. However, with the fall of the communist regime in Albania in 1990, the country's new spirit aimed to build like the developed western world. As a result, Albanians started using new materials, viewing their use as "higher quality of construction" and masonry as inferior.

Regarding construction in Albania, there are numerous instances that call for answers to land property issues, which naturally affect how buildings are constructed. It is very interesting analysing a case study of a wall in Astir, Tirana, that is composed of half reinforced concrete and half concrete blocks. Usually, the owner explains that the area with reinforced concrete should be more resistant because it is taller. Moreover, he is reluctant to disclose that he has legal issues with the use of the land and believes that the portion of the wall that will likely need to be demolished in the future should be constructed using concrete blocks in order to save money on demolition. In this instance, the wall's carrying capability is unrelated to the material selection. Simply put, because the machinery needed to cut the concrete and reinforcement is more expensive and needs skilled labor, the reinforced concrete portion in this instance is more difficult to collapse.

A dispute starts to the Green Coast development in Palasë (fig. 6). The engineers who work there defend the buildings' superior design methods and environmental certifications, yet by the public opinion it is seen a dystopian presence of authority.

This is the problem. Their claims that the building is nearly flawless in both form and technique seem reasonable, yet the overall public viewpoint is dismissed as sheer emotion. The professional claims prevail, because it is widely acknowledged in the contemporary world that reason always prevails over emotion when it comes to structural design.

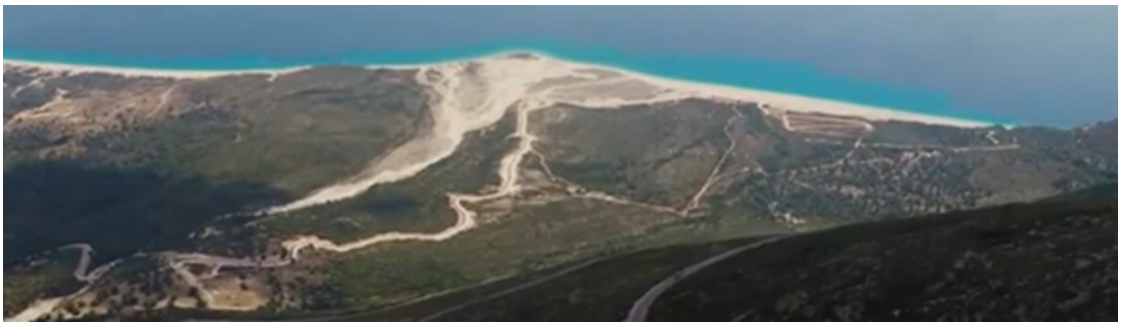


Figure 5: A green coast, Palasë. Source: Alliaj, 2014



Figure 6: Green Coast Resort, Palasë. Source: Alliaj, 2025

Structural formalism may also be connected to the ridiculousness of the structural designer profession's self-referentiality, which is progressively diverting from the actual act of creating structures. According to Peter Eisenman, the rationality of the design process itself and the internal logic of form become the only justifications left when form is no longer based on elements like function, program, meaning, technology, or client requests (Eisenman, 2004). He is arguing that designers develop more logical criteria to characterize the design process because the issues of use, values, and clients differ greatly from one another and cannot all be gathered under a single regulator.

However, the values of structural design are found in the other area of design that is covered by the right side of the brain and overlaps with rational parameters. The peculiarity of structural design creativity, for example, is that it defies a thorough and accurate explanation. This mysterious quality is what makes design valuable and sets it apart from jobs that can be completed solely by computers and machines.

Situational approaches in structural design shouldn't be disregarded. As long as they serve a purpose outside of their typical self-referential domains, even traditional methods of solving forms are acceptable. Actually, what I'm arguing is that the notion that structural design is a service to humans should be at the center of its ethics. Assuming that professional behavior lacks ethical principles is one of the common mistakes. It's similar to arguing that you will guarantee ethical behavior if you strictly adhere to the design code.

During the 2019 Albanian earthquake, structural designers frequently spoke on media that soft stories were to blame for the downfall of numerous structures. However, despite being theoretically plausible, this framing only served to conceal the true causes of the devastation. The projects were never finished, occupants altered the buildings and continuously destroyed them, developers reduced expenses, and contractors performed subpar work. The building

that resulted in the greatest number of fatalities during that incident had already reached the end of its useful life and was deemed uninhabitable by experts. Their habitants were warned to exercise caution in the event of an earthquake.

However, no one asked, "Where would these residents go?" They negotiated their current lives with their future ones, and the building where they slept every day had turned into a possible coffin for them. Numerous social problems, including poverty, politics, culture, education, and awareness. In the meantime, the structural designers, who were tasked with advocating for such a crucial case and who were expected to have a deeper understanding of the reasons of destruction than others, all said, "Soft-stories." Structural designers frequently identify issues within their domain, which is why they neglect to address the primary players that cause harm. By doing this, they would gain control over the issues and appear to be the only ones who can offer solutions.

However, that is not how phenomena occur. They are situational, unclear, and beyond anyone's area of expertise. The first step to better design is realizing this. This is not to argue that structures should be constructed without taking standard design guidelines into account. But to say that a structure's geometry is the cause of its issues is not only ignorant; rather, it is a purposeful attempt to limit structural design to an area where straightforward solutions can only be found by specializing rather than by expanding. This claim is just an open invitation to increase profits from the construction market and to make a wanted product on the market.

Recent studies published in the journals of the Athens Institute for Education and Research highlight the growing emphasis on integrating structural optimization and material performance into contemporary engineering practice. Mohammad and Ahmed (2018) demonstrate how Eurocode-based optimization methodologies can significantly enhance the efficiency of reinforced concrete cantilever systems, revealing the value of computationally informed decision-making in complex structural configurations.

Similar optimization principles are advanced by Mohammad (2016), who shows that refined design strategies for reinforced concrete columns can reduce material use while preserving safety and performance. Broader investigations into wall behavior further extend this line of inquiry; Morsy and Ibrahim (2019) present a parametric analysis that underscores how geometric and reinforcement variables condition the performance of RC wall systems. Complementary research by Özbek (2016) explores strengthening techniques using solid steel plates, illustrating how adaptive retrofitting methods can address evolving structural demands—an issue closely aligned with the contingent design scenarios discussed in the present paper.

Finally, Lovasi, Msallamova, and Kouril (2019) introduce electrochemical healing as an innovative restoration method for deteriorated reinforced concrete, demonstrating how maintenance and repair practices themselves form part of a structure’s long-term adaptive trajectory. Collectively, these studies reinforce the argument that structural design is not a fixed technical exercise but an evolving process shaped by optimization, adaptation, and the

temporal behavior of materials.

We return to our human reality by embracing contingency. According to Georges Canguilhem, under some circumstances, even the pathological is normal in its own way, therefore the normal—the one recognized by the profession—should not be contrasted with the pathological—the one excluded from the profession. Stable and respected structural architecture is far more than just the standard. To put it simply, it is the sole unquestionable rule. Canguilhem then urges us to test every other instance of norms. He challenges us to examine seeming norms and consider whether it can tolerate transgressions, reconcile inconsistencies, and adjust to conflict. He contends that true normativity, or health, is found in norms that are flexible enough to change and adapt in the future. A state of normality, on the other hand, lacks true normative intent if it just aims to maintain itself, resists change, and is unable to adapt to new circumstances. Therefore, whenever we encounter something that appears typical, we need to consider if its norms represent the current cultural values or are conservative and regressive (Canguilhem, 1994).

According to Canguilhem, the term "normal" in biology does not always refer to the old, but rather to the new form—as long as it finds circumstances that enable it to become normative and replace outmoded or declining forms. He goes on to say that once the circumstances supporting a phenomena's normative status have vanished, no phenomenon classified as normal may assert the authority of the norm itself (Canguilhem, 1994). The circumstances in which they both find themselves and determine whether or not they will live in the future are what characterize normal and abnormal in nature.

He contends that nothing is fundamentally normal or abnormal. An aberration or mutation is a potential alternative standard of life rather than a pathology in and of itself. This new norm is considered pathological if it turns out to be less stable, fertile, or adaptive than previous ones. It is considered typical if it performs equally in the same setting or even better in a different environment. In this way, normativity gives rise to normality. Therefore, pathology is not the lack of a biological standard but rather another norm that life has pushed to the periphery. (Canguilhem, 1994).

Similarly, no contingency should be disregarded as unpleasant. Instead, it should be viewed as a chance. In order to develop norms that represent the values of the zeitgeist, we must always consider how the contingency will affect the normal projection.

Canguilhem insists that “No environment is normal. An environment is as it may be. No structure is normal in itself. It is the relationship between the environment and the living thing that determines what is normal in both.” (Canguilhem, 1994) According to him, a living thing is considered truly normal when it maintains itself within norms and forms that allow for flexibility and variation, allowing some forms to become more viable as circumstances change. When a species can flourish, diversify, and adjust to changes without endangering its life, the habitat is considered normal. On the other hand, disease is precisely the inability to endure change, thus when either life or the environment cannot adapt, the condition becomes pathological (Canguilhem, 1994).

In structural design, societies serve as the environment. It is evident that no society has ever been flawless. They do, however, prescribe the design requirements that must be met; otherwise, structural design will fail and cease to exist as an activity. Regarding the scientific principles of design, structural design cannot exist without a set of sound scientific principles that can satisfy all social standards. Nevertheless, Canguilhem disputes this notion, pointing out that "certainly this environment, which science defines, is made of laws, but these laws are theoretical abstractions." (Canguilhem, 1994). He contends that living things exist in connection to other living things and events that continuously alter abstract laws rather than in the domain of those laws. For instance, the branch itself is what sustains a bird and not the elasticity principle. The bird is reduced to colloidal fluids if the branch is reduced to elasticity alone. The concepts of the environment, health, and illness vanish at such an abstract level, leaving only processes of becoming and history (Canguilhem, 1994).

5. CONCLUSIONS

Contingency plays a fundamental role in structural design, shaping both the performance of structures and the processes through which they are conceived and adapted over time. This paper has argued that structural design should be understood not only as a technical discipline, but as a dynamic practice influenced by social, cultural, and temporal conditions.

The main contribution of this study is the reframing of contingency as a productive force, alongside the proposal of a human-centered, situated approach that integrates technical rigor with lived experience. The analysis shows that more resilient and meaningful structures emerge when uncertainty is acknowledged rather than eliminated.

Future research could focus on empirical applications of these ideas, particularly through participatory design methods, user-informed criteria, and the integration of contingency into engineering practice and education.

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The courtyard as a climate-responsive and resilient spatial strategy: the case of Novi Pazar

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Abstract

The contemporary built environment is increasingly challenged by climate change, rising energy consumption, and the gradual loss of spatial identity caused by standardized housing models. Within this context, traditional residential typologies represent a potential source of passive and contextually grounded design principles. This paper examines the courtyard as a climate-responsive and resilient spatial strategy through the case study of Novi Pazar.

The research addresses the following question: how does the traditional courtyard model contribute to microclimatic comfort and housing quality in comparison with contemporary residential typologies lacking courtyards? The study is based on the hypothesis that traditional residential structures organized around courtyards incorporate transferable principles of passive temperature regulation and natural ventilation, which may inform contemporary architectural design without reliance on complex technological systems.

The research adopts a qualitative methodological approach that combines theoretical and analytical literature review with spatial-architectural analysis of three representative urban zones (the historic core, a mixed urban zone, and an area of contemporary development). The study further includes field observation and a survey conducted among 30 respondents. The analysis focuses on the relationship between built and open space, the presence of vegetation, and the potential for shading and natural ventilation.

The findings reveal a clear gradient in the transformation of the courtyard model—from a preserved microclimatic system within the historic urban fabric to the near absence of courtyards in contemporary multi-family housing developments. Survey results indicate that 43.3% of respondents prefer housing with a courtyard, while 50% believe that contemporary residential construction neglects open and green spaces.

The study demonstrates that the courtyard should not be understood solely as a cultural or historical pattern, but as a functional strategy of passive climatic regulation and spatial resilience whose principles can be reinterpreted within contemporary architectural practice.

Key words: *microclimatic regulation, passive design principles, residential morphology, spatial resilience, vernacular architecture*

1. INTRODUCTION

The contemporary built environment is increasingly confronted with challenges related to climate change, rising energy demands, and the gradual loss of spatial identity resulting from standardized architectural solutions. In this context, traditional building models represent a significant source of knowledge for the development of passive and contextually grounded design strategies.

One of the most distinctive elements of traditional architecture is the courtyard, which functions simultaneously as a spatial, climatic, and social regulator. Through its spatial configuration, orientation, and relationship with the natural environment, the courtyard contributes to the creation of favorable microclimatic conditions, ensures privacy, and encourages social interaction among the users of space.

Novi Pazar, a city characterized by a strong Ottoman and Islamic urban heritage, possesses a rich tradition of residential typologies organized around internal courtyards. These spatial configurations evolved in response to local climatic conditions, social patterns, and cultural norms, generating architectural structures that simultaneously support microclimatic stability, functional organization, and social cohesion.

This study examines the courtyard as a climate-responsive and resilient spatial strategy through the case study of Novi Pazar. The research addresses the following question: **how does the traditional courtyard model contribute to microclimatic comfort and housing quality within the contemporary urban context?** The study is based on the hypothesis that traditional courtyard-based typologies incorporate transferable principles of passive design that can inform contemporary architectural and urban practice without reliance on complex technological systems.

2. LITERATURE REVIEW

The theoretical framework of this research is grounded in interdisciplinary perspectives that conceptualize space as a socially, culturally, and environmentally conditioned phenomenon. Rather than treating space as a neutral physical entity, contemporary spatial theory emphasizes its role as a product of social relations, cultural practices, and environmental adaptation (Lefebvre, 1991; Rapoport, 1969).

Within this framework, the courtyard can be understood as more than a formal architectural

element. It represents a spatial structure that integrates social interaction, cultural values, and environmental responsiveness. The organization of space, as highlighted by Hillier and Hanson (1984), directly influences patterns of movement, interaction, and accessibility, positioning the courtyard as a central node that mediates between private and semi-public domains. From a cultural and semiotic perspective, architecture operates as a system of meaning. Eco (1979) and Psarra (2009) emphasize that spatial configurations communicate symbolic and experiential values, shaping how users perceive and engage with the built environment. In this sense, the courtyard functions not only as a physical space, but also as a carrier of social and cultural narratives, particularly in traditional residential environments.

In parallel, vernacular architecture provides a key reference for understanding the relationship between built form and environmental conditions. Studies by Rudofsky (1964) and Oliver (2006) demonstrate that traditional spatial models evolve through long-term adaptation to local climates and social structures, often achieving high levels of environmental efficiency without reliance on advanced technological systems. The climatic dimension of courtyard design is further supported by research in bioclimatic architecture. Givoni (1998) and Olgyay (1963) highlight the role of passive strategies such as shading, natural ventilation, and the use of vegetation in achieving thermal comfort in warm climates. Similarly, Allard and Ghiaus (2012) confirm the effectiveness of natural ventilation mechanisms, including cross-ventilation and stack effect, in reducing energy demand in residential buildings. Contemporary urban research further emphasizes the importance of open and green spaces in enhancing environmental quality and urban resilience. Gehl (2010) underlines the role of human-scale environments in supporting social interaction, while UN-Habitat (2020) and IPCC (2021) stress the significance of spatial planning in mitigating the effects of climate change and improving urban livability.

Despite the extensive body of research on vernacular architecture and climate-responsive design, the integration of traditional courtyard principles into contemporary urban contexts—particularly in rapidly transforming cities—remains insufficiently explored. This gap is especially evident in cities with strong historical and cultural identities, such as Novi Pazar, where traditional spatial models are increasingly being replaced by high-density residential development.

3. METHODOLOGY

In this research, a combined qualitative methodological framework is applied through a case study of Novi Pazar. The methodological approach integrates theoretical and analytical literature review, spatial-architectural analysis of residential typologies, and an empirical investigation conducted through a survey of space users.

The theoretical-analytical component relies on the interpretation of relevant scholarly works addressing the social production of space, architectural semiotics, vernacular building traditions, and sustainable design approaches. This segment establishes the conceptual

framework necessary for understanding the courtyard as a spatial, climatic, and social phenomenon within the built environment.

The spatial-architectural analysis examines the organization of courtyard spaces, building orientation, natural ventilation systems, shading conditions, and the morphological characteristics of both traditional and contemporary residential typologies. The analysis was carried out through field observation, photographic documentation, and the examination of orthophoto and satellite imagery. This approach enabled the identification of spatial patterns, building density, and the transformation of courtyard spaces over time.

The empirical component of the research was conducted through a survey among residents of Novi Pazar in order to explore users' perceptions regarding the quality of courtyard spaces, thermal comfort, the presence of greenery, and the overall quality of residential environments. The survey included a sample of thirty respondents from different urban zones of the city. The collected data were examined using descriptive statistical analysis complemented by qualitative interpretation.

Survey findings were further supported by field observations and photographic documentation, enabling the correlation of users' subjective experiences with objectively observable spatial characteristics.

The limitations of the research primarily relate to the qualitative nature of the analysis and the relatively small sample size. Nevertheless, the applied methodology provides a relevant and comprehensive insight into the spatial, climatic, and social dimensions of courtyard typologies within the urban context of Novi Pazar.

The research was conducted in accordance with ethical principles of anonymity and voluntary participation, and all collected data were used exclusively for research purposes.

3.1 Theoretical–analytical framework of the research

The theoretical component of the research is grounded in the analysis of key scholarly works from the fields of spatial theory, architectural semiotics, narrative approaches to architecture, and vernacular building traditions. The objective of this analytical review is to establish a conceptual framework for interpreting the courtyard as a spatial, climatic, and social phenomenon within the built environment.

The research draws upon the concept of space as a socially produced entity. According to Lefebvre (1991), space should not be understood as a neutral physical category but rather as the outcome of social relations, practices, and ideological structures. Lefebvre distinguishes three interrelated dimensions of space: perceived space, conceived space, and lived space. Within the scope of this research, the courtyard is interpreted primarily as a **lived space**, reflecting everyday practices, cultural norms, and patterns of family life.

The semiotic perspective on architecture is informed by the work of Umberto Eco, who approaches architecture as a system of signs and communication. Eco (1979) emphasizes that architectural elements convey both functional and symbolic meanings. In this study, the

courtyard is therefore examined as a spatial sign associated with privacy, collective life, and the relationship between domestic space and the natural environment.

The narrative dimension of architectural space is considered through the work of Psarra (2009), who argues that spatial organization shapes the way users perceive and interpret architecture. Spatial sequences influence movement, perception, and emotional experience within the built environment. In traditional houses of Novi Pazar, the spatial progression from the entrance toward the courtyard and subsequently to more private interior spaces form a clear narrative of privacy, protection, and domestic intimacy.

The theoretical framework is further complemented by contemporary perspectives on sustainable and vernacular architecture that emphasize the importance of passive environmental strategies. Oliver (2006) argues that vernacular architecture emerges through long-term adaptation to local climatic and social conditions. In this context, the courtyard can be interpreted as a natural microclimatic regulator that facilitates ventilation, shading, and thermal comfort without reliance on mechanical systems.

3.2 Spatial–architectural analysis of residential typologies

The spatial–architectural analysis focuses on examining the organization of both traditional and contemporary residential typologies in Novi Pazar, with particular attention given to the relationship between buildings and courtyards, building orientation, natural ventilation systems, shading strategies, and morphological characteristics. The analytical framework draws upon the theory of the social logic of space, according to which spatial configuration significantly influences patterns of movement and the ways in which space is used (Hillier & Hanson, 1984). Within this framework, the courtyard is interpreted as a central spatial node that connects different functional zones of the dwelling and facilitates controlled social interaction among household members.

The climatic dimension of spatial organization is examined through the principles of passive design. Givoni (1998) emphasizes that appropriate orientation, natural ventilation, and effective shading are key factors in achieving thermal comfort in warm climates. In traditional houses of Novi Pazar, the courtyard plays an important role in enabling airflow between open and enclosed spaces, thereby reducing heat accumulation within the residential environment.

Natural ventilation is further analyzed through the principles of cross-ventilation and the stack effect, which allow efficient air movement without reliance on mechanical systems (Allard & Ghiaus, 2012). Openings oriented toward both the courtyard and the street contribute to the creation of temperature differences that stimulate natural air circulation.

Shading strategies are examined through the relationship between building volumes, vegetation, roof overhangs, and wall heights. According to Olgyay (1963), architectural design should ensure protection from direct solar radiation while preserving adequate natural daylight. Traditional courtyards in Novi Pazar typically employ a combination of built and natural elements to create shaded areas during the summer months.

The morphological analysis includes the examination of the relationship between built and open surfaces, building compactness, number of storeys, and spatial hierarchy. This approach allows the courtyard to be understood as an integrated spatial system that simultaneously fulfills functional, climatic, and social requirements of residential architecture.

The results of the spatial analysis serve as the basis for a comparative assessment between traditional courtyard-based typologies and contemporary residential models lacking courtyard spaces, with the aim of identifying adaptive potentials embedded within traditional architectural solutions.

3.2.1 Field and spatial analysis

The empirical spatial analysis was conducted through direct field observation, photographic documentation, and the examination of orthophoto and satellite imagery. The research covered selected residential areas located within the historic core and the wider urban territory of Novi Pazar. Fieldwork included on-site visits to representative examples of traditional courtyard houses as well as contemporary residential buildings. During the field investigation, particular attention was given to spatial relationships between buildings and courtyards, the height and position of boundary walls, the presence of vegetation, patterns of solar exposure and natural ventilation, and the ways in which outdoor spaces are used by residents.

Photographic documentation was employed to record characteristic spatial elements, shaded zones, transitional spaces, and the relationships between private and public domains. The collected visual material provided an important basis for the comparative analysis of residential typologies.

Orthophoto and satellite imagery were analyzed in order to identify broader urban patterns, including building density, the ratio between built and open surfaces, and the transformation of courtyard spaces over time. This spatial data enabled the recognition of gradual processes through which traditional courtyards are disappearing within the contemporary urban structure.

Based on the field data, analytical diagrams were developed to illustrate patterns of natural ventilation, shading zones, and spatial sequences of movement. This approach allowed theoretical concepts discussed in the study to be connected with observable spatial practices within the built environment.

3.2.2 Analysis of spatial structure using orthophoto imagery

The analysis of orthophoto and satellite imagery was conducted through the mapping and comparative examination of three representative urban zones in Novi Pazar: the historic core, a mixed urban zone, and an area of contemporary development (Fig. 1).

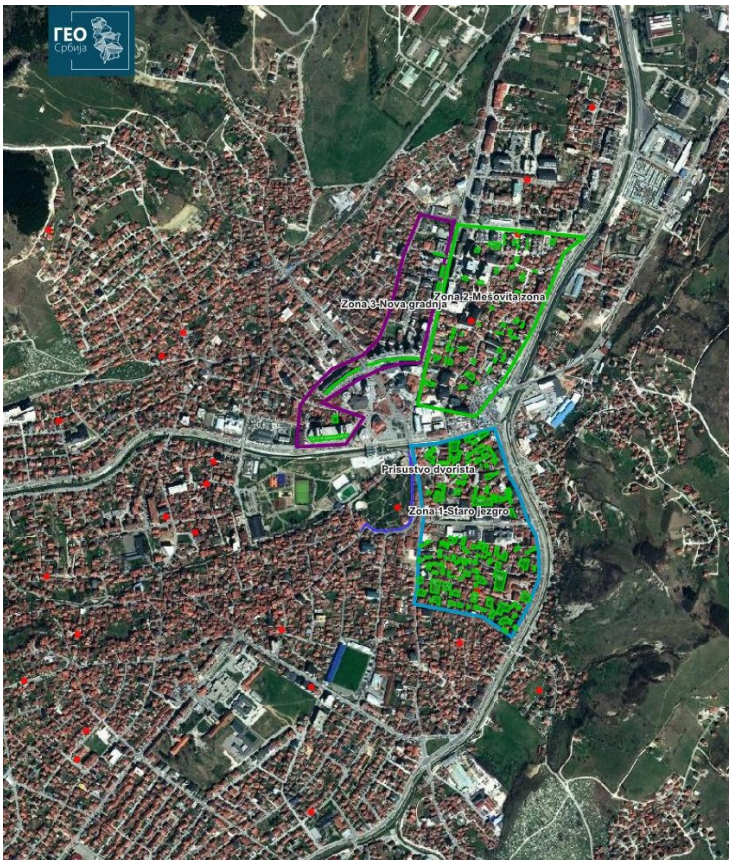


Figure 1. Orthophoto view of the analyzed urban zones in Novi Pazar. Source: GeoSrbija; processed by the author.

The boundaries of the analyzed zones were defined based on morphological characteristics, building density, and the typology of residential structures. Within the historic core, a high concentration of internal courtyards was identified. These courtyards are clearly integrated into the block structure and function as primary spatial and microclimatic regulators. This zone is characterized by compact urban fabric with pronounced internal voids that facilitate natural ventilation and the formation of shaded spaces.

The mixed urban zone reveals signs of gradual transformation, where traditional courtyards are increasingly fragmented or partially lost as a result of new construction. Although open spaces are still present, their functional role and spatial coherence have been significantly reduced.

The zone of contemporary residential development is defined by high building density, the dominance of multi-storey buildings, and the near absence of private courtyards. In these areas, open spaces are largely limited to parking and circulation surfaces, offering minimal potential for microclimatic regulation.

The cartographic analysis indicates a clear gradient from preserved courtyard structures in the historic core toward their progressive disappearance in newly developed urban areas. This pattern supports the argument that traditional courtyard-based typologies play an important role in maintaining housing quality and enhancing climatic resilience within the urban environment.

3.2.3 User survey

In order to examine users' perceptions regarding the quality of courtyard spaces and residential conditions, a survey was conducted among residents of selected urban zones in Novi Pazar. The sample included respondents living both in individual houses with courtyards and in apartments within multi-family residential buildings, allowing a comparative assessment of different housing typologies.

The survey was implemented through a structured questionnaire consisting of closed and semi-open questions. The questionnaire addressed several aspects related to the use of courtyard spaces, satisfaction with microclimatic conditions, the presence of vegetation, the perception of privacy, and the overall quality of residential environments.

The survey was carried out during the period from January to February 2026 and included a total of thirty respondents. The collected data were subsequently used for qualitative interpretation and descriptive analysis within the section presenting the research results.

4. RESULTS AND DISCUSSIONS

4.1 Zone 1 — the traditional courtyard model and climatic adaptability

The historic core of Novi Pazar is characterized by a preserved spatial structure of traditional residential buildings organized around internal courtyards. Within this urban fabric, the courtyard represents a central element of domestic spatial organization, connecting interior living spaces with the open environment.

The presence of mature vegetation, permeable natural ground surfaces, and relatively enclosed courtyard spaces contributes to the formation of favorable microclimatic conditions. These spatial characteristics provide shading, enable natural ventilation, and ensure a high level of privacy for residents. Although isolated cases of partial degradation were observed, the fundamental principles of the traditional courtyard model remain largely preserved within this urban zone.



Figure 2. Vegetation and shading in a courtyard of the historic zone of Novi Pazar. Source: Author's photographic documentation, 2026.

The photograph illustrates a traditional courtyard characterized by well-developed vegetation, with a tall tree positioned at its center that provides natural shading and contributes to microclimatic regulation. The presence of greenery and permeable ground surfaces helps reduce air temperature, increase humidity levels, and create a comfortable microenvironment during the summer months.

The spatial organization of the courtyard allows visual and functional connections between interior residential spaces and the open outdoor environment, reinforcing the everyday use of the courtyard as an extension of the living space. This example demonstrates the role of the courtyard as both a passive climatic regulator and a social core of the dwelling.



Figure 3. Loss of the functional role of courtyards in the historic zone of Novi Pazar. Source: Author's photographic documentation, 2026.

The photograph illustrates a courtyard in which the original spatial function has been partially diminished due to the predominance of circulation routes and paved surfaces. The central portion of the space is occupied by a stone pathway, while green areas are reduced to a narrow strip along the edges.

The reduction of vegetation and the increase in impermeable surfaces negatively affect microclimatic conditions by limiting the capacity of the space to provide natural cooling and shading. At the same time, the courtyard gradually loses its social and recreational role, transforming into a predominantly transitional space. This example illustrates the ongoing process of gradual degradation of the traditional courtyard model.

The analysis presented in this study indicates a high level of coherence between architectural

form, climatic conditions, and cultural patterns of dwelling. The traditional courtyard concept enables passive temperature regulation and the creation of a comfortable microenvironment during the summer months, while also ensuring a high degree of privacy for residents.

4.2 Mixed zone — transition between traditional and contemporary housing models

Zone 2 represents a transitional urban area in which the coexistence of traditional and contemporary residential typologies can be clearly observed. Within this zone, the courtyard structure becomes increasingly fragmented, accompanied by a noticeable reduction of green spaces and the emergence of spatial conflicts between older architectural forms and new construction.



Figure 4. Traditional house embedded within contemporary residential development in the mixed zone. Source: Author's photographic documentation, 2026.

The photograph illustrates a traditional single-storey house surrounded by contemporary multi-storey buildings and paved surfaces, clearly reflecting the transitional character of the mixed urban zone. This spatial context demonstrates the gradual displacement of the traditional courtyard model as a consequence of intensive urban development.

A particularly evident contrast can be observed between the traditional and contemporary structures in terms of microclimatic conditions. The traditional house, situated within a courtyard characterized by mature trees and developed vegetation, benefits from natural shading and more favorable thermal comfort during the summer months. Vegetation contributes to lowering air temperatures and mitigating the effects of direct solar radiation.

In contrast, the contemporary building—characterized by the dominant use of concrete, glass, and marble and the absence of natural shading—is exposed to intense solar heating. The lack of vegetation and permeable ground surfaces leads to heat accumulation, increasing the need for artificial cooling and reducing the overall energy efficiency of the building.

The dominance of contemporary structures disrupts the spatial hierarchy and environmental identity of this part of the city, confirming the ongoing transformation of traditional climate-responsive principles within contemporary urban development.



Figure 5. Vertical expansion of residential structures within a traditional courtyard plot. Source: Author's photographic documentation, 2026.

The photograph shows a newly constructed multi-storey building erected within the plot of a traditional house, significantly reducing the extent of the courtyard's open space. Such spatial interventions lead to fragmentation of the courtyard area and the loss of its primary function.

Vertical expansion within the parcel results in increased shading, reduced privacy, and limited natural ventilation, which collectively have a negative impact on the overall quality of residential conditions.

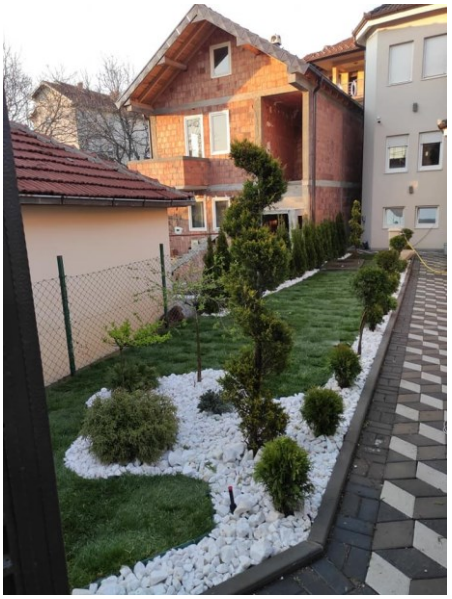


Figure 6. Contemporary courtyard design in the mixed zone. Source: Author's photographic documentation, 2026.

The photograph illustrates a contemporary courtyard design characterized by decorative greenery and paved surfaces, typical of more recent residential developments. Although vegetation is present, it serves primarily an aesthetic rather than a functional role.

The dominance of hard surfaces and ornamental plants limits the microclimatic potential of

the space when compared with traditional courtyards that feature mature vegetation and natural ground surfaces.

The analysis of the mixed zone indicates a pronounced process of transition between traditional and contemporary housing models. Within this area, the coexistence of preserved courtyard structures, spatial degradation, and newly introduced courtyard arrangements can be observed. These emerging forms of spatial organization tend to prioritize visual identity over functional performance.

4.3 Zone 3 — contemporary residential development and the loss of the courtyard concept

The zone of recent urban development is characterized by dense, predominantly multi-storey residential construction and the near absence of traditional courtyard spaces. In this area, spatial organization is largely driven by the objective of maximizing land use, with open spaces primarily reduced to circulation routes and parking areas.

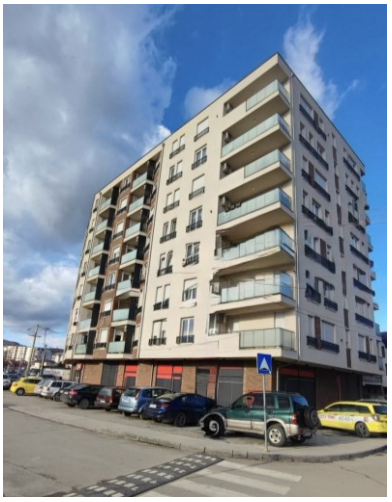


Figure 7. High-density multi-storey residential buildings with minimal open space in the new urban zone. Source: Author's photographic documentation, 2026.

The photograph shows a multi-storey residential building surrounded by asphalted and paved surfaces, with no presence of vegetation or natural ground. Open spaces within the plot are entirely converted into parking and circulation areas.

Such spatial organization contributes to the formation of an urban heat island effect, reduces opportunities for natural ventilation, and leads to the deterioration of local microclimatic conditions, ultimately affecting the overall quality of residential environments.



Figure 8. Partial preservation of traditional architectural elements within contemporary residential construction. Source: Author's photographic documentation, 2026.

The photograph illustrates a newly constructed building in which certain traditional architectural elements are present, yet they are not functionally integrated into the overall spatial concept. The open space of the plot is largely reduced to a parking area, while natural ground surfaces are almost entirely eliminated.

Such an approach represents a formal rather than substantive preservation of local identity, where traditional patterns are employed primarily as aesthetic motifs rather than as integral components of the spatial organization.



Figure 9. Compact residential blocks lacking green spaces and natural ventilation corridors. Source: Author's photographic documentation, 2026.

The photograph illustrates a sequence of newly constructed buildings positioned in close proximity to one another, without intermediary spaces that would allow for greenery, natural ventilation, or adequate daylight access. Such dense construction prevents the formation of high-quality microenvironments and negatively affects conditions of privacy.

The absence of open green areas contributes to deteriorating thermal comfort and reduces the ecological sustainability of the residential environment.

The analysis of Zone 3 reveals the complete dominance of an investor-driven development model, in which spatial quality is largely subordinated to economic interests. Within this zone, the traditional courtyard concept—once functioning as both a climatic and social regulator—has almost entirely disappeared.

4.4 Comparative analysis of spatial characteristics across all zones

A comparative assessment of the key spatial and architectural parameters of the analyzed zones is presented in Table 1. The purpose of this analysis is to identify differences in spatial organization, the presence of greenery, and microclimatic quality across different stages of urban development within the city.

Table 1. Comparative spatial characteristics of the analyzed urban zones in the city of Novi Pazar. Source: Author.

Parameter	Zone 1 – Historic core	Zone 2 – Mixed zone	Zone 3 – New development
Presence of courtyards	Highly present, enclosed	Partial, fragmented	Mostly absent
Built/open space ratio	Balanced	Dominance of built structures	Strong dominance of built structures
Building density	Moderate	Increased	High
Courtyard form	Compact, irregular	Reduced, fragmented	None
Vegetation	Present	Limited	Minimal
Shading potential	High	Medium	Low
Microclimatic quality	Favorable	Moderate	Unfavorable
Spatial privacy	High	Medium	Low

Interpretation of results

The results presented in Table 1 reveal clear differences among the analyzed zones in terms of spatial organization, the presence of open spaces, and microclimatic conditions.

The historic core is characterized by a balanced relationship between built and open spaces, a high presence of courtyards, and well-developed shading systems. Such spatial configuration provides favorable microclimatic conditions, supports natural ventilation, and ensures a high degree of spatial privacy, all of which contribute positively to the overall quality of residential environments.

The mixed zone exhibits transitional characteristics, with partially preserved courtyard spaces and an increased building density. The fragmentation of open areas and the gradual reduction of vegetation lead to a moderate level of microclimatic quality and the progressive loss of courtyard functionality.

In contrast, the zone of contemporary development is characterized by the near absence of private open spaces, high building density, and minimal vegetation. The dominance of hard surfaces and compact construction negatively affects thermal comfort, natural ventilation, and the privacy of residents, resulting in unfavorable microclimatic conditions.

The comparative analysis confirms a gradual process of degradation of the traditional

courtyard model, manifested through the reduction of green areas, increased energy demand, and the loss of the social function of open spaces. These findings provide the basis for further consideration of design recommendations presented in the concluding section of the paper.

4.5 Results of the user survey

The survey included a total of thirty respondents from different urban zones of Novi Pazar. Within the sample structure, 50% of respondents live in houses with courtyards, 10% in houses without courtyards, while 40% reside in apartment buildings. Given the limited sample size, the results of the survey should be interpreted as indicative rather than representative, providing insight into user perceptions rather than statistically generalizable conclusions.

The findings indicate that 26.7% of respondents use the courtyard on a daily basis, while 16.7% report occasional use. Only 6.7% of respondents use the courtyard rarely, whereas those without access to a courtyard do not have the opportunity to use such spaces.

Regarding summer thermal comfort, 33.3% of respondents describe the temperature conditions as very pleasant, while 13.3% consider them generally comfortable. Only 3.3% of respondents perceive summer temperatures as excessively warm, which may be associated with the presence of vegetation and shading in certain residential environments.

The analysis of air-conditioning use shows that 6.7% of respondents rely on air-conditioning daily, while 16.7% use it occasionally. Notably, 26.7% of respondents report never using air-conditioning systems, which may be linked to the presence of passive microclimatic regulation provided by courtyard spaces.

When considering the impact of courtyards on quality of life, 43.3% of respondents perceive courtyard spaces as having a significant positive influence, while 6.7% indicate a partial contribution. Only 3.3% of respondents do not recognize the importance of courtyard space.

In terms of satisfaction with greenery, 50% of respondents report being satisfied with the existing green areas, while the same proportion indicate that contemporary residential construction tends to neglect open and green spaces.

Housing preferences further support these findings, as 43.3% of respondents express a preference for living in houses with courtyards, while only 3.3% prefer housing without courtyard spaces.

Overall, the survey findings are consistent with the spatial-architectural analysis, suggesting a relationship between the presence of courtyard spaces, improved microclimatic conditions, and the perceived quality of residential environments.

4.6 Indicative microclimatic assessment and spatial quantification of urban zones

Although the conducted research is primarily qualitative in nature, certain microclimatic aspects of the analyzed spaces can be interpreted through an indicative assessment based on spatial configuration, the presence of vegetation, and passive design principles established in the relevant literature (Givoni, 1998; Olgyay, 1963). In this regard, the analysis of the three

characteristic urban zones is complemented by an estimation of the proportion between built, open, and green surfaces, derived from the interpretation of orthophoto imagery and field observations.

The results indicate a clear relationship between spatial morphology and microclimatic performance.

Within the historic core **(Zone 1)**, courtyards represent an integral component of the urban fabric and are characterized by a relatively balanced ratio between built and open areas. Built surfaces are estimated to account for approximately 50–60% of the plot, while open spaces comprise 40–50%, of which a significant portion is vegetated (approximately 20–30% of the total plot area). The presence of vegetation, permeable surfaces, and shaded areas enables effective microclimatic regulation. In accordance with bioclimatic design principles, such spatial conditions can contribute to a reduction in air temperature in the range of approximately 2°C to 5°C during summer months. At the same time, the spatial organization of buildings around courtyards supports natural ventilation through a combination of cross-ventilation and vertical air movement driven by temperature differences, thereby ensuring stable thermal comfort conditions.

In the mixed urban zone **(Zone 2)**, a gradual degradation of the courtyard concept is observed, accompanied by increased building density and fragmentation of open spaces. The estimated proportion of built surfaces ranges from 65–75%, while open areas account for 25–35%, with a reduced share of green surfaces (approximately 10–20%). Such spatial configuration results in limited microclimatic effects. The reduction of vegetation and the increase in impermeable surfaces lead to a weaker cooling effect, estimated at approximately 1°C to 3°C compared to fully built-up environments. Although natural ventilation principles remain present, their effectiveness is reduced due to decreased spacing between buildings and vertical expansion of the built structure.

The zone of contemporary urban development **(Zone 3)** is characterized by the dominance of built and impermeable surfaces, which account for approximately 80–90% of the plot, while open spaces comprise only 10–20%, with minimal vegetation (less than 5–10%). Under such conditions, key elements of passive microclimatic regulation are largely absent. The lack of shading and vegetation leads to increased surface heating and the formation of an urban heat island effect, while compact building arrangements and limited spacing between structures restrict natural ventilation. Consequently, these environments are associated with less favorable thermal comfort conditions and increased reliance on mechanical cooling systems.

The comparative analysis reveals a clear correlation between the presence of courtyard spaces and the microclimatic performance of urban structures. A higher proportion of open and vegetated surfaces in the historic core is associated with lower temperatures, improved ventilation, and a higher level of thermal comfort, whereas contemporary housing models characterized by predominantly built surfaces demonstrate a reduced capacity for passive climatic regulation. These findings further confirm that the courtyard should not be

understood solely as a morphological or cultural pattern, but as a functional element of microclimatic stabilization with a direct impact on the quality of residential environments.

5. CONCLUSIONS AND RECOMMENDATIONS

The conducted research confirms that the traditional courtyard-based housing model in Novi Pazar represents an integrated spatial, climatic, and social system developed through long-term adaptation to local environmental and cultural conditions. The analysis of three characteristic urban zones reveals a clear developmental gradient—from preserved courtyard structures in the historic core, through fragmented forms in mixed urban areas, to the near-complete disappearance of courtyard typologies in contemporary residential developments.

The findings support the initial hypothesis that the reduction or elimination of courtyard space directly contributes to the deterioration of microclimatic conditions, the weakening of natural ventilation, and the increase of thermal load, ultimately resulting in a greater dependence on mechanical cooling systems. At the same time, increased building density and the reduction of permeable and green surfaces negatively affect the energy efficiency and climatic resilience of the urban environment.

The empirical findings further indicate a relationship between the physical structure of space and the subjective perception of comfort. Although limited in scope, the survey results should be interpreted as indicative rather than representative, suggesting that users recognize the importance of courtyard spaces in enhancing residential quality, particularly in terms of thermal comfort, privacy, and access to greenery.

Based on the conducted analysis, several design-oriented recommendations can be identified:

- ensuring a minimum proportion of open space within residential plots in the range of approximately **30–40%**, in order to enable basic microclimatic regulation
- providing green surfaces of at least **15–25% of the total plot area**, with an emphasis on vegetation capable of generating effective shading
- organizing spatial layouts to support **natural ventilation**, through adequate spacing between buildings and the orientation of openings toward both courtyard and external spaces
- applying **semi-enclosed or shared courtyard configurations** within multi-family housing, as a reinterpretation of traditional spatial models under conditions of higher density
- limiting the dominance of impermeable surfaces and encouraging the use of permeable materials in the design of open spaces

In this context, the courtyard should not be understood solely as a historical or cultural pattern, but as a functional spatial mechanism that enables passive microclimatic regulation and contributes directly to the quality of residential environments.

The limitations of the research primarily relate to the qualitative character of the analysis and

the relatively small sample size. Future research may include quantitative measurements of microclimatic parameters, an expanded sample, and the application of simulation models in order to achieve a more precise evaluation of the environmental performance of courtyard-based spatial configurations.

Within the broader context of climate change and rapid urban development, the reinterpretation of the courtyard model represents a relevant strategy for improving microclimatic comfort, energy efficiency, and social sustainability in contemporary residential architecture.

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Numerical assessment of the thermal performance of a heated and cooled floor containing upgraded phase change materials

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Abstract

A two-dimensional numerical model of a radiant floor heating system integrating phase change material (PCM) microcapsules microencapsulated in polyethylene spheres was elaborated to estimate its thermal performance. The outcomes point that ideal incorporation of the microcapsules directly above the heating pipes, with a 15% concentration in the cement mortar layer, meaningfully increases heat transfer to the upper floor surface. The parametric study highlights that increasing the pipe space extends the PCM melting time, stabilizes the surface temperature during the heating and cooling phases, and allows for a decrease in the number of pipes, thus improving the system's economic performance. A heating start-up temperature of 35°C is within the limits of thermal comfort, while higher temperatures generate discomfort, primarily during the heating phase. Evaluation between organic and inorganic PCMs shows that inorganic PCMs, particularly S27 hydrated salts, exhibit the best thermal performance, with a 4°C increase in temperature range and a 5,5-hour phase shift assessed to a floor without PCMs. The addition of conductive nanoparticles to form enhanced phase-change materials (NePCMs) achieves a total phase shift of 6.5 hours, ensuing significant cost savings. Finally, in cooling mode with water circulating at 19°C, a 4.5°C reduction in internal surface temperature is achieved.

Key words: *latent heat storage, microcapsules, NePCM, phase shift, thermal comfort.*

1. INTRODUCTION

Underfloor heating is a low-temperature heating system in which hot water (35–45 °C) circulates through pipes embedded in the floor. The heat spreads across the floor surface and warms the indoor space. According to the DTU 65.14 standard (NF DTU 65.14, 2021), the floor surface temperature should remain around 28 °C to ensure thermal comfort. This system can operate with different heat sources such as solar energy, boilers, or heat pumps and can also be used for both heating and cooling. Several studies have examined the performance of underfloor heating systems. Mokhtari et al. (Mokhtari et al., 2021) studied a solar underfloor heating system consisting of copper tubes (15 mm diameter) embedded in concrete and insulated with a 50 mm polystyrene layer. Their results showed that the fluid temperature stabilized at around 40 °C after 60 hours and maintained indoor temperatures between 20 °C and 25 °C, which satisfies thermal comfort requirements. Similar work by Zaheer-Uddin et al. (Zaheer-Uddin et al., 1997) used a gas boiler instead of solar collectors. Their results showed that the system required approximately 50 hours to reach stable operation and could maintain the indoor temperature close to the desired setpoint even when the outdoor temperature reached −6 °C. In another study, Mokhtari et al. (Mokhtari et al., 2021) explored the use of underfloor systems for summer cooling without air conditioning. The results showed that solar floors could cover up to 60 % of building energy needs in Maghreb climates and reduce indoor temperature by about 4 °C when circulating water at around 22.5 °C while avoiding condensation risks. Belkacem et al. (Belkacem et al., 2015) also evaluated a solar floor heating system without a storage tank and suggested combining reversible floor heating with night ventilation to improve comfort and reduce energy consumption. Control strategies also play an important role in system efficiency. According to the EN 12098 standard (NF EN 12098-5, 2021), intermittent operation with scheduled control can optimize energy use, particularly during periods when buildings are unoccupied. To further improve energy efficiency, several researchers have proposed integrating phase change materials (PCMs) into underfloor heating systems. PCMs store thermal energy during the heating phase and release it when the system stops. González et al. (González and Prieto, 2021) conducted a 2D numerical study comparing floors with and without PCMs. Their results showed that PCM integration increased stored thermal energy from about 445–552 Wh/m² to 1141–1245 Wh/m², although heat transfer decreased slightly. Other researchers have explored different PCM configurations. Wenlong Cheng et al. (Cheng et al., 2015) introduced PCM panels made of paraffin, polyethylene, and expanded graphite into a test room with underfloor heating and observed improved energy efficiency and reduced insulation thickness. Devaux et al. (Devaux and Farid, 2017) investigated the integration of PCMs in walls, ceilings, and floors, achieving energy savings of 32 % and cost reductions of 42 %. Farid et al. (Farid and Kong, 2001) tested macro-encapsulated PCMs integrated into concrete slabs with a melting temperature of around 28 °C. The results showed reduced floor temperature fluctuations and allowed heating to operate only during off-peak electricity hours. Similarly, Huang et al. (Huang et al., 2014) studied a floor system with two layers of heating tubes and a PCM layer containing capric acid, which released 37,677.6 kJ of heat over 16 hours, representing 47.7 % of the supplied solar energy. Sung Ho

Choi et al. (Choi et al., 2019) analyzed the thermal delay introduced by PCM layers in floor heating systems. Their results showed that PCMs increased the heat release period during discharge by more than 5 hours, improving peak load management. Zhang et al. (Zhang and Zhaosheng, 2021) also developed a numerical model to study the influence of PCM properties, concluding that phase change temperature and thermal conductivity significantly affect indoor comfort. However, PCMs generally suffer from low thermal conductivity (Al-Maghalseh and Mahkamov, 2018), which can limit their performance. To overcome this limitation, researchers have proposed enhancing PCMs with nanoparticles, creating nanoparticle-enhanced phase change materials (NePCMs). Al-Kayiem et al. (Al-Kayiem and Lin, 2014) showed that adding copper nanoparticles increased the thermal conductivity of paraffin PCM by 24 % and improved solar collector efficiency. Similarly, Karunesh et al. (Kant et al., 2017) demonstrated that graphene nanoparticles enhance PCM melting rates, although excessive concentrations may increase viscosity and reduce natural convection.

Sarrafha et al. (Sarrafha et al., 2021) investigated the use of carbon nanotubes (CNTs) in organic PCMs and found that they improved thermal comfort in winter and moderate seasons but could increase heat transfer during summer. Tian-Hu Wang et al. (Wang et al., 2020) also improved PCM thermal conductivity by mixing microencapsulated PCM with expanded graphite, increasing thermal conductivity from 0.22 W/m·K to 0.51 W/m·K and enhancing heat storage and release performance. In this study, it was numerically investigated the integration of PCM microcapsules. The objective is to exploit the thermal storage capacity of PCMs to reduce heating energy consumption and stabilize indoor temperatures near the comfort level. A two-dimensional model based on the enthalpy method and the finite volume approach is used. To address the low thermal conductivity of PCMs, nanoparticle-enhanced PCMs (NePCMs) are considered. The system is analyzed for both winter heating and summer cooling by circulating hot or cold water through the floor pipes.

2. METHODOLOGY

Our system is a heated floor consisting of five layers. The system described is based on a typical full-scale configuration taken from the literature (Abdellatif et al., 2019). The first layer consists of a 4 cm cement screed followed by 4 cm of cork and EPS thermal insulation. The next layer contains heating pipes and phase-change material microcapsules, and finally, a 2 cm marble top layer. In this study, it was specifically investigated the performance of nanoparticle-enhanced phase change materials (NePCMs). The enhanced PCM is composed of S27 hydrated salts integrated with 1% copper (Cu) nanoparticles and 4% Al_2O_3. This specific fraction was selected to overcome the inherently low thermal conductivity of organic and inorganic PCMs.

Figure 1 illustrates the composition of the heated floor under study. The water temperature circulating in the pipes is taken from an experimental study in the literature (Larwa et al., 2021). The thermophysical properties of the materials used are shown in Tables 1 and 2.

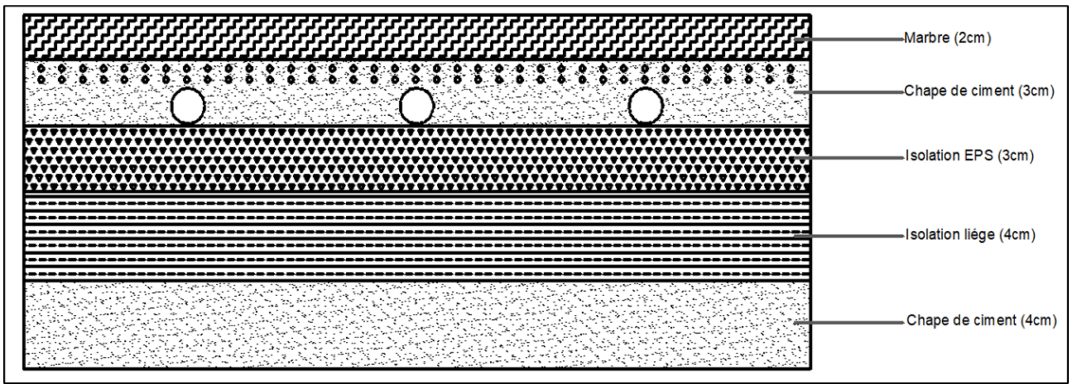


Table 1. Thermophysical properties of the slab construction materials

Construction materials	Density [kg/m³]	Thermal conductivity [W/ (m K)]	Specific heat capacity [J/(kg K)]
Liege	400	0.065	1500
Marber	2800	3.5	1000
cement	1600	0.85	1000
EPS	29	0.04	1450

Table 2. Thermophysical properties of the PCM

Melting point [°C]	**27**
Latent heat of fusion [J/kg]	185 000
Density (solid / liquid) [kg/m³]	1500
Thermal conductivity [W/(m·K)]	0,54
Specific heat capacity (solid) [J/(kg·K)]	2200

Simplifying assumptions

The heat balance of heat diffusion within the heated slab is developed using the following simplifying assumptions:

• The physical properties of the materials are assumed to be constant.
• Heat transfer within the slab and the fluid is unsteady and two-dimensional (2D).
• The heated slab is assumed to be adiabatic on all sides, except for the upper surface in contact with the internal environment.
• Contact is perfect at the interfaces.
• Convection is negligible in the molten phase of the PCM: Convection is neglected in the molten phase of the PCM. This simplification is justified by the fact that the PCM is

microencapsulated within polyethylene spheres. The small diameter of these microcapsules physically restricts the mobility of the liquid phase, thereby suppressing buoyancy-driven natural convection

• The tubes are surrounded by a conductive material such that the water temperature is equal to the surface temperature of the heating tubes.

• Heat transfer within the layer containing the tubes and microcapsules is symmetrical.

Mathematical formulation

The heat transfer within the radiant floor is governed by the energy conservation equation. Based on the assumptions stated previously, the mathematical model is formulated using the enthalpy method in order to account for latent heat storage in the PCM layers.

For the standard layers (cement screed, insulation, and marble), the transient heat conduction equation is expressed as:

$$\left(1-\epsilon\right)\rho C_p\frac{\partial T}{\partial t}=\frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right)\right) \quad (1)$$

For the layer containing the heating tubes and the microencapsulated PCM, the governing equation incorporates the PCM volume fraction $\epsilon$and the total enthalpy $H$to describe the phase change process:

$$\epsilon\,\rho\frac{\partial H}{\partial t}=\frac{\partial}{\partial x}\left(k\frac{\partial T}{\partial x}\right)+\frac{\partial}{\partial y}\left(k\frac{\partial T}{\partial y}\right) \quad (2)$$

The total enthalpy $H$is defined as the sum of sensible and latent heat contributions:

$$H=C_pT+fL \quad (3)$$

Where:

- ρ is the density of the material $\left(kg/m^3\right)$
- C_p is the specific heat capacity at constant pressure $(J/kg.K)$
- T is the local temperature (K)
- t is time (s)
- k is the thermal conductivity $(W/m.K)$
- ϵ is the volume fraction of microencapsulated PCM
- H is the total specific enthalpy (J/kg)
- f is the liquid fraction of PCM (1)
- L is the latent heat of fusion of the PCM (J/kg)

Boundary conditions

- $-\alpha\left(\frac{\partial h}{\partial y}\right)_{y=h}=h_{int}(T_{(y=h,t)}-T_{int})$

$$h_{int}=10\ \text{W/(m}^2\text{.K)}\ et\ T_{int}=20°C$$

- $-\alpha\left(\frac{\partial h}{\partial y}\right)_{y=0}=0$

$T|_{(x+l/2)^2+(y-R)^2=R^2}=T|_{(x-l/2)^2+(y-R)^2=R^2}=T_{eau}$

Initial condition

- $T(x, y, 0) = T_{int}$

Solution using the finite volume method

An implicit time integration scheme was employed to ensure numerical stability, and the resulting nonlinear system was solved iteratively using the Gauss–Seidel method, where the coupling between temperature and enthalpy was updated at each time step until convergence was achieved with normalized residuals below 10^{-6}.

The discretization of the energy equation using the finite volume method is performed by integrating the equation as follows for the general case:

$$\iiint \quad (1-\varepsilon)\left(\frac{\partial h}{\partial t}\right)dxdydt = \iiint \quad (1-\varepsilon)[\alpha\frac{\partial}{\partial x}\left(\frac{\partial h}{\partial x}\right)+\alpha\frac{\partial}{\partial y}\left(\frac{\partial h}{\partial y}\right)-\rho L\left(\frac{\partial f}{\partial t}\right)]dxdydt$$

- $(1-\varepsilon)\frac{h_p-h_p^0}{\Delta t} = \alpha(1-\varepsilon)\frac{h_e-2h_p+h_w}{\Delta x^2}+\alpha(1-\varepsilon)\frac{h_S-2h_p+h_N}{\Delta y^2}-\rho L(1-\varepsilon)\left(\frac{fp-fp0}{\Delta t}\right)$
- $(1-\varepsilon)(h_{(i,j)}-h_{(i,j)}^0) = (1-\varepsilon)\alpha\frac{\Delta t}{\Delta x^2}\left(h_{(i-1,j)}-2h_{(i,j)}+h_{(i+1,j)}\right)+$
- $(1-\varepsilon)\alpha\frac{\Delta t}{\Delta y^2}\left(h_{(i,j-1)}-2h_{(i,j)}+h_{(i,j+1)}\right)-(1-\varepsilon)\rho L(f_{(i,j)}-f_{(i,j)}^0)$
- $(1-\varepsilon)\left(-\alpha\frac{\Delta t}{\Delta x^2}\right)h_{(i-1,j)}+(1-\varepsilon)\left(1+2\alpha\frac{\Delta t}{\Delta x^2}+2\alpha\frac{\Delta t}{\Delta y^2}\right)h_{(i,j)}+(1-\varepsilon)\left(-\alpha\frac{\Delta t}{\Delta x^2}\right)h_{(i+1,j)}=(1-\varepsilon)h_{(i,j)}^0+(1-\varepsilon)\alpha\frac{\Delta t}{\Delta y^2}\left(h_{(i,j-1)}+h_{(i,j+1)}\right)-(1-\varepsilon)\rho L(f_{(i,j)}-f_{(i,j)}^0)$

The liquid fraction for the general case is zero and the equation will take the following form:

$$(1-\varepsilon)\left(-\alpha\frac{\Delta t}{\Delta x^2}\right)h_{(i-1,j)}+(1-\varepsilon)\left(1+2\alpha\frac{\Delta t}{\Delta x^2}+2\alpha\frac{\Delta t}{\Delta y^2}\right)h_{(i,j)}+(1-\varepsilon)\left(-\alpha\frac{\Delta t}{\Delta x^2}\right)h_{(i+1,j)}=(1-\varepsilon)h_{(i,j)}^0+(1-\varepsilon)\alpha\frac{\Delta t}{\Delta y^2}\left(h_{(i,j-1)}+h_{(i,j+1)}\right)$$

The discretized equation takes the following form:

$$a_e h_{(i+1,j)}+a_p h_{(i,j)}+a_w h_{(i-1,j)} = b$$

3. RESULTS AND DISCUSSIONS

Mesh and Time Step Optimization

The mesh chosen for the layers not containing the PCM microcapsule lightly coarse at 0.5 cm. Mesh optimization was performed for the layer incorporating the microcapsules, using three finer meshes of 0.1, 0.2, and 0.3 cm. The transition from a 0.2 cm to a 0.3 cm mesh resulted in a 1.09% change in the surface temperature and a 9% change in the liquid fraction. Therefore, a 0.2 cm mesh will be considered, given that the transition from 0.1 cm to 0.2 cm results in a 0.885% change in surface temperature and a 1.329% change in the liquid fraction,

respectively. Regarding the effect of the different time steps (Δt = 5, 2, and 1 s) on the internal surface temperature, the following table presents the relative variations in internal surface temperature for the chosen time steps. As can be seen, the transition from Δt = 2 s to Δt = 1 s resulted in a relative variation in internal temperature of approximately 0.003% and a difference of 1.0 x 10^{-3}°C, in addition to a variation in the liquid fraction of 0.991%. Finally, the chosen mesh size is 0.2 cm for the layer incorporating the PCM microcapsules and 0.5 cm for the other layers, with a time step of 2 seconds. The obtained results are in good agreement with previously reported studies in the literature, confirming the validity of the numerical model (Larwa et al., 2021).

Table 3. Effect of the mesh on the internal temperature.

dx(cm)	dy(cm)	T(i=N)	V.R[%]	Différence	fr(i=N)	V.R[%]	Différence
0,1	0,1	28,342			0,668		
0,2	0,2	28,595	0,885%	0,253	0,677	1,329%	9,0E-03
0,3	0,3	28,911	1,093%	0,316	0,744	9,005%	6,7E-02

Table 4. Effect of time step on internal temperature.

dt	T(i=N)	V.R[%]	Différence	fr(i=N)	V.R[%]	Différence
5s	28,911			0,9988		
2s	28,902	0,031%	9,0E-03	0,9987	0,010%	1,0E-04
1s	28,901	0,003%	1,0E-03	0,9889	0,991%	9,8E-03

Validation with experimental results from literature

The system on which we validated our mathematical and numerical model is an improved radiant floor with macro-encapsulated salt hydrate phase change materials (PCMs) in a layer of wet sand [21]. Our two-dimensional validation model of the radiant floor was implemented in a computational fluid dynamics (CFD) software using the finite volume method.

To minimize numerical errors and accelerate the calculation, the mesh size was refined for the area near the PCM containers and coarse for the area further away. The full mesh is limited to 0.5 cm to reduce computation time, with a 0.2 cm mesh reserved for the layer incorporating the PCM microcapsules. The comparison between our numerical results and those obtained experimentally on the temperature variation of the underside of the floor covering with PCMs.

Comparing the two solutions yields a numerical curve very close to the experimental curve, with a mean error (ERR) of 0.5%. This can be explained by neglecting the phenomenon of natural convection in our assumptions.

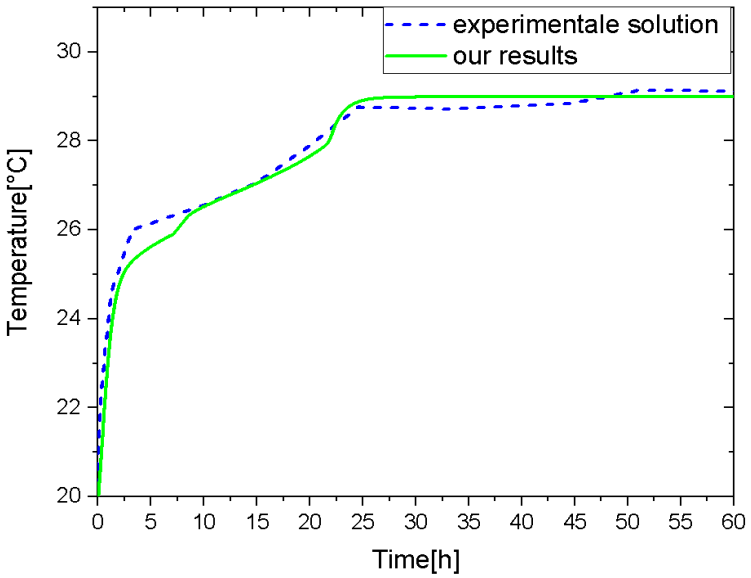


Figure 2. Validation of the digital and experimental solution for underfloor heating.

In general, we conclude that the numerical results are consistent with the experimental values, allowing us to affirm that the developed model is valid for predicting results closer to reality for this type of underfloor heating system.

Evaluation of heating and cooling Floor

To ensure climate control for year-round thermal comfort, this section proposes applying a cooling mode to the selected configuration during the winter months. This allows the floor to function as a conditioned hydraulic circuit for cooling during the summer. To prevent condensation of the fluid in the heating pipes, we will set the temperature to 19°C to ensure indoor comfort. The following figure illustrates the temporal variation of the internal surface temperature for the heating floor without cooling and the heating floor with cooling (cooling floor).

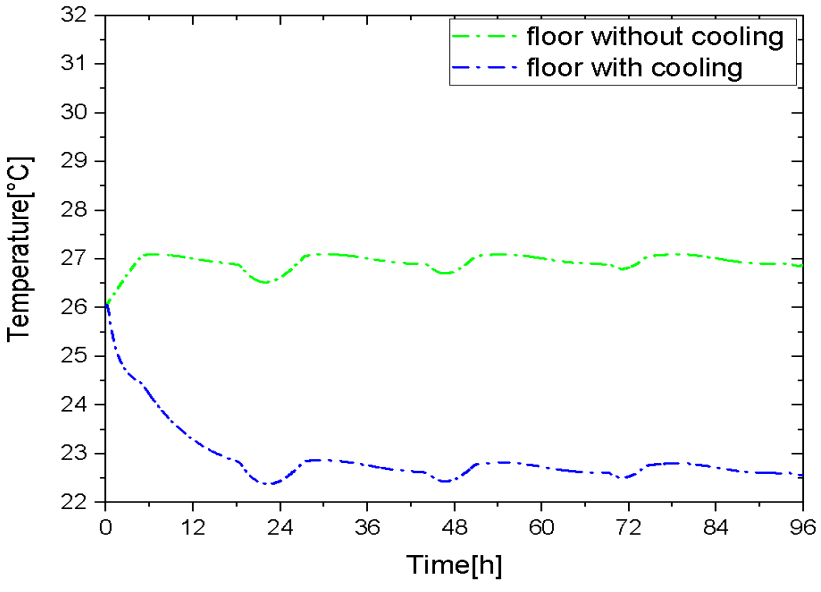


Figure 3. Variation of internal surface temperature for the floor with and without cooling.

According to the results shown in the figure, when circulating cold water at 19°C through the pipes to cool the indoor environment in the case of the cooling floor, the floor surface temperature varies between 22.3°C and 22.7°C. However, when using the floor without cooling, we observe that the surface temperature of the floor varies between 26°C and 27.2°C. We therefore emphasize that the use of cooling floors has shown that the process can indeed provide satisfactory results with a maximum reduction of 4.5°C in the ambient temperature, provided that a relatively high hydraulic circuit temperature of around 19°C is used to both provide a feeling of comfort for the occupants and to avoid the risk of condensation.

Regarding the liquid fraction, the following figure shows the temporal variation of the liquid fraction for the floor with and without cooling.

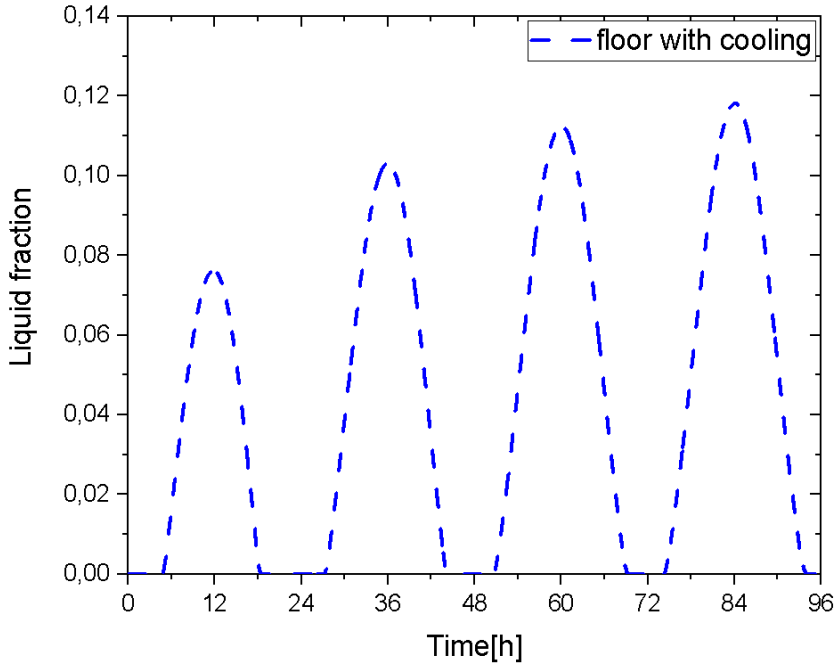


Figure 4. Variation of the liquid fraction of MCP microcapsules for the floor with and without cooling.

We observe that the liquid fraction of the PCM microcapsules exhibits a maximum liquefaction of 12% during the daytime period. This liquefaction is related to the imposed perceived temperature, which is slightly higher than the melting temperature (27°C) and which enabled the solid-liquid phase change of the microcapsules (f=0.12). However, the PCM remains in the solid phase during the nighttime period. This is related to the PCM's melting temperature (27°C), which is significantly higher than the imposed cooling temperature (19°C) and higher than the imposed temperature of 26°C during this period. In this case, the PCM microcapsules act as thermal insulation and can increase the temperature at the top surface of the floor, but the circulation of cold water at 19°C in the tubes cools the internal environment. We conclude that underfloor heating can be used as a heat diffuser during the winter period and can also be used as a heat absorber during the summer period; this is referred to as reversible underfloor heating.

4. CONCLUSIONS AND RECOMMENDATIONS

A two-dimensional physical model is used in this chapter to evaluate the thermal behaviour of a radiant floor heating system incorporating phase-change material microcapsules microencapsulated in polyethylene spheres. This prevents leakage into the liquid phase of the phase change material (PCM).

In this study, we evaluated the impact of adding simple and hybrid NePCMs on the floor's thermal performance and compared their respective effects.

Through this integration of phase-change material microcapsules enhanced with 1% copper and mixed with 4% Al2O3, we achieved a 4°C temperature increase with a 6.5-hour phase shift compared to conventional underfloor heating. Next, we performed a numerical simulation during the summer period using the same configuration as during the winter period. The results showed that integrating the PCM microcapsules into the floor provides improvements in thermal performance during both summer and winter periods, using the S27 hydrated salt PCM. Finally, we performed a numerical simulation for a cooling floor using the best configuration selected for the underfloor heating system during the winter period. By circulating cold water through the pipes at a temperature of 19°C, we achieved a cooling of the internal floor environment with a decrease in the internal surface temperature of 4.5°C. The main limitation of this study lies in the neglect of natural convection within the PCM during the melting process. Future work will focus on incorporating convective effects and experimental validation to further improve the model accuracy.

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Eco-Friendly Building Envelopes:
Thermal, Energy, Cost, and Time Performance of Prefabricated Lightweight MRC Panels in Residential Construction

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Abstract

The construction sector remains one of the largest energy users worldwide, with a significant portion of its demand coming from space heating and cooling. Since the building envelope controls the transfer of heat between indoor and outdoor spaces, improvements in wall, roof and floor systems are key to increasing energy efficiency and reducing operational emissions. In this context, traditional reinforced concrete (RC) frame buildings with brick infill walls continue to dominate residential construction in many Mediterranean countries.

Although common and readily available, these systems often rely on multiple separate layers to provide structural stability and thermal insulation, which can increase construction complexity, thermal transition risks and variability during construction. At the same time, industrialized prefabricated systems, including lightweight micro-reinforced concrete (MRC) panels are emerging as promising alternatives for both structural and envelope functions.

This study evaluates the thermal, energy, cost, and construction-time performance of prefabricated lightweight micro-reinforced concrete (MRC) panels – a type of EPS-core shotcrete sandwich system – as an alternative to traditional RC frame construction with brick infill walls. A comparative case study of a two-storey residential villa is conducted, combining energy analysis, cost assessment, and construction time evaluation.

Results show that the MRC system reduces wall U-values by nearly 50% and lowers annual primary energy demand by approximately 14.7%. Construction time is reduced by about 19%, while initial costs increased moderately (≈2.8%).

The findings highlight that while MRC panels improve envelope performance and construction efficiency, overall energy gains remain constrained by other envelope components, particularly the ground floor. The study supports a system-level approach to building design, where prefabricated solutions are integrated within a broader optimization framework.

***Keywords**: building envelope, prefabricated panels, energy performance, thermal transmittance, cost analysis, construction time*

1. INTRODUCTION

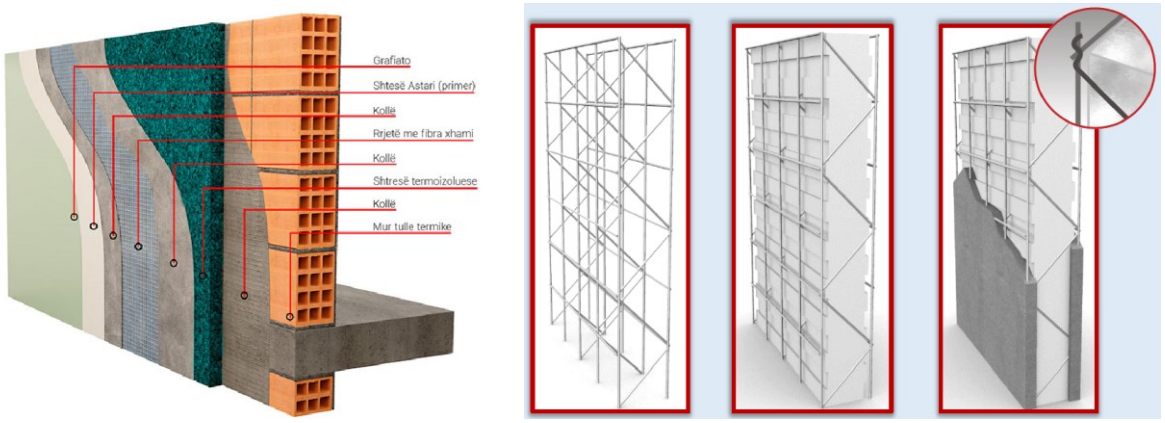
Buildings contribute significantly to energy consumption at global and European levels, mainly due to the need for comfortable thermal conditions. In the case of housing, heating and cooling directly depend on how well the envelope is constructed — walls, roof, floor, openings and connections between elements. Improving the building's envelope is one of the most effective ways to reduce energy consumption and negative environmental impact. European policies, such as the Energy Performance of Buildings Directive, as well as standards such as ISO 6946, ISO 10211 and ISO 13788, support this direction by providing clear calculation methods for heat transfer, thermal bridges and condensation risk. (*ISO 6946, 2017; ISO 10211, 2017; ISO 13788, 2012)*.

In traditional residential construction, especially in reinforced concrete frame structures, the building envelope is usually constructed in separate layers, with each layer having its own function — structural or thermal. Brick walls with external insulation are the most commonly used solution, because many builders know and master them well. However, this approach has its drawbacks. Coordination of different materials and workers often leads to errors, insulation breaks, and thermal bridges at critical points — slab edges, columns, window openings, and joints between the roof and the wall. Studies show that these thermal bridges can significantly impair the performance of the building: they increase heat loss, lower the temperature of internal surfaces, and, if not properly treated, can lead to condensation and mold formation. *(Alhawari & Mukhopadhyaya, 2017; Mayer et al., 2023).*

Prefabricated wall and panel systems have become prominent in industrialized construction strategies. Studies indicate that prefabricated envelopes can enhance dimensional accuracy, speed up assembly, improve quality control, and provide more consistent thermal performance, especially when insulation is integrated into the panel rather than added afterward. Among these, precast concrete sandwich panels and lightweight systems stand out because they can serve structural, enclosure, and thermal functions within a single

component. However, their real-world effectiveness relies on connector design, layer composition, insulation continuity, and junction treatment. In essence, simply including insulation inside a panel does not ensure optimal overall building performance. *(Yu et al., 2021; Sah et al., 2024; Tsoka et al., 2020; Kim & Allard, 2014; Ximei et al., 2018).*

This paper examines an integrated building system that uses lightweight MRC panels as a single element — both cladding and load-bearing structure. MRC panel refer to a category of lightweight prefabricated sandwich systems consisting of an expanded polystyrene (EPS) core (density about 16 kg/m³) combined with welded steel mesh reinforcement and shotcrete layers. These systems are also described in literature as 3D wire-mesh panels, shotcrete sandwich panels, or EPS-core structural panels. It has the potential to reduce the need for additional insulation, provide better thermal continuity, and at the same time simplify the structural and thermal design of the building.



a) b)

Figure 5. a) The conventional clay brick infill wall with façade cladding insulation system (left) and b) the lightweight prefabricated MRC panel infill wall system (right)

Despite the promise, a key gap exists in the appeal and practical performance of integrated prefabricated systems. Most studies focus on façade insulation or sandwich panel behavior, with fewer on the energy and implementation impacts of replacing traditional RC frames and brick infills with panel systems at the building level. This is especially true in markets where masonry construction dominates, and decision-makers need evidence on thermal performance, costs, and trade-offs. *(Yu et al., 2021; Ruoyu et al., 2020).*

This paper assesses whether prefabricated lightweight MRC panels can be a technically viable alternative to the traditional way of building's envelope. The study is based on a specific case – a two-story villa – relying on architectural drawings of the building and comparative energy and cost data for both methods. The paper answers three main questions:

(1) How does the MRC panel system affect the thermal performance of the wall and roof, compared to a traditional wall system?
(2) How does the improved envelope affect the reduction of the annual energy demand?
(3) What is the cost difference between the classic solution with RC frame and brick infill compared to the solution with MRC panel as a complete structural element?

2. LITERATURE REVIEW

The literature is clear: envelope performance is the key factor for building energy efficiency. The U-value, a widely used indicator, measures the amount of heat passing through walls and roofs. ISO 6946 standardizes the way it is calculated, and studies show it remains an important tool in design and verification. However, researchers point out that the U-value alone is not enough to fully understand the thermal behavior of a building, especially when factors such as thermal mass, air leakage, and insulation discontinuities directly affect energy consumption *(Song et al., 2024).*

Studies on prefabricated wall systems highlight their important role in sustainable construction. Yu et al. (2021) found that prefabrication offers energy savings, emission reductions, and higher manufacturing accuracy, but called for more evaluations across different wall types and climates. Sah et al. (2024) identified prefabricated external wall panels as key elements for energy-efficient and net-zero buildings, pointing in particular to precast concrete sandwich panels, which combine structural and thermal functions in a single component. Tsoka et al. (2020) showed, in a Mediterranean context, that prefabricated envelope systems can significantly improve energy performance when designed as multifunctional components, rather than simply as replacements for traditional wall layers.

Another important area of the literature deals with the thermal behavior of sandwich and precast concrete panels. Kim and Allard (2014) found that the shape and placement of connectors significantly influence heat transfer across these walls, as metal connectors can act as thermal bridges passing through the insulation layer. Earlier, Lee and Pessiki (2006) showed that panel configuration directly affects thermal resistance. Zhai et al. (2018) demonstrated that hybrid connectors can deliver higher thermal efficiency compared to more conductive alternatives. These findings are particularly relevant for MRC panels, showing that integrated systems can outperform traditional walls when the continuity of the thermal layer and the bridging effect of connectors are properly managed.

Thermal bridges are well-known problems that arise where insulation is interrupted by structural elements, irregularities, or high-conductivity materials. Alhawari and Mukhopadhyaya (2018) stress that they weaken envelope quality by increasing heat loss, lowering internal surface temperatures, and negatively affecting durability and indoor air quality. ISO 10211 provides detailed methods for their evaluation. In practice, integrated systems such as prefabricated panels can reduce these problems by lowering the number of junctions and interfaces that cause thermal bridging effects.

Envelope performance also depends on building airtightness, a factor that is often underestimated when only the U-values of opaque elements are considered. Studies show that quality control, testing, and assembly methods are critical for reliable performance. In warm and mixed climates, air infiltration directly affects energy consumption. Field studies link higher airtightness to better overall building performance. Industrialized panel systems may offer advantages through controlled manufacturing and consistent assembly, but this

depends on junction details and installation quality, not just on the panel material itself. *(Poza-Casado et al., 2020; Guillén-Lambea et al., 2019; Šadauskienė et al., 2016; Sinnott et al., 2012)*.

Thermal inertia refers to the ability of heavy envelopes to delay heat transfer — an effect that can be beneficial or modest, depending on the climate, building use, and ventilation system. The review by Verbeke and Audenaert shows that its impact is highly context-dependent: it can reduce peak loads and improve comfort, or it can be negligible and require careful balancing with insulation levels and operational needs. This is particularly relevant for lightweight prefabricated panels. While insulated integrated panels can reduce steady-state heat loss, their summer performance must be carefully evaluated, especially in climates where overheating and solar gains are real risks *(Verbeke & Audenaert, 2018; Aste et al., 2009; Di Perna et al., 2011)*.

The literature on off-site construction highlights its environmental and practical benefits beyond heat transfer — such as waste reduction and optimized assemblies — influenced by logistics, material choices, and system design. For practical decision-making, thermal, energy, cost, and constructability aspects should be assessed together, and it is precisely this integrated approach that forms the basis of this study. *(Yu et al., 2021)*.

3. METHODOLOGY

This study follows a comparative case-study approach, applied to a two-story residential villa. The reference building is a detached home, described through architectural drawings and analyzed using comparative data on energy performance, cost, and construction time. The core of the approach lies in evaluating two different construction options applied to the same building, under the same conditions.

The methodological framework is structured around three analytical directions:

- *Energy performance*, by examining the thermal behavior and annual energy demand of a traditional wall system against an MRC prefabricated panel solution.
- *Implementation cost*, by comparing the bill of quantities for the conventional RC frame with brick infill against the fully structural MRC panel solution.
- *Implementation time*, by comparing the total construction duration needed for each of the two scenarios.

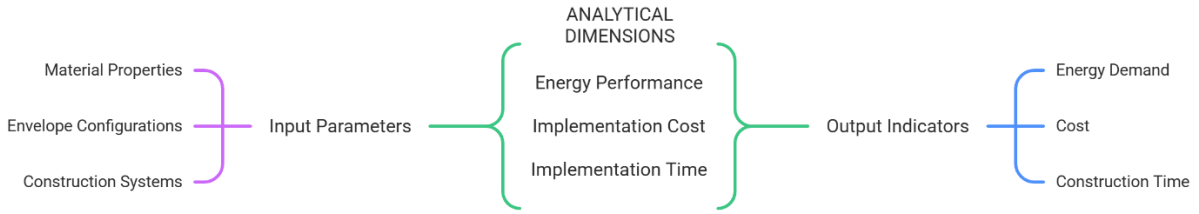


Figure 6. The comparative framework

The framework distinguishes clearly between input parameters (material properties, envelope configurations, and construction systems) and output indicators (energy demand, cost, and construction time), ensuring a structured comparison between the two scenarios.

3.1 The role of Building's Envelope in Energy Performance

The building envelope — which includes exterior walls, roof, ground floor, windows, and doors — has a direct impact on how much energy a building needs to maintain comfortable indoor conditions. These elements are the main pathway through which heat moves between the inside and the outside, driving both heat losses in winter and heat gains in summer.

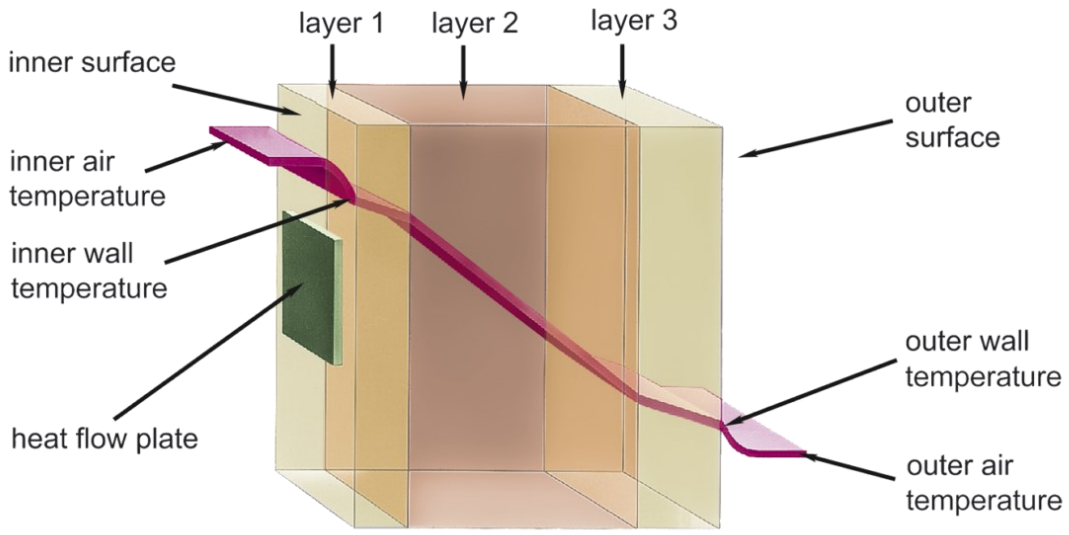


Figure 7. The heat flux measurement diagram (source: ahlborn.com)

The thermal performance of the envelope depends on the properties of the materials used, how the layers are arranged, and the quality of construction. The most important factors are the U-value, heat capacity, and airtightness, all of which directly influence how much energy the building consumes.

This study compares two energy scenarios under the same boundary conditions. Both variants use identical windows and ground-floor assemblies, but differ in their wall and roof construction. The traditional wall system has a wall U-value of 0.546 W/m²K and a roof U-value of 0.581 W/m²K. The MRC panel solution brings these down to 0.288 W/m²K and 0.33 W/m²K, respectively. The ground floor remains unchanged in both cases, with a U-value of 1.663 W/m²K — making it the thermally weakest part of the envelope in both scenarios.

The comparison is based on the following criteria: thermal transmittance of the main envelope components, annual total energy consumption, annual delivered energy, annual primary energy, and performance relative to the national building benchmark. The methodology follows the well-established principle that envelope heat transfer should be assessed through standardized thermal resistance and transmittance calculations, while also recognizing that whole-building performance is shaped by additional factors such as thermal bridges, airtightness, and dynamic thermal behavior. For this reason, the results are not interpreted as simple U-value improvements in isolation, but rather as system-level outcomes of switching from one envelope technology to another. *(Poza-Casado et al., 2020; Verbeke, 2018)*.

3.2 Energy Simulation Framework

The energy performance assessment was conducted using the MEEC (Montenegrin Energy Efficiency Certification) software, a standardized calculation tool based on European energy performance methodologies for residential buildings. The analysis follows a quasi-steady-state approach consistent with regulatory energy certification procedures, allowing for comparative evaluation of building envelope performance.

The case study building is assumed to be located in Tirana, Albania, characterized by a Mediterranean climate. Due to the compatibility of climatic conditions, climate data for Podgorica, Montenegro were used within the MEEC software environment. Both cities exhibit similar temperature profiles, seasonal variations, and heating-cooling demand patterns, making this substitution methodologically acceptable for comparative analysis.

To ensure consistency, identical boundary conditions were applied to both construction scenarios. The main assumptions include:

- Indoor heating setpoint: 20-21 ºC
- Cooling setpoint: 25-26 ºC
- Occupancy profile: standard residential usage patterns
- Internal heat gains: based on typical household activity
- Ventilation rate: in accordance with standard residential air exchange assumptions
- Infiltration: assumed equal for both scenarios
- HVAC system: simplified system with standard efficiency parameters as defined in MEEC
- Primary energy factors: applied according to national energy certification convention.

The analysis isolates the influence of the building envelope by maintaining all other parameters constant across both scenarios. Consequently, the results should be interpreted as comparative evaluation of envelope performance, rather than an absolute prediction of real operational energy consumption.

It should be noted that the adopted methodology does not involve fully dynamic simulation, and therefore does not explicitly capture transient thermal effects, detailed occupant behavior, or advanced system interactions. However, it provides a robust and consistent basis for evaluating relative differences between construction systems within the same climatic and operational context.

3.3 U-value and thermal-envelope criteria

This study relies on the standard U-value approach, in line with ISO 6946, where thermal transmittance is defined as the inverse of the total thermal resistance of a building component. Although the draft includes an incomplete mathematical explanation, the main goal is straightforward: to compare different envelope options based on how well they reduce heat flow through walls and roof assemblies. Since thermal bridges and local discontinuities

can cause real-world performance to differ from standard U-value calculations, the study also briefly addresses these effects, drawing on ISO 10211 and related research.

The U-value, or thermal transmittance coefficient, tells us how much heat passes through a building element per unit area for every 1°C or 1K difference in temperature between inside and outside. It is calculated as the ratio between the heat flux density through the element and the indoor-outdoor temperature difference. Under controlled experimental conditions, this is expressed by the following formula:

$$U = \frac{q}{T_i - T_e}$$

where:
U= thermal transmittance coefficient (W/m^2K)
q= heat flux density (W/m^2)
T_i= indoor air temperature $(^\circ C)$
T_e= outdoor air temperature $(^\circ C)$

Theoretically, the U-value can also be calculated as the inverse of the total thermal resistance of the element:

$$U = \frac{1}{R_{tot}}$$

where R_{tot} includes the thermal resistances of all the component layers of the element, as well as the internal and external surface resistance. This method is widely used in design, while the direct measurement method serves for experimental verification of the real performance of building elements.

3.4 Condensation and surface-temperature considerations

The draft draws attention to temperature distribution and condensation risk, in line with ISO 13788 and research showing that cold spots can lead to condensation, moisture buildup, and material deterioration over time. Condensation is not directly simulated in this study, but is treated as a likely consequence of poor junctions and thermal bridging. Integrated panel systems may therefore be beneficial not only for achieving lower U-values, but also for improving thermal continuity and reducing the severity of cold bridges when properly detailed.

The way heat moves through a building element — and the temperature distribution that results — directly determines where condensation is most likely to form:

- Thermal bridges: These are localized areas, such as metal connectors or wall-to-floor joints, where heat flows much faster than through the surrounding construction. These spots tend to have the lowest surface temperatures and are therefore the first places where condensation develops.
- Insulation quality: Better insulation helps keep internal surface temperatures higher, which reduces the risk of the air near those surfaces cooling below its dew point.

- Heating consistency: Maintaining a steady, moderate level of heat across all rooms is more effective at preventing condensation than heating one room to a high temperature while leaving others cold.

3.5 Thermal bridge assessment

Thermal bridges are widely recognized in the literature as one of the main factors that weaken the thermal performance of building envelopes. They occur where insulation is interrupted by structural elements or changes in geometry, leading to increased heat flow and lower internal surface temperatures. Many studies show that thermal bridges can significantly raise heating and cooling energy needs, while also increasing the risk of condensation and indoor comfort problems. In practice, these effects are most visible at wall-to-floor junctions, column edges, window reveals, and roof-to-wall connections — precisely the areas where traditional layered construction tends to be most vulnerable.

Existing research on envelope design makes it clear that relying solely on the U-value of uniform elements can lead to underestimating real energy losses caused by thermal bridges. The difference between calculated and actual performance can be substantial, particularly in buildings where structural elements frequently interrupt the insulation layer. As a result, analyzing construction details and comparing different envelope systems has become an essential step in studies focused on building energy performance.

In recent years, there has been growing interest in integrated envelope systems, such as prefabricated panels with built-in insulation. These systems can reduce both the frequency and severity of thermal bridges compared to conventional masonry walls with separate insulation layers. By combining structural and thermal functions into a single continuous component, they limit the number of junctions and interfaces where bridging typically occurs. Such approaches are now seen as key to building more energy-efficient structures and improving the long-term durability of the envelope.

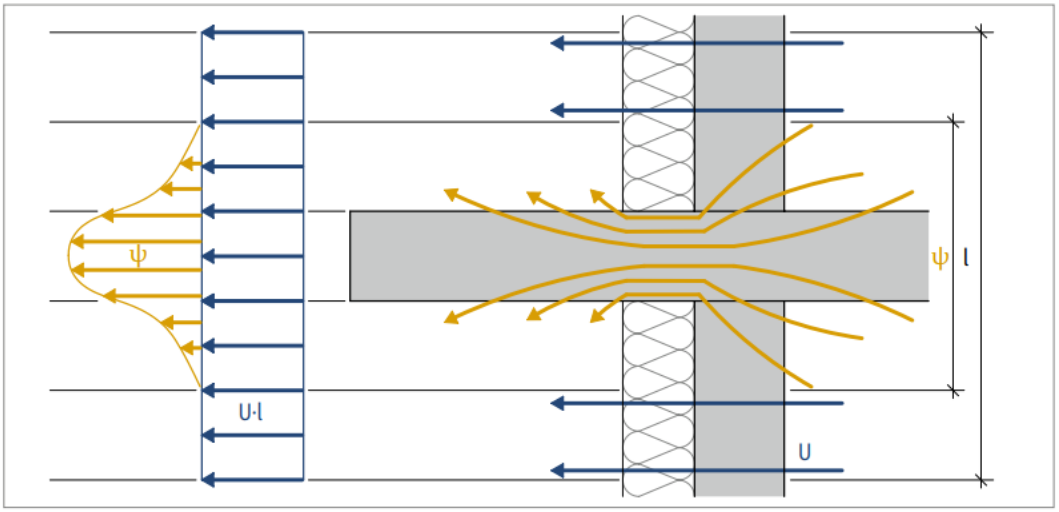


Figure 8. The illustrative diagram of a thermal bridge in building construction (source: schoeck.com)

It is important to clarify that thermal bridges, airtightness, and condensation effects are

discussed qualitatively and are not explicitly included in the numerical energy calculations. Their role is considered interpretative, supporting the understanding of differences between construction systems. This represents a limitation of the study and may affect the accuracy of absolute performance values.

3.6 Cost and Time Comparison Method

For the cost and time comparison, the study relies on detailed Bills of Quantities for both scenarios. Both include the same work packages — earthworks, roof works, finishes, doors and windows, MEP, and external works. The key difference between the two lies in the structural and wall packages. In Scenario 1, the building follows a traditional approach, with RC foundations, columns, shear walls, beams, slabs, reinforcement bars, brick infill walls, and a separate façade insulation layer. In Scenario 2, the same RC foundations are kept, but the superstructure is built entirely with MRC panels, serving as both vertical and horizontal load-bearing elements. This results in significantly less reinforcement steel and eliminates the need for a separate brick infill package altogether.

The cost estimates were prepared in accordance with the Albanian Manual of Construction Works Prices and DCM No. 629, dated 15.07.2015, as referenced in both uploaded cost sheets. The time comparison is based on the total execution durations derived from the construction schedules developed for each scenario.

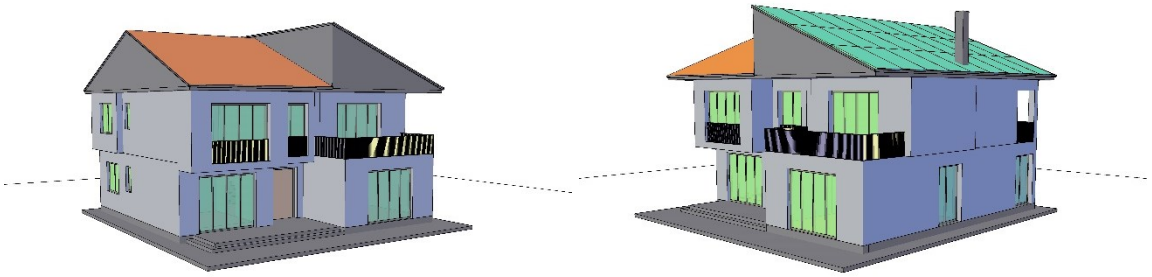


Figure 9. The 3D volumetry of the villa in the case study

This two-part structure allows the study to clearly separate the effects on operational energy performance from those related to construction cost and time. This distinction matters because the energy simulation focuses specifically on envelope differences, while the cost and time comparison reflects a broader, system-level substitution — one that goes beyond the envelope alone and covers the entire structural approach of the building.

4. RESULTS AND DISCUSSION

4.1 Energy performance of the envelope variants

The results clearly show that the prefabricated MRC panel system performs better in thermal and energy terms compared to the traditional wall solution. The wall U-value drops from 0.546 W/m²K to 0.288 W/m²K, reflecting a significant reduction in heat loss through the vertical envelope. The roof follows a similar trend, improving from 0.581 W/m²K to 0.33 W/m²K. Since windows and ground floor remain the same in both scenarios, these gains are directly linked

to the upgraded wall and roof assemblies.

At the whole-building level, the total annual energy requirement falls from 265.19 kWh/m²a in the traditional scenario to 225.65 kWh/m²a with the MRC panel system. Delivered energy drops from 298.46 kWh/m²a to 252.72 kWh/m²a, and total primary energy from 369.35 kWh/m²a to 315.07 kWh/m²a. This means the panel-based envelope cuts primary energy demand by roughly 14.7% — a meaningful improvement achieved through a single envelope technology change. Looking at monthly data, the reduction is most visible in the colder months, when heat losses through opaque elements are at their highest. January's demand falls from 35.61 to 28.39 kWh/m², February's from 27.92 to 22.15 kWh/m², and December's from 32.10 to 25.46 kWh/m².

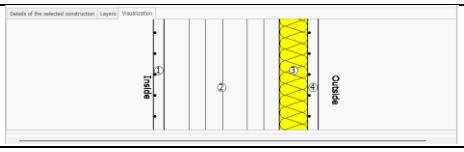
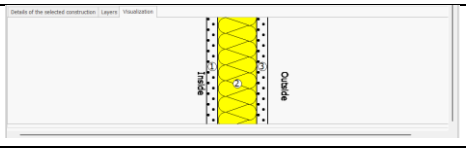
The reduction of approximately 14.7% in primary energy demand is primarily driven by improved envelope transmittance. However, the magnitude of improvement remains limited due to the unchanged ground floor performance, which acts as a dominant heat-loss pathway. This indicates that envelope optimization strategies must be holistic, as localized improvements cannot fully compensate for poorly performing elements.

These findings are consistent with the broader body of research on prefabricated and insulated panel systems. Several studies on precast sandwich walls show that integrated insulated assemblies tend to offer better thermal resistance than traditional masonry, provided that connector bridging and local construction details are properly handled. This case supports that conclusion: the prefabricated system delivers improved annual energy performance thanks to its lower transmittance and better thermal continuity compared to the conventional alternative.

That said, both variants still fall well above the national building benchmark of 148.5 kWh/m²a. The traditional scenario sits at 249.2% of the benchmark, while the MRC panel solution reaches 212.6%. Although the panel system clearly improves performance, it is not enough on its own to bring the building to a high-efficiency standard.

The main reason is straightforward: the ground floor U-value remains at 1.663 W/m²K in both cases — far worse than the wall and roof values — and likely accounts for a large share of the total heat loss. This highlights an important point: even a well-performing wall system cannot compensate for significant losses elsewhere in the envelope. Research consistently confirms that a building's energy performance depends on the combined behavior of all its components — walls, roof, floor, windows, airtightness, and junctions — not on any single element in isolation.

Table 1. The energy parameters input for both scenarios

	Traditional Wall	MRC Panel
Input wall		

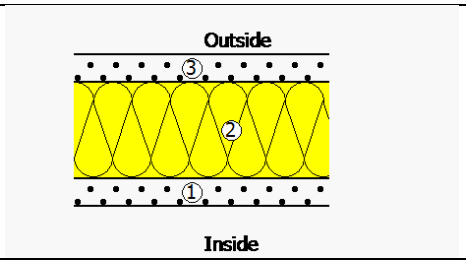
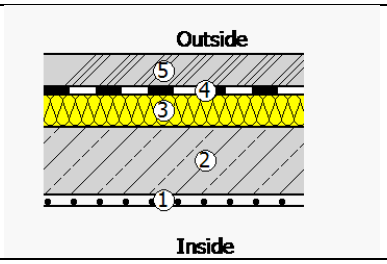
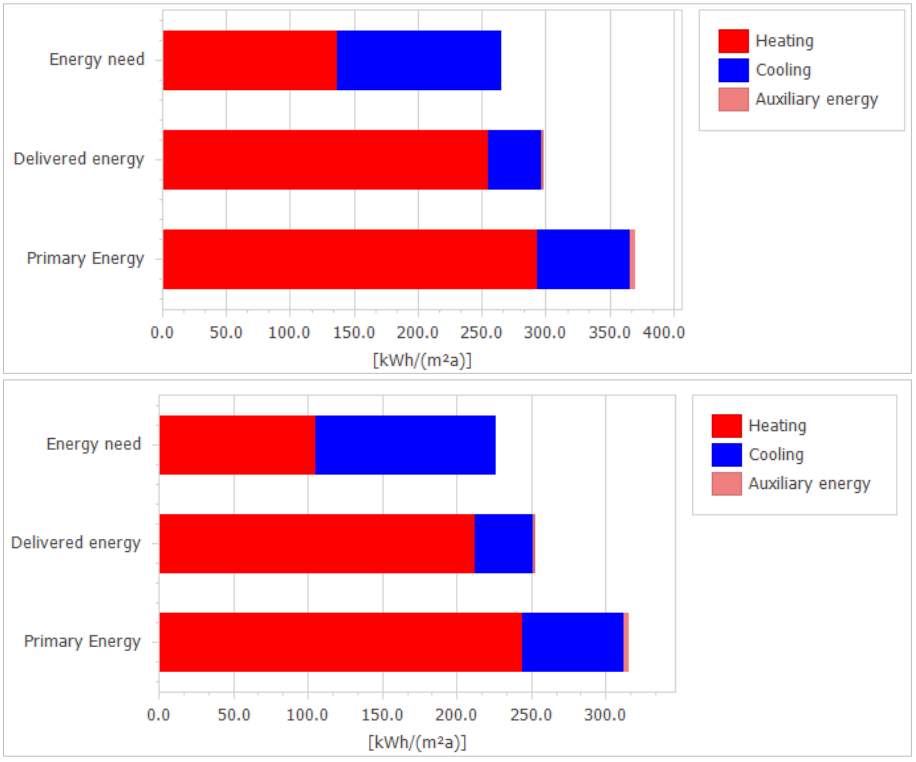
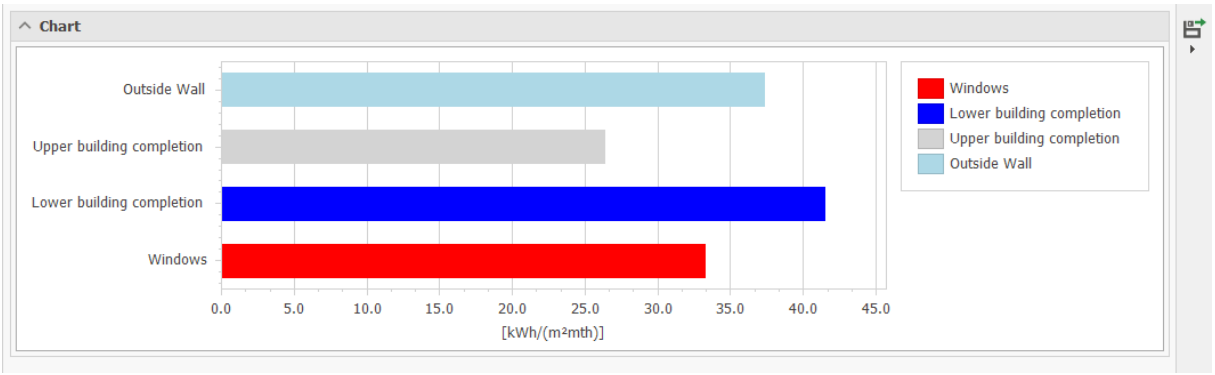
U-value W/(m²K)	0.546	0.288
Window	Same window for both variants	
U-value W/(m²K)	1.67	1.67
Roof		
U-value W/(m²K)	0.581	0.33
Ground floor	Same window for both variants	
U-value W/(m²K)	1.663	1.663

Table 2. The total energy performance results

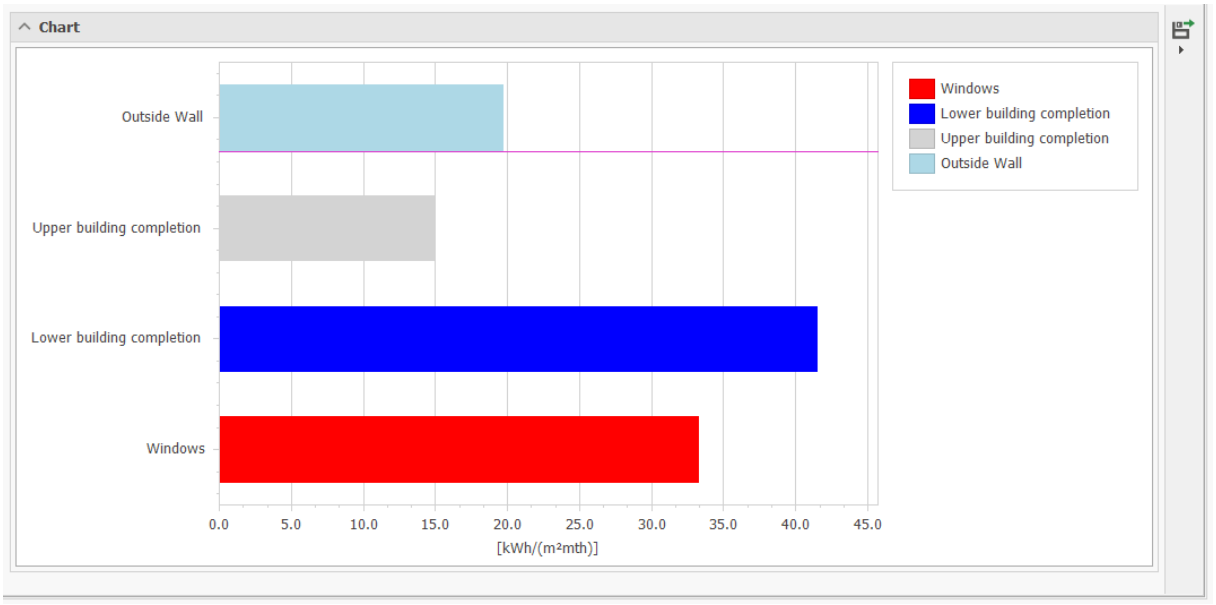
Results		
Total energy need (kWh/(m²a)	265.19	225.65
Total delivered energy (kWh/(m²a)	298.46	252.72
Total primary energy (kWh/(m²a)	369.35	315.07
National Building Benchmark	148.5	148.5
Differences between - Total primary energy and National Building	249.2%	212.6%



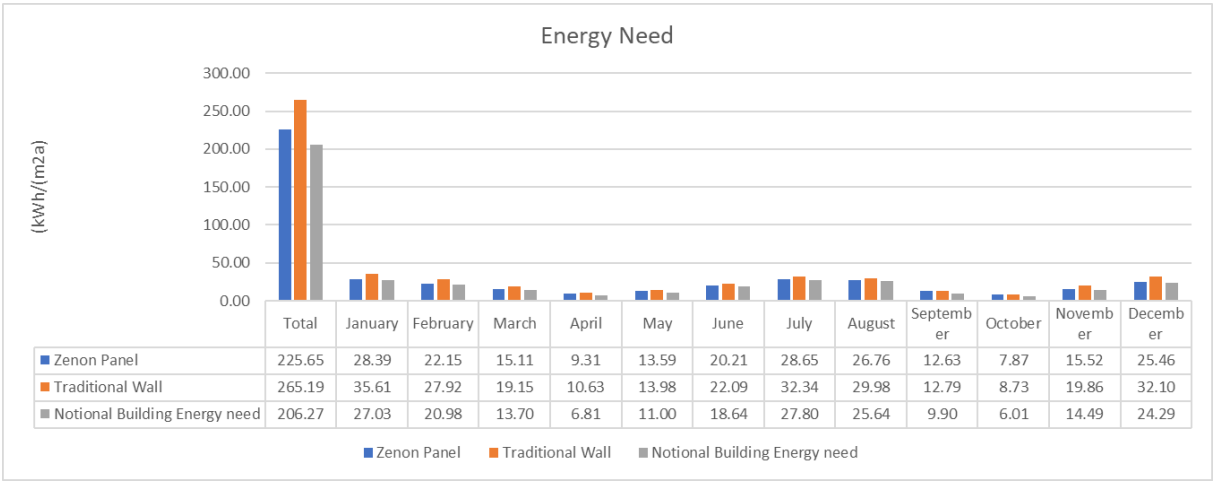
Graph 1. The performance graph of the Traditional Wall system (above) and MRC Panel (below)



Graph 2. The transmission heat losses chart of Traditional Wall system



Graph 3. The transmission heat losses chart of MRC Panel system



	Total	January	February	March	April	May	June	July	August	September	October	November	December
Zenon Panel	225.65	28.39	22.15	15.11	9.31	13.59	20.21	28.65	26.76	12.63	7.87	15.52	25.46
Traditional Wall	265.19	35.61	27.92	19.15	10.63	13.98	22.09	32.34	29.98	12.79	8.73	19.86	32.10
Notional Building Energy need	206.27	27.03	20.98	13.70	6.81	11.00	18.64	27.80	25.64	9.90	6.01	14.49	24.29

Graph 4. The monthly energy needs chart of MRC Panel, Traditional Wall and National Building

4.2 Thermal bridges, condensation risk, and construction quality

In traditional RC-frame construction with brick infill, thermal bridges typically form at slab edges, columns, beams, balconies, and wherever the structural frame meets the masonry or

external insulation layer. These are precisely the points where the insulation layer is most likely to be interrupted, compressed, or simply missing — and where heat finds the path of least resistance through the building envelope. In practice, such discontinuities are difficult to avoid entirely in layered construction, because each trade works on a separate system, and coordination gaps are common. An integrated panel system can help reduce these discontinuities by bringing structure, enclosure, and insulation closer together into a single coordinated assembly. The literature on thermal bridges and precast wall systems supports this view, but also warns that metal connectors and poorly designed junctions can themselves become significant heat transfer pathways if not carefully engineered (Alhawari et al., 2018; Kim et al., 2014).

The same logic applies to condensation risk. Lower surface temperatures caused by local thermal bridges increase the likelihood of condensation and mold growth, particularly in poorly ventilated areas such as corners, reveals, and junction zones. When surface temperatures drop below the dew point of the indoor air, moisture begins to accumulate — first invisibly, then visibly — leading over time to material deterioration, reduced air quality, and potential health issues for occupants. While integrated systems can improve thermal continuity and contribute to healthier interior surfaces, this is not an automatic outcome. The benefits depend heavily on precise connector design, accurate installation on site, and well-sealed junctions between panels and adjacent elements such as windows, floors, and roof edges.

For this reason, the MRC panel system should be seen not simply as a material swap, but as a broader detailing strategy — one that requires careful junction design and tight control over the quality of execution. The panel itself may perform well under laboratory or standard conditions, but its real-world effectiveness is ultimately determined by how well the critical details are resolved in practice. This means that the transition to an integrated panel system must be accompanied by a shift in design thinking: from component-by-component specification to a whole-envelope approach where every junction is considered, documented, and verified during construction.

4.3 Cost implementation results

The cost comparison offers a more nuanced picture than the energy analysis alone. The traditional construction method — an RC frame with perforated clay brick infill walls — carries an estimated total cost of €269,180 including VAT. The alternative approach, using lightweight MRC panels as the primary structural system, comes in at €276,618 including VAT. This represents a difference of €7,438, or approximately 2.76% more for the MRC panel solution. Before VAT, the gap narrows to €6,198, with figures of €224,317 and €230,515 respectively.

At first glance, the MRC panel solution appears more expensive. However, looking at the cost breakdown tells a more complete story. In the traditional scenario, the structural RC package costs €55,504, while the brick infill walls and façade insulation add another €17,088. In the

MRC scenario, the combined cost of RC foundations, MRC structural panels, and reinforcement steel totals €78,791 — but the separate infill wall package disappears entirely, because the panel system serves simultaneously as load-bearing structure and building enclosure. This means the higher upfront structural cost reflects a system-level substitution, not a straightforward like-for-like replacement of wall components.

From a practical standpoint, the cost increase can reasonably be considered moderate given what the system delivers. The MRC scenario reduces reinforcement steel from 18.35 tons to just 5.17 tons, eliminates the need for separate brick infill quantities, and merges structural and envelope functions into a single prefabricated component. These changes point to real potential benefits — a simpler and more streamlined workflow, better quality control, and possibly faster construction — even if these advantages are not directly captured in the static Bills of Quantities.

This is a well-known limitation in cost comparisons of this kind. Research on off-site and prefabricated construction consistently notes that standard initial-cost comparisons tend to undervalue industrialized systems, because the gains from factory-controlled production, reduced material waste, tighter tolerances, and shorter on-site construction time often do not show up in a conventional BOQ. The true economic picture only becomes clear when the full lifecycle of the building — including energy savings, maintenance, and construction efficiency — is taken into account. As a result, the comparative assessment may underestimate the full economic potential of the prefabricated system.

Table 3. Bill of Quantities and Cost for the RC frame structure and perforated clay brick infill walls

BILL OF QUANTITIES AND COST

Object: "Two-storey Residential Villa with RC frame structure and perforated clay brick infill walls"

No.	WORK DESCRIPTION	Unit	Quantity	Price (€/quantity)	Value €
	1. Earthworks				
1	Excavation	m^3	350	22	€ 7,700.0
2	Gravel fill	m^3	260	18	€ 4,680.0
3	Earth moving	m^3	400	4	€ 1,600.0
	Sum 1				€ 13,980.00
	2. Concrete and reinforced concrete works				
1	RC Foundations	m^3	52.6	150	€ 7,890.0
2	RC Columns and shear walls	m^3	11.1	220	€ 2,442.0
3	RC Beams	m^3	26.8	285	€ 7,638.0
4	RC Slab and stairs	m^3	42.3	280	€ 11,844.0
5	Rebar reinforcement	ton	18.35	1400	€ 25,690.0
	Sum 2				€ 55,504.00
	3. Infill Walls				
1	Infill wall with perforated clay bricks t=20cm	m^3	31.8	185	€ 5,883.0
2	Infill wall with perforated clay bricks t=12cm	m^3	8.0	181	€ 1,455.2
3	Facade cladding with thermo-insulation t=5cm + plaster.	m^2	195	50	€ 9,750.0
	Sum 3				€ 17,088.24
	4. Horizontal layers				
1	Styrobeton layer for filling and leveling	m^3	26.5	80	€ 2,120.0
2	Parquet flooring (rooms)	m^2	125	82	€ 10,250.0
3	Marble tile flooring (corridors and living room)	m^2	140	62	€ 8,680.0
4	Porcelain tile flooring (toilets)	m^2	73	30	€ 2,190.0
	Sum 4				€ 23,240.00
	5. Plastering and painting works				
1	Ordinary plaster for wall and ceiling	m^2	717	15	€ 10,755.0
2	Hydroplastic paint	m^2	717	6	€ 4,302.0
	Sum 5				€ 15,057.00
	6. Roof works				
1	Roof and insulation	m^2	195	65	€ 12,675.0
	Sum 6				€ 12,675.00
	7. Door and window works				
1	Doors	m^2	32.13	210	€ 6,747.3
2	Windows	m^2	65	185	€ 12,025.0
	Sum 7				€ 18,772.30
	8. Utilities Infrastructure - MEP				
1	Mechanical	lump sum			€ 10,000.0
2	Electrical	lump sum			€ 18,000.0
3	Plumbing	lump sum			€ 15,000.0
	Sum 8				€ 43,000.00
	9. Greening works and external arrangements				
1	All external works including greenery	lump sum			€ 25,000.0
	Sum 9				€ 25,000.00
	SUM 1 - 9				€ 224,316.54
	V.A.T. 20%				€ 44,863.31
	TOTAL				€ 269,179.85

**The cost estimate was drafted based on the manual of construction works prices and DCM No. 629 dated 15.07.2015.*

Table 4. Bill of Quantities and Cost with lightweight MRC panels as structural elements

BILL OF QUANTITIES AND COST

Object: "Two-storey Residential Villa with lightweight MRC panels as structural elements"

No.	WORK DESCRIPTION	Unit	Quantity	Price (€/quantity)	Value €
	1. Earthworks				
1	Excavation	m^3	350	22	€ 7,700.0
2	Gravel fill	m^3	260	18	€ 4,680.0
3	Earth moving	m^3	400	4	€ 1,600.0
	Sum 1				€ 13,980.00
	2. Reinforced concrete works and MRC structural panels				
1	RC Foundations	m^3	52.6	150	€ 7,890.0
2	MRC panels as vertical load-bearing elements	m^2	325	107	€ 34,775.0
3	MRC panels for horizontal load-bearing elements	m^2	270	107	€ 28,890.0
4	Rebar reinforcement	ton	5.17	1400	€ 7,235.8
	Sum 2				€ 78,790.76
	3. Horizontal layers				
1	Styrobeton layer for filling and leveling	m^3	26.5	80	€ 2,120.0
2	Parquet flooring (rooms)	m^2	125	82	€ 10,250.0
3	Marble tile flooring (corridors and living room)	m^2	140	62	€ 8,680.0
4	Porcelain tile flooring (toilets)	m^2	73	30	€ 2,190.0
	Sum 3				€ 23,240.00
	4. Plastering and painting works				
1	Ordinary plaster for wall and ceiling	m^2	717	15	€ 10,755.0
2	Hydroplastic paint	m^2	717	6	€ 4,302.0
	Sum 4				€ 15,057.00
	5. Roof works				
1	Roof and insulation	m^2	195	65	€ 12,675.0
	Sum 5				€ 12,675.00
	6. Door and window works				
1	Doors	m^2	32.13	210	€ 6,747.3
2	Windows	m^2	65	185	€ 12,025.0
	Sum 6				€ 18,772.30
	7. Utilities Infrastructure - MEP				
1	Mechanical	lump sum			€ 10,000.0
2	Electrical	lump sum			€ 18,000.0
3	Plumbing	lump sum			€ 15,000.0
	Sum 7				€ 43,000.00
	8. Greening works and external arrangements				
1	All external works including greenery	lump sum			€ 25,000.0
	Sum 8				€ 25,000.00
	SUM 1 - 8				€ 230,515.06
	V.A.T. 20%				€ 46,103.01
	TOTAL				€ 276,618.07

**The cost estimate was drafted based on the manual of construction works prices and DCM No. 629 dated 15.07.2015.*

4.4 Time implementation results

The construction timeline comparison further strengthens the case for the lightweight MRC panel system. According to the case study schedules, Scenario A — the traditional RC frame with brick infill walls — takes approximately 36 weeks, or around 9 months, to complete. Scenario B, using lightweight MRC panels, requires only 29 weeks. This is a reduction of 7 weeks, representing roughly 19.4% fewer total construction weeks.

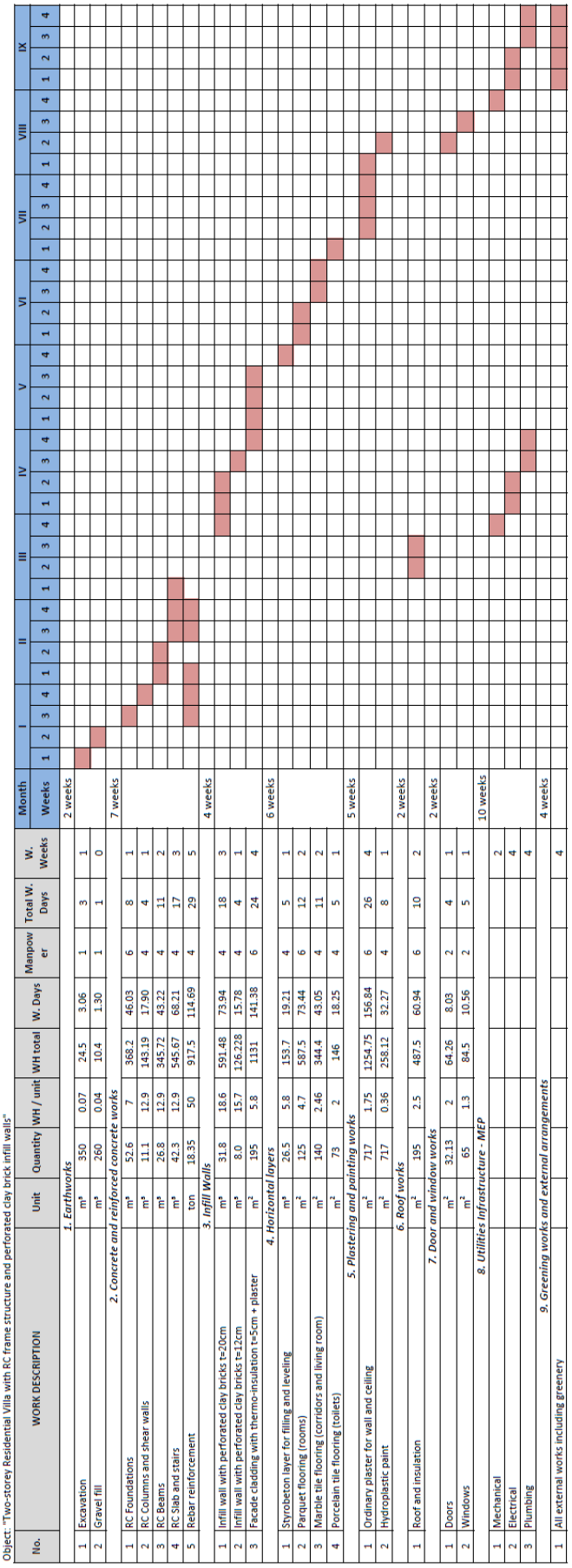
This difference has real and tangible implications on site. Traditional construction typically

follows a fragmented sequence: erecting the RC frame, waiting for curing, installing brick infill, adding façade insulation, and coordinating a series of finishing trades one after another. The MRC panel approach, by contrast, integrates structural and envelope functions into a single system, which simplifies the workflow and reduces the number of separate on-site operations needed to complete the building shell.

The shorter timeline of Scenario B highlights one of the most practical advantages of prefabricated construction. Industrialized panel systems generally allow faster site assembly, more predictable sequencing, and less dependence on wet trades compared to traditional RC frame methods. A time saving of nearly 20% of the total project duration is far from trivial — it can translate into lower site overhead costs, earlier building handover, reduced on-site labor exposure, and better cash flow management throughout the project.

When read alongside the energy and cost findings, the time results help build a more balanced and complete picture of what the MRC panel alternative actually offers. Although Scenario B carries a slightly higher initial cost, the shorter construction duration can partially offset this difference in real project conditions. This is an important point: the MRC system should not be judged on material and construction costs alone, but within a broader performance framework that also accounts for delivery speed, execution efficiency, and process simplification.

Taken as a whole, the time analysis confirms that the lightweight MRC panel solution brings not only thermal and structural benefits, but also a clear and measurable advantage in terms of implementation. For residential projects where timely delivery matters, cutting the construction period from 36 to 29 weeks is a compelling argument in favor of prefabricated integrated systems.

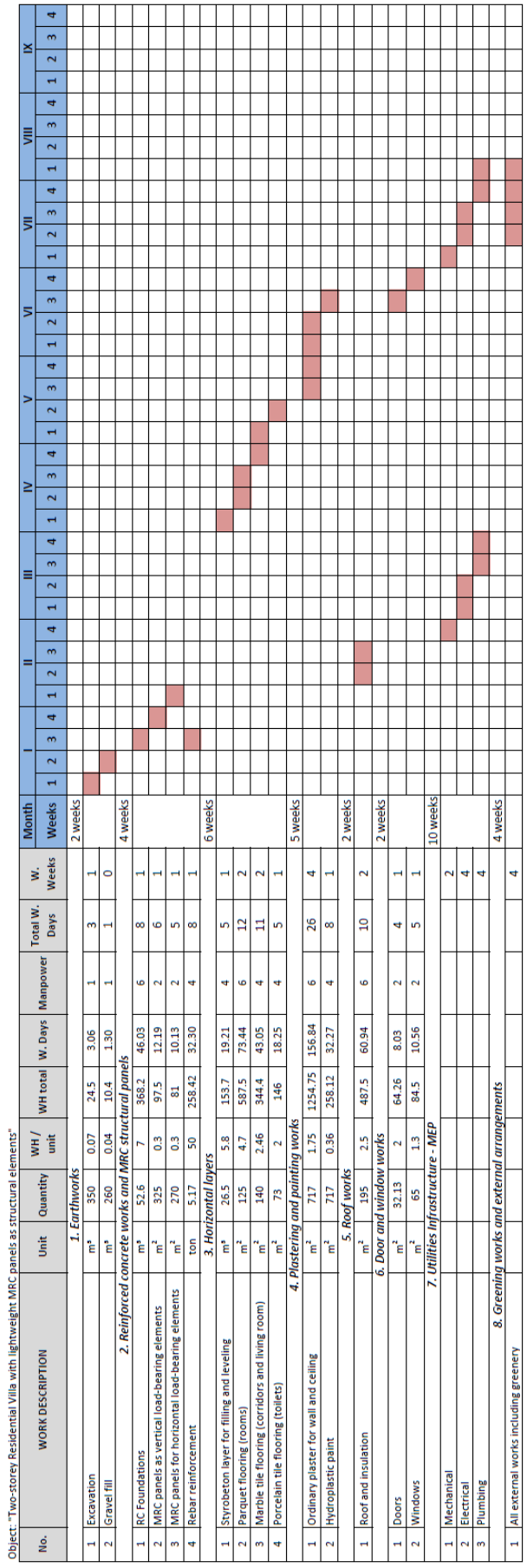


CONSTRUCTION TIME GANNT CHART

Object: "Two-storey Residential Villa with RC frame structure and perforated clay brick infill walls"

No.	WORK DESCRIPTION	Unit	Quantity	WH / unit	WH total	W. Days	Manpower	Total W. Days	W. Weeks	Month / Weeks
	1. Earthworks									2 weeks
1	Excavation	m³	350	0.07	24.5	3.06	1	3	1	
2	Gravel fill	m³	260	0.04	10.4	1.30	1	1	0	
	2. Concrete and reinforced concrete works									7 weeks
1	RC Foundations	m³	52.6	7	368.2	46.03	6	8	1	
2	RC Columns and shear walls	m³	11.1	12.9	143.19	17.90	4	4	1	
3	RC Beams	m³	26.8	12.9	345.72	43.22	4	11	2	
4	RC Slab and stairs	m³	42.3	12.9	545.67	68.21	4	17	3	
5	Rebar reinforcement	ton	18.35	50	917.5	114.69	4	29	5	
	3. Infill Walls									4 weeks
1	Infill wall with perforated clay bricks t=20cm	m³	31.8	18.6	591.48	73.94	4	18	3	
2	Infill wall with perforated clay bricks t=12cm	m³	8.0	15.7	126.228	15.78	4	4	1	
3	Facade cladding with thermo-insulation t=5cm + plaster	m²	195	5.8	1131	141.38	6	24	4	
	4. Horizontal layers									6 weeks
1	Styroboton layer for filling and leveling	m³	26.5	5.8	153.7	19.21	4	5	1	
2	Parquet flooring (rooms)	m²	125	4.7	587.5	73.44	6	12	2	
3	Marble tile flooring (corridors and living room)	m²	140	2.46	344.4	43.05	4	11	2	
4	Porcelain tile flooring (toilets)	m²	73	2	146	18.25	4	5	1	
	5. Plastering and painting works									5 weeks
1	Ordinary plaster for wall and ceiling	m²	717	1.75	1254.75	156.84	6	26	4	
2	Hydroplastic paint	m²	717	0.36	258.12	32.27	4	8	1	
	6. Roof works									2 weeks
1	Roof and insulation	m²	195	2.5	487.5	60.94	6	10	2	
	7. Door and window works									2 weeks
1	Doors	m²	32.13	2	64.26	8.03	2	4	1	
2	Windows	m²	65	1.3	84.5	10.56	2	5	1	
	8. Utilities Infrastructure - MEP									10 weeks
1	Mechanical								2	
2	Electrical								4	
3	Plumbing								4	
	9. Greening works and external arrangements									4 weeks
1	All external works including greenery								4	

Figure 10. Construction time schedule of the RC frame structure and perforated clay brick infill walls



CONSTRUCTION TIME GANNT CHART

Object: "Two-storey Residential Villa with lightweight MRC panels as structural elements"

No.	WORK DESCRIPTION	Unit	Quantity	WH / unit	WH total	W. Days	Manpower	Total W. Days	W. Weeks	Month / Weeks	I 1	I 2	I 3	I 4	II 1	II 2	II 3	II 4	III 1	III 2	III 3	III 4	IV 1	IV 2	IV 3	IV 4	V 1	V 2	V 3	V 4	VI 1	VI 2	VI 3	VI 4	VII 1	VII 2	VII 3	VII 4	VIII 1	VIII 2	VIII 3	VIII 4	IX 1	IX 2	IX 3	IX 4
	1. Earthworks									2 weeks																																		
1	Excavation	m³	350	0.07	24.5	3.06	1	3	1																																			
2	Gravel fill	m³	260	0.04	10.4	1.30	1	1	0																																			
	2. Reinforced concrete works and MRC structural panels									4 weeks																																		
1	RC Foundations	m³	52.6	7	368.2	46.03	6	8	1																																			
2	MRC panels as vertical load-bearing elements	m²	325	0.3	97.5	12.19	2	6	1																																			
3	MRC panels for horizontal load-bearing elements	m²	270	0.3	81	10.13	2	5	1																																			
4	Rebar reinforcement	ton	5.17	50	258.42	32.30	4	8	1																																			
	3. Horizontal layers									6 weeks																																		
1	Styrobeton layer for filling and leveling	m³	26.5	5.8	153.7	19.21	4	5	1																																			
2	Parquet flooring (rooms)	m²	125	4.7	587.5	73.44	6	12	2																																			
3	Marble tile flooring (corridors and living room)	m²	140	2.46	344.4	43.05	4	11	2																																			
4	Porcelain tile flooring (toilets)	m²	73	2	146	18.25	4	5	1																																			
	4. Plastering and painting works									5 weeks																																		
1	Ordinary plaster for wall and ceiling	m²	717	1.75	1254.75	156.84	6	26	4																																			
2	Hydroplastic paint	m²	717	0.36	258.12	32.27	4	8	1																																			
	5. Roof works									2 weeks																																		
1	Roof and insulation	m²	195	2.5	487.5	60.94	6	10	2																																			
	6. Door and window works									2 weeks																																		
1	Doors	m²	32.13	2	64.26	8.03	2	4	1																																			
2	Windows	m²	65	1.3	84.5	10.56	2	5	1																																			
	7. Utilities infrastructure - MEP									10 weeks																																		
1	Mechanical								2																																			
2	Electrical								4																																			
3	Plumbing								4																																			
	8. Greening works and external arrangements									4 weeks																																		
1	All external works including greenery								4																																			

Figure 11. Construction time schedule of lightweight MRC panels as structural elements

4.5 Overall interpretation

Taken together, the results suggest that the MRC panel system delivers better thermal performance at a slightly higher initial cost compared to the traditional construction approach. This makes it a viable and environmentally friendly option, particularly for projects that prioritize envelope quality, industrialized construction methods, and integrated system design.

At the same time, the analysis reveals an important limitation: energy efficiency gains are ultimately constrained by the weakest part of the envelope. Even though wall and roof transmittance values were significantly improved, this did not lead to a proportional gain in overall energy compliance, because the ground floor remained highly conductive throughout both scenarios. The key lesson here is clear — MRC panels should not be treated as a standalone technological upgrade, but rather as one part of a broader, whole-envelope optimization strategy where all components are addressed together.

The cost comparison also points to a wider conclusion: judging the MRC panel system on initial cost alone gives an incomplete and potentially misleading picture. Its true value only becomes apparent when energy performance, construction time, and process efficiency are considered together as a package. Viewed through this lens, the MRC panel solution represents a more balanced and forward-looking approach to residential construction — one that is better aligned with the growing demand for sustainable, high-performance buildings.

5. CONCLUSIONS AND RECOMMENDATIONS

This study examined the thermal, energy, and cost-time implications of using prefabricated lightweight MRC panels as an alternative to traditional construction in a two-storey residential villa. The results clearly show that the panel-based envelope significantly improves the building's thermal performance. Compared to the conventional wall system, MRC panels reduced the wall U-value from 0.546 to 0.288 W/m²K, improved roof insulation, and brought annual primary energy consumption down from 369.35 to 315.07 kWh/m²a. These findings confirm that integrated prefabricated systems can deliver meaningful operational energy savings when they improve insulation continuity and reduce conductive heat losses through the opaque envelope.

At the same time, the study makes it clear that replacing the envelope alone is not sufficient to achieve high overall energy performance. Both scenarios continued to exceed the national benchmark by a wide margin, largely because the ground floor maintained a very poor U-value in both cases. This reinforces a well-established principle in building envelope research: real-world energy performance is shaped by the weakest components and by how all parts of the envelope — floors, junctions, windows, airtightness, and thermal bridges — work together as a system.

The cost analysis showed that the fully structural MRC panel solution is approximately 2.8% more expensive to implement than the traditional RC frame with brick infill. However, this

figure should not be read in isolation. The additional cost is relatively modest when weighed against the system's ability to combine load-bearing and enclosure functions in a single component, reduce the complexity of traditional wall construction, and offer the potential for higher quality and more consistent execution on site.

The time analysis adds another important dimension to this picture. The traditional scenario requires 36 weeks to complete, while the MRC panel scenario takes only 29 weeks — a saving of 7 weeks, or approximately 19.4% of the total construction period. This demonstrates that the prefabricated approach can significantly improve delivery speed and construction efficiency. In practical terms, this translates into better project planning, lower site overhead costs, and earlier building handover or occupancy.

Overall, the findings position lightweight MRC panels as a promising and environmentally responsible option for residential construction. Their main strengths lie in improved thermal performance, better energy efficiency, considerably faster construction, and only a moderate increase in upfront costs. This makes the system particularly well-suited for projects that place a high value on industrialized delivery, quality assurance, and execution speed.

Based on these findings, the following recommendations are put forward:

- Future design applications should optimize all envelope components — particularly the ground floor — in order to achieve stronger and more balanced overall energy performance.

- Future studies should incorporate detailed thermal bridge and airtightness analysis to further validate the operational benefits of integrated panel systems.

- Implementation assessments should go beyond first cost and also account for the indirect economic benefits associated with shorter construction durations.

- Broader life-cycle and environmental assessments should be carried out in future research to fully evaluate the sustainability potential of MRC panel systems.

In conclusion, the MRC panel system should be understood not as a simple material substitution, but as an integrated design and construction strategy — one that is capable of improving both building performance and project delivery outcomes in a meaningful and measurable way.

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SESSION III

Technological Advancements and Seismic Design for Resilient Places

Seismic resilience and risk mitigation: Seismic hazard assessment / Structural safety / Risk-informed design / Resilient buildings and infrastructure.

Digital and computational technologies: Digital fabrication / Parametric methodologies / Computational design / Technology-assisted decision-making.

Adaptive building systems: Façade transformation / Prefabricated housing systems / Adaptive architectural solutions / Building-envelope innovation.

Resilient urban systems: Future mobility / Technology-driven urban transformation / Resilience-oriented planning / Safer and adaptive urban environments.

Identification and assessment of resident-driven façade interventions in prefabricated large panel buildings: the case of Tirana

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Abstract

Prefabricated concrete large-panel buildings, built over 50 years ago, have undergone numerous interventions during their life span, which were often carried out without technical criteria or standardized guidelines. These interventions have significantly impacted the façade layout and its performance, as well as the overall functioning of the buildings.

This paper aims to identify and analyze resident-driven interventions in these buildings, located in selected areas of the city of Tirana. The main objectives are to identify the most common types of interventions, assess the extent of façade modifications, and evaluate their potential impact on structural behavior. The study addresses the level of informal interventions and their possible implications for building performance. The working hypothesis assumes that 3D

extension on the façade significantly alters the original building configuration and may introduce structural risks.

The methodology is based on visual field inspection and photographic documentation of the identified interventions, which are classified according to a basic typological scheme. The collected data are compared with the original drawings of the buildings, provided by the Central Technical Construction Archive.

The study's results are expected to identify the most frequent types of interventions carried out in these buildings, the degree of modification of the main facades, and the potential of these interventions to influence the structural behavior of the buildings.

Keywords: *large panel buildings, unregulated interventions, façade alterations, structural performance, integrated rehabilitation*

1. INTRODUCTION

Large panel buildings, as well as other construction technologies, are designed with a lifespan of approximately 50 years. Since those buildings were built in the late 70s, they have exceeded the design period. The major influence on the performance is the degradation of the building, as the main factor is age, but in order for the building to fulfill the demands of the changes created by the continuous change of the city, which, in our case study, Tirana, is one of the most dynamic cities. Those buildings have been adapted through maintenance, renovation, and refurbishment, which becomes a key essential to make those buildings livable.

Some of the buildings' stock have undergone so many changes, and there is a gap between the original design (as built) and the current condition, accounting for all the existing interventions and their influence on the buildings. The changes have different natures, they may be at a local level, a whole block, or a whole neighborhood, and it is important to mention that some of them are without proper technical documentation or without professional approval. The character of the intervention goes from aesthetic modification, improvement of the thermal layer, to structural alterations. One of the most widespread interventions, which in some places is found at the local level, made by apartment owners, that is done only on the façade of their apartment, is the use of thermal insulation layers on the façade. This intervention has also been carried out at the neighborhood level, with support from the municipality as part of the city revitalization project. Another common typology is closing balconies or turning windows into doors, especially on the ground floors.

All interventions made after construction have a direct or indirect impact on the building's overall performance. From a structural point of view, the building mass and the natural period are important factors in the building's dynamic performance, especially in high-seismic regions. From an energy performance perspective, inadequate intervention can create a new thermal bridge or cause a malfunction in the HVAC system, leading to a significant increase in

energy consumption.

The accurate identification of these interventions is crucial for any further technical assessment. Without a clear overview of the changes made over the years, engineering analyses risk being based on incorrect assumptions, leading to uncertain or economically inefficient decisions for the maintenance or reinforcement of the building. The use of diagnostic techniques and the systematic comparison of the initial state with the current state are necessary for modern engineering.

In this context, the following research question arises: to what extent do resident-driven interventions on the façades of large panel prefabricated buildings influence the structural behavior of these structures?

The aim of this study is to identify and classify the interventions carried out on the façades of large panel prefabricated buildings in selected neighborhoods of Tirana (Ali Demi, 21 Dhjetori, and Shkolla Teknologjike), and to discuss their potential impact on the structural behavior of these buildings. The study focuses on the documentation and typological analysis of resident-driven interventions, based on field surveys and photographic documentation of the investigated buildings.

2. LITERATURE REVIEW

Large panel buildings were chosen as the system that met the urgent housing needs of post-war Europe, offering rapid, cost-effective construction solutions. Widely implemented across the Soviet Union and Eastern Bloc countries, these buildings featured typical prefabricated elements. While in Western Europe their production declined in the late 1970s, in Central and Eastern Europe this industry experienced a new surge through "house factories" that produced standardized components for configuring urban micro-districts.

Over time, the need to rehabilitate this housing stock became inevitable. Many of them have shown deficiency, such as:

- Insufficient thermal insulation and low energy efficiency.
- Outdated architectural design that no longer responded to contemporary needs.
- Degraded urban infrastructure requiring regenerative interventions.

As a regulatory measure, many European nations have undertaken renovation initiatives, going from basic improvement in thermal insulation to complete structural and aesthetic modernization.

Krosi (2025) shows different interventions made with the focus to improve the quality of residents' lives, which focus on structural strengthening, façade renovation, and integration of renewable energy sources. Those measurements have changed the entire building block.

Even though the technology of prefabricated large panels is not used nowadays in Albania and in Europe, all the buildings built with these technologies are habitable, and there is still the need to update those buildings. This global context provides a clear perspective on the

possibilities and constraints of rehabilitation, providing as a roadmap for tackling urban infrastructure in the 21st century.

2.1 Global Context of Large Panel Systems

Interventions in large-scale prefabricated building structures are not only a problem in Albania but also in the region and in Europe. As a result of the interventions and the time of use, many European countries have started large-scale renovation programs to address the problems of degradation and deficiencies created by the interventions. These interventions range from basic improvements of insulation only to the facade layer to comprehensive renovations, including structural improvements, facade transformations and the integration of renewable energy systems, aiming to improve sustainability and living conditions.

The refurbishment of Large Panel Buildings (LPB) across Europe shows multiple strategies to specific national priorities, ranging from deep energy retrofitting to radical structural and architectural transformations. In countries such as Estonia and Austria, interventions are primarily technology- and energy-driven, focusing on high-performance solutions through modular façade systems, advanced insulation, and the integration of renewable energy technologies aligned with Passive House standards (Kalle Kuusk, Peep Pihelo, Targo Kalamees, 2019). In contrast, countries like Germany and France emphasize architectural “humanization” and the improvement of living quality through spatial expansions, façade redesign, and the addition of elements such as winter gardens and balconies, often without displacing residents (Houpt, Mochocka, & Wijas, 2019) (Pintos, 2019). Meanwhile, in Slovakia, Serbia and Romania, rehabilitation projects commonly integrate functional adaptation and vertical additions, such as transforming ground floors into community spaces and adding attic levels to improve housing capacity. This large range of possibilities provides an important framework of reference for considering the informal, resident-driven alterations reported in Tirana, illustrating the gap between coordinated, large-scale repair initiatives and unregulated individual adaptations. (Jakub Onyszkiewicz, Kajetan Sadowski, 2022) (Jovanović-Popović, Radivojević, Ignjatović, & Elezović, 2006).

2.2 The Albanian Context and Seismic Vulnerability

Throughout their lifespan, they have undergone various changes from factors such as natural factors, such as earthquakes, where they suffer joint damage, as presented in (Merita Guri, Svetlana Brzev, Diana Lluka, 2022). Another factor is the intervention of residents where buildings have undergone changes to their facades as part of municipal programs to maintain various civil buildings, as presented in the study (Guri, Krosi, & Klodjan, 2023).

2.3 Informal Interventions and Research Gap

Although some level of formal maintenance exists, a more visible and complex reality is shaped by the numerous informal and often uncontrolled interventions carried out by residents. As their spatial needs have changed over time, occupants have adapted their apartments in different ways. (Krosi, 2024) identifies several common types of resident-driven modifications, including the removal of interior panels, the addition of three-dimensional elements—most commonly through balcony enclosures—the conversion of windows into doors (and vice versa), and the widespread practice of enclosing balconies.

While archival sources provide a clear picture of how these buildings were originally designed and constructed, much less is known about their current condition. In particular, there is still limited understanding of how these small, localized changes—when accumulated over time—affect the overall behavior of the buildings. This is especially relevant in Tirana neighborhoods such as Ali Demi, 21 Dhjetori, and Shkolla Teknologjike, where such interventions are widespread. This study aims to address this gap by systematically documenting and analyzing these modifications from a typological perspective.

It is important to note that in Large Panel Systems, façade panels are not merely architectural elements; they often play a structural role, either as load-bearing or shear-resisting components. As a result, unrecorded modifications to these elements may have direct implications for the overall stability of the building.

3. METHODOLOGY

3.1 Research Design and Study Areas

This study uses a qualitative, observational research design to identify and classify façade interventions in Large Panel Buildings (LPBs). The approach is exploratory in nature, focusing on understanding the types, characteristics, and distribution of resident-driven modifications rather than quantifying their frequency.

3.2 Study Area Selection

The focus of the study are three different zones in Tirana: 21 Dhjetori, Ali Demi, and Shkolla Teknologjike. These neighborhoods were selected based on the following criteria:

1. Representation of typical large panel prefabricated housing typologies in Albania
2. High concentration of LPB buildings
3. Visible presence of informal and resident-driven façade interventions
4. Urban relevance and accessibility for field investigation
5. These areas provide a representative sample of the transformation processes affecting LPB buildings in the Albanian context.

3.3 Data Collection Methods

Data collection was conducted through field surveys involving third-year bachelor students from Polis University, in collaboration with Co-PLAN, and was complemented by systematic photographic documentation of the study areas. The site visit focused on observing and recording the current condition of the façade. Meanwhile, the photographs and drone footage were used to capture various types of interventions. Also, to serve as a base reference in order to identify every potential deviation from the as-built project, the original planes and facades (see Figure 1), which were taken from AQTN, are used.

Visual inspection focused on identifying modifications such as:

- balcony enclosures
- window-to-door conversions
- volumetric additions
- panel removals or alterations

The data collection process aimed to document the buildings' actual condition, including all visible interventions.

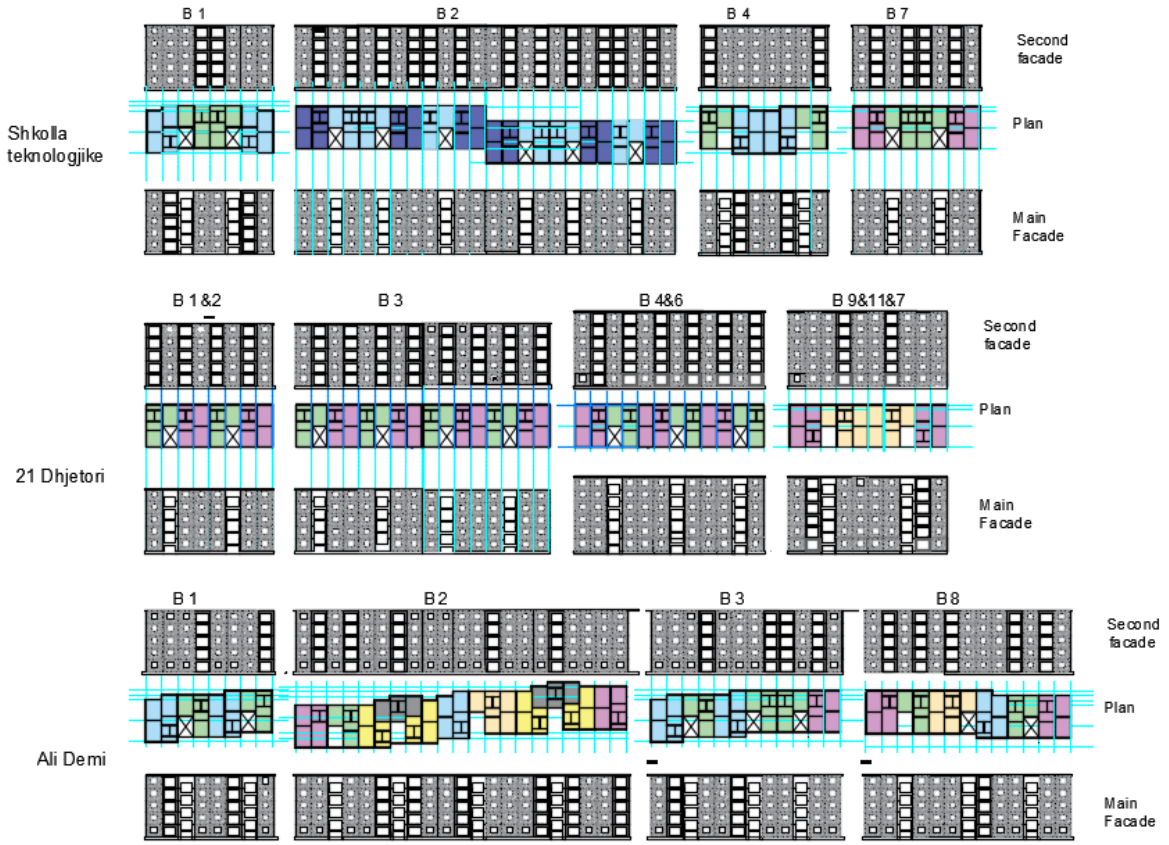


Figure 1. Original floor plans and facade elevations of the selected residential blocks in Tirana, sourced from the National Technical Archive of Construction (AQTN).

3.4 Data Analysis and Classification

The collected data were analyzed using a typological classification approach.
Interventions were grouped based on:

- type of modification (architectural/functional / structural-related)
- scale of intervention (minor vs. invasive)
- impact on façade composition

This classification enables a structured understanding of the most common patterns of resident-driven transformations and provides a basis for further discussion of their potential implications.

3.5 Limitations of the Study

This study is based on visual observation and qualitative assessment, which may not capture hidden structural modifications or internal alterations.
Additionally:

- The analysis does not include detailed structural calculations
- The findings are limited to selected case study areas in Tirana
- Informal interventions may vary over time, making the dataset dynamic

Despite these limitations, the study provides a valuable overview of façade transformations and highlights critical issues for further technical investigation.

4. CASE STUDY

The case study focuses on identifying the current situation in selected residential blocks in Tirana city, such as 21 Dhjetori, Ali Demi, and Shkolla Teknologjike, where each building is numbered (see Figure 2). The objective of the study is to identify the types, distribution, and intensity of interventions on the building's facade made by residents through a comparative analysis of the original (redrawn from originals, see Figure 1) and current drawings of the building.



a) b) c)

Figure 2. Location of the selected case study areas in Tirana: a) 21 Dhjetori, b) Shkolla Teknologjike,, c) Ali Demi, highlighting the analysed building blocks and study boundaries.

Each study area is represented by a selected building that is considered representative of the dominant LPB typology and intervention patterns observed in the respective neighborhood.

4.1 21 Dhjetori

During the field visit to the 21 December area, a high concentration of facade-related interventions and material degradation in the buildings was observed. The most frequent interventions identified include filling in balconies, modifications of openings and closing of windows and doors, installation of technical equipment (such as air conditioning units and antennas, water tanks), and volumetric additions, especially at the edges of the buildings. In addition, several forms of material degradation were observed, including cracking of facade panels, detachment of plaster layers, and moisture-related damage, especially in the lower areas of the facade. Localized damage was also identified at the panel joints. These interventions and deterioration processes have significantly changed the original configuration of the facade and can affect both the functional performance and the structural behavior of the buildings.

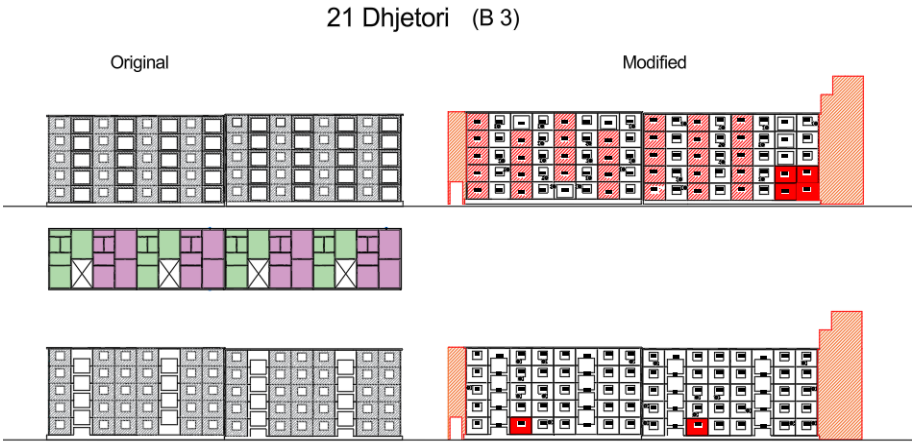


Figure 3. Case study building "21 Dhjetori".

The analysis of the selected representative building in the 21st December area (Block B3) shows a considerable level of interventions leading to the transformation of the facade. As illustrated in Figure 3 where the modified surface is identified in red, approximately 35–45% of the facade surface has been modified through interventions made by the residents. These include the enclosure of balconies, modifications of window openings and the addition of volumetric extensions, especially at the edges of the building. The distribution of interventions evidences both localized and continuous patterns along the facade, indicating a progressive and largely uncoordinated transformation process. One of the facades of the building has more than 50% of the facade modified and two side ones are 100% modified and thus we can say that the building has undergone many changes. The presence of horizontal volumetric additions results in increased loads and a change in the initial mass distribution, potentially affecting the structural behavior of the building, especially under seismic actions.

4.2 Ali Demi

Field observations in the Ali Demi area revealed a wide range of facade-related interventions and material degradation phenomena that affect the facade's appearance. The most common interventions found are comparable to those of 21 Dhjetorit and include balcony enclosures, small-scale volumetric additions at lower levels, modifications to openings (such as window-to-door conversions and new openings), and the installation of technical equipment (such as air conditioning units, antennas, and water tanks). In addition, material degradation was observed, including cracks in the facade panels, falling plaster, moisture, and damage to individual elements, affecting both the facade elements and the panel joints. These interventions and degradation processes have progressively changed the original configuration of the facade and can affect both the functional and structural performance of the buildings.

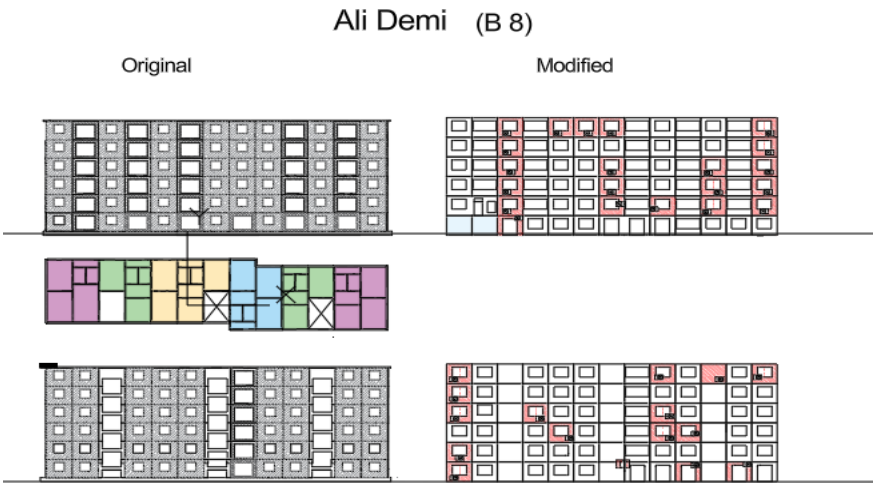


Figure 4. Case Study Ali Demi

Building B8 was selected as a case study to systematically and in detail analyse the identified changes in the façade configuration. The initial configuration of the façade, according to archival documentation, was presented as a conventional modular system with standardized openings. The material collected from the field visit shows that around 25-35% of the façade surface has been changed by interventions directed at the inhabitants, as shown in Figure X. These are generally arranged in vertical bands across the façade and include balcony enclosures, window opening adjustments and local additions. The predominance of individual interventions, in the absence of a coordinated approach, is reflected in their spatial organisation and suggests a fragmented and piecemeal transformation process.

4.3 Shkolla Teknologjike

Field observations in the area of the Shkolla Teknologjike revealed a wide range of interventions on the facade, as well as phenomena of material deterioration. The most common interventions, as in the two cases identified above, include the installation of technical equipment on the facades (such as air conditioning units and water tanks), the modification of openings, balcony enclosures or extensions, as well as small-scale volumetric additions, especially at the ground floor level. In addition, various forms of material degradation were observed, including cracks in the facade panels, detachment of plaster layers, the presence of moisture and localized damage to prefabricated elements and joints. These interventions and degradation processes have progressively modified the original configuration of the facade and can affect both the functional performance of the building envelope and the structural behavior of the prefabricated system.

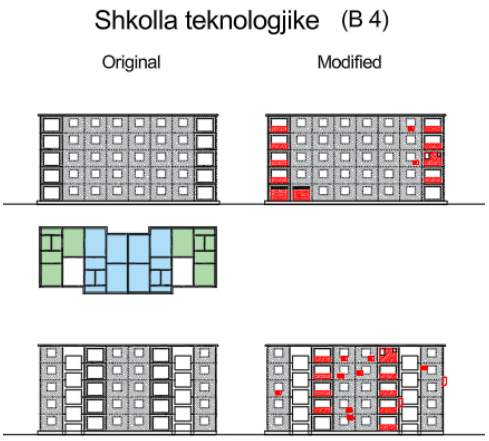


Figure 5. case study: Shkolla Teknologjike.

The case study in the Technological School area focuses on a representative LPB building (Block B4), selected for the identification and detailed analysis of facade interventions. Field observations show that the building has undergone a series of modifications made by residents, which directly affect the facade. As illustrated in Figure 5, approximately 20–30% of the facade surface has been modified. The typologies of the intervention include the closure of balconies creating new indoor living space, changes to window openings, the installation of technical equipment, and small-scale volumetric additions. The distribution of these interventions is also mainly at the apartment level, with modifications appearing at different points of the facade, without a unified organizational pattern. These changes reflect a gradual transformation of the building facade, mainly driven by individual inhabitant needs and the absence of a coordinated intervention approach.

5. RESULTS AND DISCUSSIONS

5.1 Problems Identified in Large Panel Buildings

Field surveys conducted in the three study areas in Tirana (Ali Demi, 21 Dhjetori, and Shkolla Teknologjike) revealed several key categories of problems related to the current condition of Large Panel Buildings (LPBs). These issues are the result of a combination of factors, including material degradation over time, environmental exposure, seismic activity, and resident-driven interventions carried out during the buildings' lifespan.

5.1.1 Structural Problems

As stated above, the structural load-bearing system of this typology consists of load-bearing panels and their connections. In both elements, we have stated degradation and interventions. In most cases, due to degradation, the concrete between panels at the joint has been removed, exposing the reinforcement (Figure 6d). In the load-bearing panels, new windows have been created (Figure 6b). And in one case in 21 Dhjetori, a hole new floor was added (Figure 6a). Also, in different parts of the façade and in the roof, there were spotted new load additions in the form of water storage (Figure 6c).



a) b) c) d)

Figure 6. Structural Problems

5.1.2 Joint Deterioration

One of the most important elements of the structural system in LPB it the connection between the panels. Due to the degradation, slippage, and cracking of the filler material (concrete), the life span has exposed the reinforcement of the joint (see Figure 7a) and has increased the possibility of corrosion. As shown in (Merita Guri, Svetlana Brzev, Diana Lluka, 2022), even during the Durres earthquake of 2019, the damage occurred mostly in the joints.

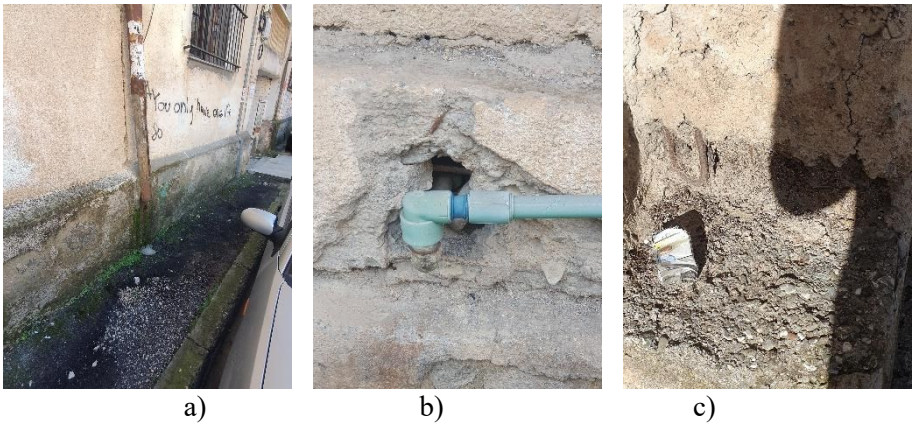


a) b)

Figure 7. Joint damages

5.1.3 Foundation Problems

Various issues were also identified in the foundation zones of the buildings. These include material degradation (Figure 8c) , cracking at the base of walls, and interventions related to the installation of technical systems (Figure 8b). Modifications carried out in foundation areas, particularly for service installations, may negatively affect the long-term stability of the structure.



a) b) c)

Figure 8. Foundation damages

5.1.4 Water Damage and Material Degradation

In LPB structures, the system pipes are prone to water-related damage. Site visits revealed efflorescence, mold growth, and moisture strains on panel surfaces, all of which suggested that water had seeped into the structure. The drainage system along the facades and in the surrounding areas is a primary source of this problem. The system is not properly connected with the city drainage system, and it has leaking spots even in the building with new thermal layers, which can cause deterioration of the building envelope. The piping and electrical systems in a building are crucial for maintaining functionality, energy efficiency, and occupant comfort. The adaptation of those systems has caused some regulation on the building systems. Besides the building's piping system, we note additional systems for rainwater drainage and internal use. The electrical system it is a mess.
The main system is an HVAC system, which stands for Heating, Ventilation, and Air Conditioning, that is an essential component of modern buildings designed to provide indoor climate control and air quality management.



a) b) c) d)

Figure 9. Drainage and electrical system

5.1.5 Energy Performance Issues

Unlike the city of Kamza, where, as a result of a measure taken by the municipality to improve energy performance, the entire LPB typology is thermally insulated, in the case studies in this study, the thermally insulated additions appear fragmented. These were made by the residents; for example, in Figure 10a, only half of the building is thermally insulated. In Figure 10b, it is seen that interventions were made only at the apartment level. Base on the study of (ISLAMI, 2016) the current state of housing with prefabricated panels in Albania is problematic, with only 10% of the stock having no renovation interventions since construction. The rest of the stock has undergone renovation interventions but with minimal impact on energy performance. The thermal performance of prefabricated panels in Albania is affected by construction technology, construction materials, and depreciation. Thermal bridges contribute over 10% of general thermal losses, and condensation inside the panel's perimeter reduces the capabilities of heat-insulating panels.



a) b)

Figure 10. Façade thermal layer intervention, a)

5.1.6 Building Envelope Modifications

One of the most seen modification on the façade of the building is the closure of the balconies not just with aluminum door elements but also with brick walls (see Figure 11a). Also, in some cases, small windows are enlarged, and new doors are opened (Figure 11d), especially on the base floor. 3D extensions are seen in the vertical (Figure 11b), horizontal (Figure 11c), and the new floor addition.



a) b)

c) d)

Figure 11. Building envelope modification: a) closure of balconies, b) 3D vertical extension, c) 3 D horizontal extension, d) new door opening.

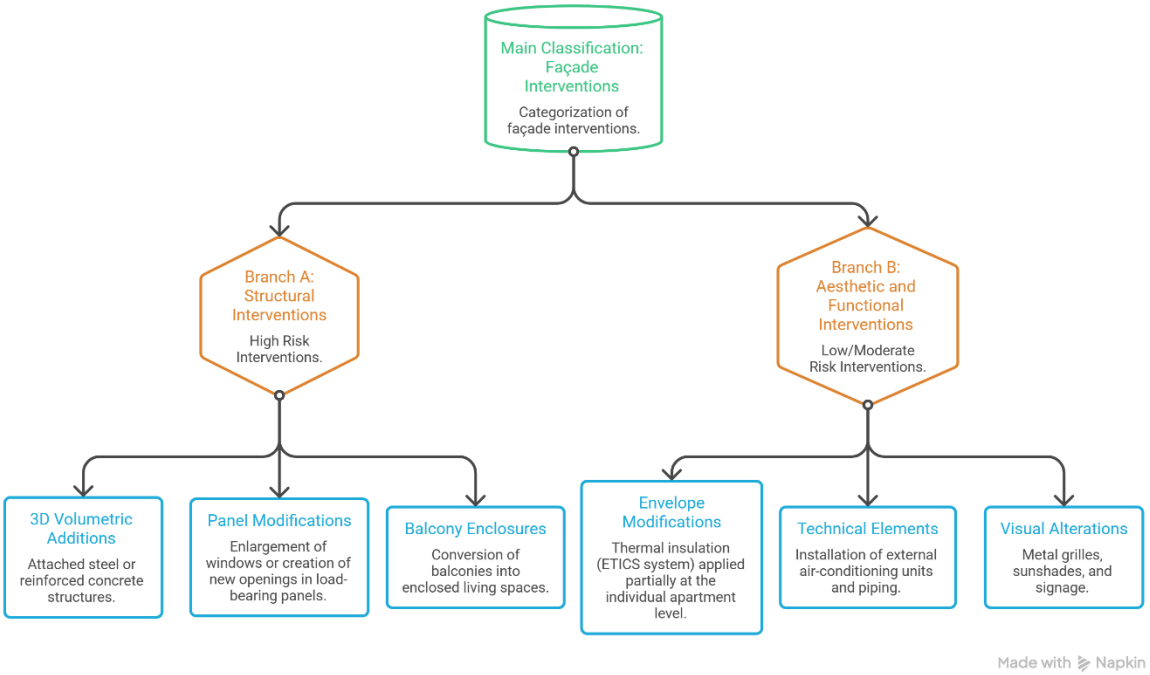


Figure 12. Classification of the intervention.

5.2 Discussion

The identified façade modifications and deterioration phenomena have important implications for both the seismic and energy performance of LPB buildings. According to Eurocode 8 (EN 1998-1, 2004), the structural response of buildings is highly dependent on the distribution of mass and stiffness, as well as the integrity of load-bearing elements and their connections.

Resident-driven interventions, such as the creation of new openings in load-bearing panels or the addition of volumetric extensions, may locally reduce stiffness and alter the global load path of the structure. These changes can lead to irregularities in stiffness distribution, which are known to increase seismic vulnerability, particularly in prefabricated panel systems.

Furthermore, deterioration of panel joints may significantly affect the behavior of the structure under seismic loading, as joints are critical for ensuring force transfer and overall structural continuity. The presence of cracking, sliding, and material degradation in these areas may reduce the energy dissipation capacity of the system and increase the likelihood of localized or progressive failure mechanisms.

In addition, the accumulation of non-structural elements on façades, such as enclosures, equipment, and informal additions, contributes to an increase in mass, which directly affects seismic forces acting on the structure. According to EC8 principles, an increase in mass results in higher seismic demand, potentially exceeding the original design assumptions of these buildings.

From an energy performance perspective, uncoordinated façade interventions significantly affect the thermal behavior of the building envelope. Partial insulation applied at the apartment level leads to discontinuities in the thermal layer, creating thermal bridges and reducing overall energy efficiency.

Modifications such as balcony enclosures, changes in window configurations, and the installation of technical equipment may alter ventilation patterns and solar exposure, further

affecting indoor thermal comfort. In addition, the presence of moisture and material degradation contributes to a decrease in thermal resistance and may accelerate heat loss through the envelope.
As a result, the actual energy performance of these buildings often deviates significantly from theoretical expectations, highlighting the need for integrated and building-scale refurbishment strategies rather than fragmented, individual interventions.

6. CONCLUSIONS AND RECOMMENDATIONS

In three residential areas of Tirana—21 Dhjetori, Ali Demi, and Shkolla Teknologjike—this study explored the range and effects of resident-driven façade alterations in Large Panel Buildings (LPBs). The outcomes emphasize the following important points:
Important Findings- Frequent and uncontrolled interventions: Balcony enclosures, opening changes, technological equipment installation, and small-scale volumetric expansions are among the most frequent homeowner-driven modifications, which are extensive and mostly unregulated.

- Façade transformation: A considerable portion of façade panel have been modified, resulting in a loss of façade consistency and creating a difference from the original architectural configuration.
- Structural implications: removal of load-bearing panels and modifications on the joints may change the load transfer mechanisms, reduce stiffness locally, and introduce irregularities, increasing the seismic vulnerability of LPB buildings.
- Joint and material degradation: Deterioration of panel joints, cracking of façade elements, and exposure of reinforcement contribute to reduced structural integrity and long-term durability issues.
- Energy performance : Not all types of intervention made by inhabitants are the correct ones and their results in terms of energy performance are not the expected ones. Also as stated at (Guri, Krosi, & Klodjan, 2023) the presence of air condition on the panels of the fasades creates thermal bridges.
- Increased vulnerability: The combined effect of ageing, material degradation, and unregulated interventions has led to an overall increase in the vulnerability of these buildings, particularly under seismic conditions.

The results show that interventions in LPB buildings made by residents are not only aesthetic or functional adoption, but they are critical factors that may influence both structural safety and energy performance. An urgent project is needed at the municipal level, including different experts (architect, engineers) to coordinate rehabilitation strategies that integrate structural assessment and energy efficiency improvements, ensuring the long-term safety and sustainability of the existing housing stock.
Limitations and suggestions for future research.
The limitation of this study is the small number of buildings taken into consideration, which is focused on 3 different neighborhoods. Also, another limitation is that the study is focused on visual inspection and photographic documentation just of the envelope of the building and not on the inside. Future research should create a more detailed current state of the building, what the changes are, and those should be documented. For each building, whether or not intervention should be conducted, a more detailed structural and thermal analysis should be conducted.

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Tirana_ toward a (non) resilient city of the future

Re-shaping mobility and bring back "La raison d'être of the city"

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Abstract

The rapid transformation of Tirana has intensified mobility pressures while disappearing its "locus". Despite recent interventions—partly removal of on-street parking, expansion of bicycle lanes, and increased parking fees—private car dependency persists. The same humanity has developed in the digital era, the "self-correcting mechanisms" should be explored in reshaping mobility and bringing back to life "la raison d'être" of our walkable Mediterranean city.

We need to provide options. Mobility should be gender inclusive, for women and gender minorities have a better and safer life. So, we can embrace and implement a new philosophy of city planning. Bus stations can be the urban catalysts. We need switch mode areas, so come by car, take the bike at the station, use a bus later on, or get in a shared car again. As Carlo Ratti would state: "Welcome to the era of free choice of transportation means".

The research question guiding the study is: How can gender inclusive and micro mobility reshape public space, foster walkability and impact the future of a vivid and yet breathing city?

The central hypothesis proposes that resilience in mobility is achieved through the "urban mobility artefacts" — multimodal nodes where public transport, shared vehicles, and pedestrian networks converge — supported by digital platforms enabling flexible choice. Such catalysts become the landmarks of social interaction re shaping mobility habits and public space.

Methodologically, the study combines theoretical analysis of resilience and mobility paradigms with actual urban context. It critically examines the relationship between infrastructural connectivity, and social impact, emphasizing how micro-mobility nodes and bus stations can function as safe social spaces being the "new urban artefacts", for behavioral adaptation and spatial regeneration.

The paper contributes to the theory by conceptualizing mobility integration as a cultural and spatial strategy for reclaiming the heart of the city: accessibility, proximity, and social interaction.

Keywords: *new urban artefact, transportation means, micro mobility, gender inclusive mobility, digital network*

1. INTRODUCTION

1.1 Reshaping mobility paradigm through public transport and micro-mobility.

Tirana has historically been a city that offers sustainable mobility opportunities. The old neighbourhoods of the ottoman period give a typical example of dense areas with people on the main focus. During dictatorship of Hoxha (1944–1985) the vast majority of population did not have access to private cars so citizens would walk, cycle of use the bus and the total number of cars until 1990 was about some thousands. After the regime fall, private car users increased rapidly and as a result walkability faded as did the public transport use. The number of cars increased from 57.000 from 1993 to more than 450.000 in 2020, and nowadays this number has doubled already. The negative effect of this situation was already experienced with the heavy traffic, air pollution, narrow spaces for pedestrians and car parked everywhere occupying spaces that did not belong to them, threating safety and comfort.

Today, walking in the central Tirana the power of being present, mindful, enjoying the being and the urban vibe is really felt but soon after being far the central area, these emotions disappear as the chaos is recognized. This “magic effect” is relying on some urban spaces where the city seems to be developed physically and aesthetically but the periphery hits differently. There is everything in Tirana except going from A to B really quick, easy and cheap. Bike lanes the successful intervention once, are still dominated by the daily use of car parking and quick stops so they have lost their continuity as simple itineraries. Buses are in the urge to be renewed besides the fact new vehicles are needed. The layer beneath, the so called “missed city” which has easily walkable distances, hides its own infrastructure network in which buses and bikes can dominate again. The urban transformations in the last years have impacted the urban memory, so the physical spaces have changed, lacking orientation, safety and enjoyable itineraries. So how can we assure that everyone can feel not lost in some parts, of the city, safe and comfortable walking in Tirana? The result after all these years of changes and development, is a city that does not belong to anyone.

1.1.1 Gender equity in public transport is essential to facilitate access and enhance wellbeing in the society.

There is actually a lot happening but no “felicitous happening” at all. Bus stations as local market points, a place to host private business, books, music, painting, a place of events happening in the everyday life. Mothers can do the groceries while waiting the bus, going to the pharmacies or staying put and comfortable and enjoying it as a happy pause. The aim is to design bus stations, as a place to stop, rest and reset for the next destination trip. Public transport is not just a matter of infrastructure but it is essentially a social issue, we need to face and improve the approach to it. The young need to be promoted to a flexible, practical and still happy lifestyle without limitations.

We need to have back our liveable city by a sustainable network of urban mobility. The lack of parking places and options to that, is collapsing a lot of shops and small businesses. So, why not include the community in this new concept of urban mobility and infrastructure? A

business incubator for simple ideas; local sellers of vegetables and fresh products can get their eligible place for free or symbolic fee, using these shelters to host their activities. This symbiotic connection of small producers and the public sector can be efficient in terms of the increase of public transport users. A top-down initiative to a bottom-up interaction might have a great impact in the urban life in general. Start- ups can benefit from generating ideas how mobile apps can work it out through getting the service and using the user's data even to get in touch with each other, by using this as a sharing, communicating or even a dating platform. Shared platforms for women only, can exist by giving them the chance of using their dedicated lines, dedicated timetables or special vehicles and stations. Gender inclusive mobility should be provided in full safety of using the public means of transport so the undeniable necessity of private car use can vanish.

2. LITERATURE REVIEW

Cars have been shaping the paradigm of urban development of the twentieth century since the time they were produced. The latest concept defining the new global identity is being questioned through the new concept of Ratti 3"Intelligens", an intersection of natural and artificial in order to address the climate change issue and the urban adaptation. We need to look back at humanity and evolve through mitigation and adaptation. AI can help create new patterns natural patterns adapting to this momentum.

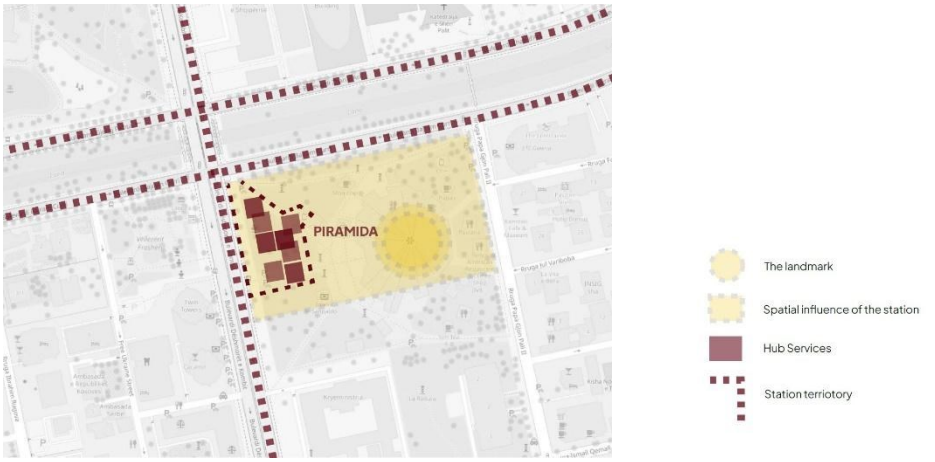
But can we adapt to the future through its memory? Referring to Aldo Rossi (1982) probably yes, we can.

This overlapping of the individual and the collective memory, together with the invention that takes place within the time of the city, has led me to the concept of analogy. Analogy expresses itself through a process of architectural design whose elements are pre-existing and formally defined, but whose true meaning is unforeseen at the beginning and unfolds only at the end of the process. Thus, the meaning of the process is identified with the meaning of the city.

In an urban artefact, certain original values and functions remain, others are totally altered; about some stylistic aspects of the form we are certain, others are less obvious. We contemplate the values that remain—I am also referring to spiritual values—and try to ascertain whether they have some connection with the building's materiality, and whether they constitute the only empirical facts that pertain to the problem. At this point, we might discuss what our idea of the building is, our most general memory of it as a product of the collective, and what relationship it affords us with this collective.

Based on this theoretical approach, the resilience in mobility is achieved through the "urban mobility artefacts" — multimodal nodes made by micro mobility devices, car sharing and ridesharing, and public transport as flexible choices. These artefacts of the city, which hold the mobility program are used as catalysts reshaping memories and places. So, despite redesigning the Pyramid into TUMO center and reshaping its silhouette through cubes and color, the core remains there and a certain area of this public place can be integrated in a

mobility hub station, bringing another use of its public space.



Example of a multimodal-node using the Pyramid as core landmark



Example of a multimodal-node using the Parku "Rinia" as core landmark



Example of a multimodal-node using the market as cross section in an old street as core landmark

"Cities are a product of time" (Lewis Mumford, 1938). From this saying we should consider is time to shift the mobility paradigm to another level. Through AI by collecting the necessary data we should make public transport and any other mean of micro mobility the utmost natural way to its users.

The complexity of micro mobility as the new way of thinking and defining mobility with a

human use purpose could be simplified in two main aspects: the simple vehicle/device or the mode of transport. E-scooters are the new human and technological invention in terms of mobility, facilitating movement in the urban areas.

The recent years face an increase number of e-scooters all over the world, especially in Europe, being used by both men and women, mostly young generation. It was quickly developed as a simple and easy mobility mode to survive the heavy traffic. Although collective data from the Ministry of Internal Affairs has shown that in our country there had been almost 991 accidents reported from the Emergency Room due to e-scooter which led to the decision of banning them from the streets.

Referring to EIT study, there were several case studies which are considered crucial to this paper, to be taken as reference in term of policy and regulations.

Case study: The city of Madrid

The city consequently conceptualized an Urban Mobility Ordinance in October 2018, which empowered new rules, governing the occupation of public space for all electric kick scooters in parking and circulation. The regulation has since prohibited e-kick scooters from riding on pavements, bus lanes, roads with more than one lane in each direction, and from most orbital motorways, whereas they were allowed to use cycle lanes, as they were treated the same as bicycles. Moreover, the ordinance introduced a minimum age for users of 15 years and the mandatory wearing of safety helmets, in order to avoid accidents. Concerning the parking of electric kick scooters, the new regulation stated that only designated parking areas for motorcycles and bicycles could be used.

Case study: The city of Paris

Paris in some ways has become one of the most important open living labs for shared 60 micro-mobility services. France announced the legalisation of the use of electric kick scooters and similar devices. Before there was no law regulating the use of this new type of vehicle. According to these new regulations, the e-kick scooters are bound to a speed limit of 25km/h and are obliged to use bicycle lanes or roads with speed limitations. Moreover, due to the new regulations riding the electric kick scooter requires a minimum age of 12 years, wearing headphones is prohibited as well as transporting other passengers. According to the introduced set of regulations, e-kick scooters must be equipped with front and rear lights, a horn and a retro-reflective system (The Mayor, 2019).

Case study: The city of Berlin

After the use of electric kick scooters on German roads was permitted by the enactment of the Ordinance on Small Electric Vehicles, a chaotic start took place in Berlin, with almost no municipal measures regulating the e-kick scooters and accident rates, violations of road traffic laws (Tagesspiegel, 2019) and numbers of acts of vandalism (B.Z. Berlin, 2020) underlining the situation in the best possible way. Consequently, the municipality established no-parking zones at the most congested sites and locations, so that important point of interest in the city

could remain their functionality, regarding their touristic and civil value as well. For this reason, bilateral agreements were concluded between the operating companies and the municipality, which are not legally binding on the partners. In these agreements, restricted areas were defined where users could not log out, which could be achieved by using geofencing technologies (Berliner Zeitung, 2020). As a further measure, the municipal administration planned to transform 500 parking lots for cars in dedicated parking zones for rental bikes and e-kick scooters (Redaktionsnetzwerk Deutschland, 2020). Interestingly, the city of Berlin has opened several mobility hubs in an iterative process, where e-kick scooters can be rented since June 2019 using the "Jelbi" app, which enables users to search, book and pay for a bunch of different mobility services. These mobility hubs are located at important public transportation nodes, where shared vehicles from different providers can be rented locally to cover the last mile.

Replaced Modes of Transportation	Free-floating e-kick scooter sharing (n = 757)	Privately owned e-kick scooters (n = 329)
Public transportation	29.2%	30.2%
Car	26.7%	28.4%
Walking	26.1%	21.1%
Bicycle	14.2%	15.5%
Electric bicycle	1.5%	1.6%
Additional trips	1.8%	1.5%
Other	0.1%	1.1%
Motorcycle	0.4%	0.6%

Figure 1. Modes of transportation replaced by the use of free-floating and personal e-kick scooters (adapted from Moreau, et al., 2020).

All three case studies, have one thing in common: they try to fix the legal framework in order to make micro mobility mode survive the urge reducing traffic. New technology needs new approaches to be implemented. Special lanes, parking areas, apps and safety measures lead to recognizable benefits to take advantage from this new mean of transport in micro mobility use.

The overview gap analyses can be done through certain addressed issues in which our city context has: Firstly, all the above measures taken, need some time to be tested in order to achieve a certain impact in the city. Secondly, it is also needed that the urban planning mechanisms and policy makers of the city take in consideration these new indicators while rethinking any traffic measures taken. Cycle lanes need to be redesigned to be an integral part of the micro mobility infrastructure which leads to other urban interventions that can be affected by cycling and pedestrian itineraries including traffic lanes and public spaces also.

Last, although our prominent new age of population and the technology usage, the apps use as a crucial part of this system need to be tested if the whole infrastructure can rely on it.

This quote from Lina Ghotmeh (2026) “Architecture is about people first”, frames another point of view of the discussion whether we should feel the responsibility to provide wellbeing inside our cities.

The INSTAT (Institute of Statistics in Albania) data from 1st January 2025 shows that 32.2% of the country population is living in Tirana, so the urge to find safe solutions to women using public transport is immediate. There is a slight advantage in the percentage of the female population so they need a lot of focus in the given options.

A study of IDRA, Research & Consulting with UN Albania (2000?), mentioned in even in the city of Durrës in 2018, that from 200 asked women, 50% had experienced harassment in the streets and they could not walk on their own after 8 pm due to darkness and the lack of street lighting. This leads to approach this case studies: “In order to achieve the dominance of women use in public transport and the safety comfort is important to understand how this initiative has taken place in other cities and how they have implemented their standards to this stereotype”.

An UCLA study of 2023 regarding the theme of Designing Streetscapes for Gender Inclusivity shows several case studies which this research paper found in interest to address as they refer the same issue in another country although more developed.

Case study Seattle

Pedestrian street lightning: Why it is important for gender equity?

- Uniform illumination provided by pedestrian – scale lightning allows for clear visibility of one’s surroundings while walking or waiting at transit stops at night.
- Women more often than men are fearful of street crime and harassment and the presence of well-lit settings helps lessen this fear.
- Adequate street lighting increases feelings of comfort and safety especially among women and gender minorities (Boomsma &Steg, 2014; Loewen et al., 1993.)
- Poor lighting near transit stops has been associated with increased risk of sexual violence against women and LGBTQ + individuals (Ceccato et al,. 2020)



Figure 2. From Citywide Pedestrian Lighting Plan, by SDOT, 2012, p. 18.

The Seattle Department of Transportation (SDOT) released its Citywide Pedestrian Lighting Plan in 2012 to apply a data-informed approach to siting pedestrian lighting and to improve its planning, design, and implementation (SDOT, 2012).

The calculation of these areas took into account:

Key takeaways for pedestrian street lighting:

- Including pedestrian-scale lightning in street improvement projects and development standards can help get more light on the ground when funding is limited
- Night time walk audits, especially with local community members, should be used in the planning of projects to identify lightning needs.
- Consistent colour temperature and light distribution along with the minimization of glare can create a more comfortable night time environment
- Public space analyses grounded in observation can be used to identify populations that may be underrepresented, such as women, girls, and gender minorities, and determine improvements that should be made to make all population feel safe and comfortable

Case study NYC DOT

Public seating: Why is this important for gender equity?

- People who are pregnant, have a disability, or are older may need to stop to rest while out walking, whether it is for exercise, to access public transit, or run household errands.
- Women often have greater care responsibilities and public seating can serve as spaces to care for dependents or older companions while out in public
- Public seating for women, girls and gender minorities of all ages to socialize comfortably in the streets

NYC DOT launched its City Bench program in 2012 to provide public seating on sidewalks throughout the city. All reports pointed out the need for public seating to increase

walkability, support older adults and people with disabilities, and improve street life (Office of the Mayor, City of New York, 2011).



Figure 3. Left: example of a City Bench; Right: a previous style of bench on an NYC sidewalk

Key takeaways for public seating:

- In addition to transit stops, public seating should be installed at locations such as commercial corridors, senior centers, and civic institutions like schools, libraries, and healthcare facilities.
- Benches with backs, wide seats, and armrests offer increased support and personal care.
- The use of imagery software like Cyclomedia can simplify the process of identifying appropriate locations for sating installation and for checking the condition of street furniture.

Case study TriMet

Bus stop amenities: Why is this important for gender equity?

- Bus stop shelter provide protection from direct sunlight and inclement weather, which is especially important for more vulnerable populations such as pregnant people, children and older adults.
- Seating at bus stops provides these populations with a place to sit and rest while waiting for transit
- Trash cans can deter littering and help maintain a pleasant transportation environment

TriMet is the regional public transit agency serving 26 cities in the Portland, Oregon metropolitan area. The agency owns all of its bus stop amenities and prioritizes their installation at locations that will have the greatest benefit to their ridership.



Figure 4. Example of seating and bus shelters used by TriMet. Credit: Transit Center

Key takeaways for bus stop amnesties:

- Sitting bus stop shelter and benches where they are most needed, not where they will result in the highest advertising revenues, can help to ensure they are placed where they will best support transit riders.
- The minimum number daily weekday boardings for installing bus shelter should be lowered in underserved communities and at locations serving high numbers of vulnerable customers such as older adults or people with disabilities
- Forming partnerships with businesses and community groups to maintain bus stop amenities such as trash cans can help to increase the provision of amenities at locations that do not meet minimum daily weekday boarding requirements.
- Using a GIS-based equity analysis that includes factors such as Limited English Proficiency populations and limited vehicle access households, for example, can aid in identifying locations where the addition of bus stop amenities should be prioritized.

Case study Minneapolis Department of public works

Pedestrian infrastructure: Why is this important for gender equity?

- Wide, level sidewalks with pedestrian curb ramps provide barrier-free access for people travelling with strollers, carts, or mobility devices.
- Curb extensions and pedestrian safety island increase the visibility of pedestrians and shorten the crossing distance at intersections, which supports traveling with dependents and older adults.

When curbside uses are altered, such as reducing the number of parking spaces for a mid-block crossing, the DPW often receives a lot of push back from the community. In these situations, it can be easier to move forward with a project if the curb lines are not altered. Ultimately, “safety is a big goal for [the DPW] and if you’re not able to influence the way people cross the street, then you’re not helping anyone”



Figure 5. High-visibility continental crosswalks and quick-build curb extensions. Credit: City of Minneapolis

Key takeaways for pedestrian infrastructure:

- Creating and regularly updating inventories of pedestrian assets can aid in forming a baseline of existing conditions, identifying disparities in the condition of infrastructure, and developing action plans to bring all infrastructure up to standard.
- Developing detailed equity-focused prioritization criteria can help ensure that funding for projects goes to communities where investments are most needed
- Establishing a Capital Improvement Plan can help to target investments years in advance and create a roadmap for achieving larger goals such as improving gender equity
- Initially prioritizing quick-build treatments can help to make wide scale improvements in a short time frame.

3. METHODOLOGY

This research analyzes qualitative data from diverse case studies, comparing successful international strategies and addressing their application within the specific urban context of Tirana. This approach intends to connect this philosophy and the emergent situation of a city in the limit of urban suffocation.

Cities are engines of opportunity where citizens choose and switch between modes of living and moving comfortably. However, development has overpassed human scale, so a moment for reflection is needed. Tirana's core identity as a city is rapidly vanishing. Children lack spaces to play, the elderly have lost their access to relaxing in greenery, and mothers urge their kids to drive despite traffic, and the oil price increase, in order to survive the urban life—a burden that is far from a luxury.

Could micro mobility be the answer? Having back a city enjoyable after all? Car sharing and ridesharing are actually crucial to be part of the whole transport system. E-scooters which are although banned from the government need to be seen as an integral part of the new urban mobility system. Although the negative effects they have brought due to accidents in the

streets, this new means of transport urges its regulation to be eligible and fully efficient. Cargo bikes involvement in public services and private sector, pedestrian infrastructure concept and redesign of sidewalks, using space rationally to create specific cycling lanes, in order to really be of use in the everyday circulation are the objective and the scope of this study.

Multimodal stations and bus stops should be the focus of a new urban planning strategy and design, where "the magic happens". Public space in its best quality was not experienced before. "Felicitous happening" should be the new identity of each artefact. Community can also be of use by interacting with retired people who want to be still active, do volunteer work and get benefits from it in e.g. free transportation, paid beverages, etc, this way of cultivating social life could be proficient to working mothers, so in some of the most crowded mobility hubs, there could be areas of use as a quick day care until the next bus arrives, while parents do the shopping, they can have their babies taken care and pay the extra fee service in the season ticket.

Bus stops can be considered a public ground, especially by providing safety for women and children. A program inside these hubs is a game changer. Filling these spaces with services could lighten peoples' life and make use of their time. These physical spaces can get ephemeral design approach through the AI technology, moving and changing facades, to be enclosed or turn them into encapsulated spaces provide safety and protection.

Despite all, Tirana remains a monocentric city. Infrastructure lacks in all the new areas built which are still "dormitories". A 15-min walk city concept could be the result in a series of these multimodal stations, as new urban artefacts full of amenities to get near people on their way home.

This can seem as a feminist approach, but it is time to face the truth. Through gender equity in transport, we can move toward a resilient city which self-corrects last year's chaotic development and improves the air quality by reducing pollution and traffic. This is actually a global issue to women and gender minorities who are in the same situation. Our system and government policies must persist and support the issue.

A feminist approach city means a social friendly city for all. The example we are experiencing today with the dedicated bus lines for women from their factory are increasing. A lot of companies use this strategy in order to persuade women to accept the job and feel safe during their way back and forth. This example is crucial to be used as an initiative in rethinking our public transport in general and give women more access in this sector as users, providers and policy makers.

4. RESULTS AND DISCUSSIONS

The findings on the analysis of the case studies highlight the potential of micro mobility, multi modal hubs as a core element of the city and the socially inclusive planning through gender equity to address the city' s chaotic situation.

Micro-mobility options are vital components in creating convenient public transport and

reducing private car dependency. Reconsidered infrastructure of cycle lanes is crucial to provide safety measures to the integral modes of mobility. Tirana's current lack of fully settled and connected cycling infrastructure could be a significant barrier, yet redesigning sidewalks to allocate space for cycling by all means and walking freely would encourage more sustainable mobility habits and improve everyday circulation.

Redesigning bus stations in Tirana into multimodal urban artefacts can foster community interaction and make waiting time efficient, pleasant and socially interactive. The inevitable AI use and adaptation to the new technology offers dynamic design and public space use to respond to people's needs for safety and comfort.

Adding a program to each station or multimodal node, depending on the size can help give these space meaningful design and use. As safety concerns are universal, the inclusion of gender equity issues and gender minorities enables them to foster the initiative of public transport use and give a practical solution to urban mobility.

Tirana's rapid expansion into new residential areas presents both opportunities and challenges. Case studies show urban development supported by balanced, multi-nodal transport systems connecting these new poles with the city centre. This approach leads to a polycentric city at last.

5. CONCLUSIONS AND RECOMMENDATIONS

This study outlines strategies which are based either on theoretical approach or practical case studies globally. The mobility paradigm can be transformed and be a fundamental part of urban mobility through public transport and micro mobility measures, by redesigning public spaces as mobility hosts and also the transport modes to its core identity. Through urban planning and design approach, public space can be an integral part of the new urban artefacts functioning as multi modal nodes and bus stations, creating a floating space with no physical limitations between waiting platforms, cycle lanes and pedestrian itineraries.

The gender equity focus is crucial to foster public transport use, facilitating women's life especially mothers' needs and caregivers, which is essential to a better and healthier lifestyle. The 15-minute walk can finally let the city breathe again, evoking the past when walking as a necessity and joy.

This proposal requires both actor parties of policy making and urban planners designing and implementing this strategy of new and freeways of the transportation era.

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A Seismic Hazard Model of Albania

Case study: Kukes, Berat and Himarë

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Abstract

Albania is situated along the Alpine-Mediterranean seismic belt, making it one of the most seismically active regions in Europe. The country's complex tectonic landscape is primarily driven by the ongoing continental collision between the Adriatic microplate and the Eurasian plate. Historical records and instrumental data emphasize the severe seismic hazard across the country. Between the 3rd century B.C. and the present, Albania has experienced approximately 56 strong earthquakes with intensities of I>VIII (MSK-64), with 15 reaching intensities of IX or higher. Recent devastating events, such as the November 2019 Durrës earthquake (Mw=6.4), have further highlighted the urgent need for an updated seismic hazard model of the country. This paper focuses on a new seismic hazard model for Albania and deriving the seismic hazard profiles of three distinct urban centers: Kukës, Berat, and Himarë, which represent varying geological and tectonic environments. By analysing the probabilistic seismic hazard (PSHA) for these cities, this study aims to provide localized data on Peak Ground Acceleration (PGA) for two return periods, required for modern engineering standards.

Keywords: *Tectonic setting, earthquake catalogue, ground motion prediction equations, seismic hazard model of Albania.*

1. INTRODUCTION

Earthquakes are an unpredictable and unavoidable natural geological hazard with a significant potential for destruction. Implementing suitable measures to decrease the effects of earthquakes on infrastructure and buildings is the best protection against them. This is impossible to achieve without a reliable seismic hazard analysis, which serves as an input necessary to improve design codes for seismically resistant structures. Seismic design codes, seismic risk assessment and management, as well as improving earthquake safety, must be based on appropriate hazard models and reliable seismic hazard maps.

The present study describes the methodology used to build a new model for the seismic hazard of Albania and the results achieved. In addition to seismic hazard maps in compliance with the requirements of the Eurocode 8 standard, which are required for the implementation of this standard in our country, seismic hazard profiles are given for three different urban centers: Kukës, Berat, and Himarë. They reflect different geological and tectonic contexts, so their seismic hazard is the subject of this paper.

Kukës - situated in the interior part of the northeast region of Albania. This area is impacted by transverse fault zones. Although Kukës has historically seen earthquakes larger than magnitude 6.0, it is generally thought to be less dangerous than the coast.

Berat - located in central-southern Albania. It is the city that experienced high-intensity occurrences in the past, most notably a strong earthquake in 1851 that resulted in numerous landslides and over 400 fatalities. With large earthquakes (M>6), it continues to be one of the interior's most active zones.

Himarë - a southwest seaside town situated in the extremely active Ionian fault zone. Strong occurrences like the 1930 M=6.0 earthquake have historically struck this area, which is characterized by thrust faults.

By analyzing the probabilistic seismic hazard (PSHA) for these cities, this study aims to provide localized data on Peak Ground Acceleration (PGA) for two return periods for modern engineering standards.

2. LITERATURE REVIEW

2.1 Regional and local seismicity

Microearthquakes ($1.0<M\leq3.0$), numerous minor earthquakes ($3.0<M\leq5.0$), rare medium earthquakes ($5.0<M\leq7.0$), and extremely rare major earthquakes ($M>7.0$) are typically common in Albania (Aliaj et al., 2009). Based on historical records, our country has seen 56 powerful earthquakes with intensities $I_0\geq$VIII of the MSK-64 scale since the third century BC. In 2019, Albania was struck by two strong earthquakes (M_w=5.7 on September 21 and M_w=6.4

on November 26). The November 26, 2019, earthquake caused significant material damage and 51 fatalities (European Union et al., 2020). It is regarded as the world's most catastrophic earthquake of that year.

2.2 Seismic zonation and Design Code

Albania's first seismic map was compiled in 1952 by specialists from the Ministry of Construction and the Institute of Sciences (Sulstarova et al., 1980). Since then, various papers have been produced in an effort to provide the most realistic evaluation of the seismic hazard in our country (Duni & Kuka, 2004, Aliaj et al., 2010, Luzi et al., 2020, Danciu et al., 2021). The seismic zonation map compiled in 1979, an outdated empirical map created on a non-probabilistic basis, serves as the foundation for the current Albanian Design Code KTP-N.2-89. It describes the macro-seismic intensity (MSK-64 scale) and not the ground shaking intensity levels such as PGA, PGV, SA, etc., which are used nowadays in modern design codes (CEN, 2004).

As a result, it is crucial to accurately update the seismic hazard model and create a new national seismic hazard map that will serve as the foundation for our nation's new design code, aligning with Eurocode norms (CEN, 2004). Moreover, the deadly Mw 6.4 earthquake that struck close to Durrës on November 26, 2019, has brought attention to the Albanian Design Code's need for reform (Bilgin, 2023). Therefore, it is clear that these technological requirements need to be improved and brought into compliance with EU regulations.

2.3 Probabilistic seismic hazard analysis

After the disastrous Durres earthquake on November 26, 2019, with a magnitude of Mw=6.4, a major revision was conducted between 2020 and 2024 to update the earthquake database and improve the accuracy of the seismic hazard assessment for the territory of Albania (Kuka et al., 2023).

The partnership between the Institute of Geosciences (IGEO) and the GEM Foundation (Global Earthquake Model, Pavia, Italy) has made a significant contribution to update the seismic hazard. With funding from the Energy Corporation of Albania (KESH) and the European Investment Fund (CEI-Central European Initiative), GEM and IGEO carried out a one-year project (KEP2022) during the period 2023–2024 to update and enhance the probabilistic seismic hazard model of Albania (under the coordination of Dr.Marco Pagani and Dr. Anila Xhahysa, and the essential expertise of Prof. Dr. Neki Kuka).

3. METHODOLOGY

The results of the probabilistic analysis used in the NATO SfP 984374 project (Kuka, et al., 2015), applied to the updated earthquake catalogue of earthquakes and some new ground motion prediction models (Kuka, et al.,2022), combined with the new results obtained (Kuka, et al., 2023), within the framework of the aforementioned project between GEM and IGEO (KEP2022) are merged to obtain the final seismic hazard model of Albania. A logic-tree

structure, which explains the epistemic uncertainties related to the development of the seismic source model and the ground motion prediction (GMPE) models, is used in the computations for hazard assessment. In compliance with the Eurocode norms (CEN, 2004), the results are presented in terms of maximum horizontal acceleration (PGA) for the 95- and 475-year return periods. The analysis is performed with OpenQuake computational tool created by the GEM project (Pagani et al., 2014).

3.1 Earthquake catalogue

The seismological database utilized in this research is a uniform catalogue list of earthquakes that was created as part of the NATO project SfP 984374, also known as the BSHAP2 project. Over 20,000 new occurrences of magnitude MW≥3.0 that occurred in the region [36.5°–45.5°, 15.5°–24.5°] between January 1, 2013, and December 31, 2022 were included in the GEM-IGEO project (KEP2022).

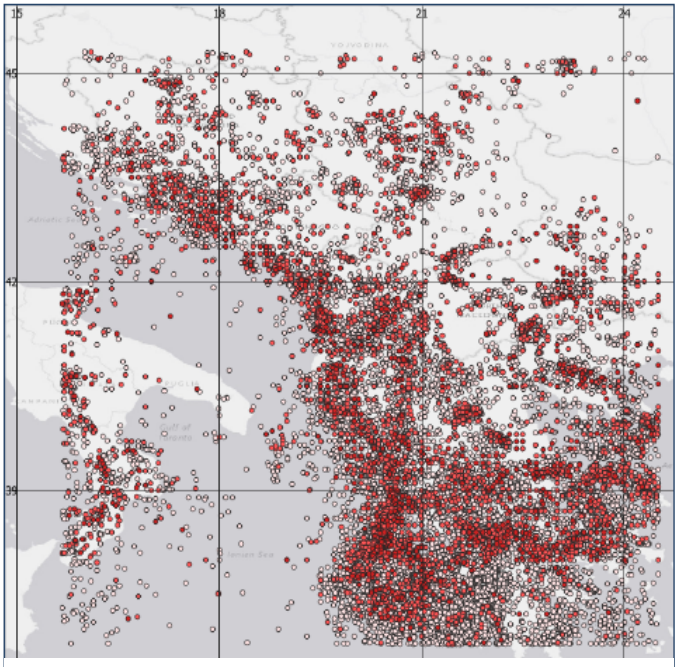


Figure 1. Updated earthquake catalogue for the period 1/1/2013-31/12/2022 in the region [36.5°- 45.5°, 15.5°- 24.5°].

The process used to unify and homogenize these occurrences in terms of M_W magnitude was the same as that used for the BSHAP catalogue. Regression models developed during the BSHAP2 project, or new relations created specifically for this study were utilized to convert various magnitudes (M_L, m_b, M_S, etc.) to M_W. Approximately *46,000* events that took place on our nation's territory or within 300km of its borders are included in the new inventory. In terms of M_W magnitude, it is uniform and homogeneous. *Figure 1* displays the spatial distribution of earthquake epicenters in this database, while *Figure 2* displays their distribution according on moment magnitude, M_W.

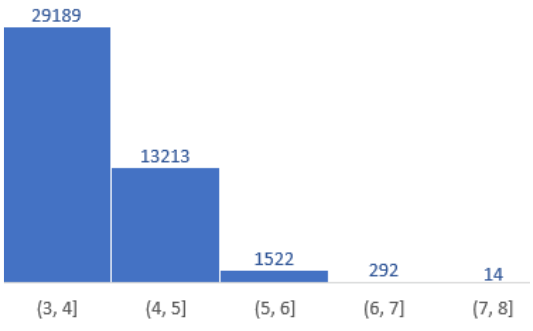


Figure 2. Earthquake distribution according to M_W.

Foreshocks and aftershocks must be removed from the earthquake database in order to calculate the Poissonian rate of seismicity. We have chosen to employ three algorithms among the different approaches suggested for this goal: Gardner and Knopoff (1974), Gruenthal (1985) and Uhrhammer (1986). The algorithms have identified *5,082*, *3,473* and *8,624* main events with magnitude $M_w \geq 4.0$, respectively.

Determining the magnitude completeness threshold, or M_c "*the minimum magnitude for which 100% of the events in a space-time volume have been detected* (Woessner & Wiemer, 2005)" is another crucial step in the data extraction process for seismic hazard analysis. The estimate of seismic hazard in a particular area could be significantly impacted by systematic errors caused by an insufficient earthquake database when identifying recurrence patterns.

Therefore, the identification of the magnitude of completeness is a clear requirement for the preprocessing of the data to be used for seismic hazard assessment. Although occurrences of magnitude $M_W \geq 3.0$ are included in the present catalog of earthquakes, it cannot be argued that all events with $M_W \geq 3.0$ are included, particularly prior to 1990, when seismological monitoring networks were relatively scarce across all of the region's countries. For the new catalog, Mc=4.0 was found using the ZMAP program (Wiemer, 2001). The methodology suggested by Stepp (1971) was applied to evaluate the temporal fluctuation in the

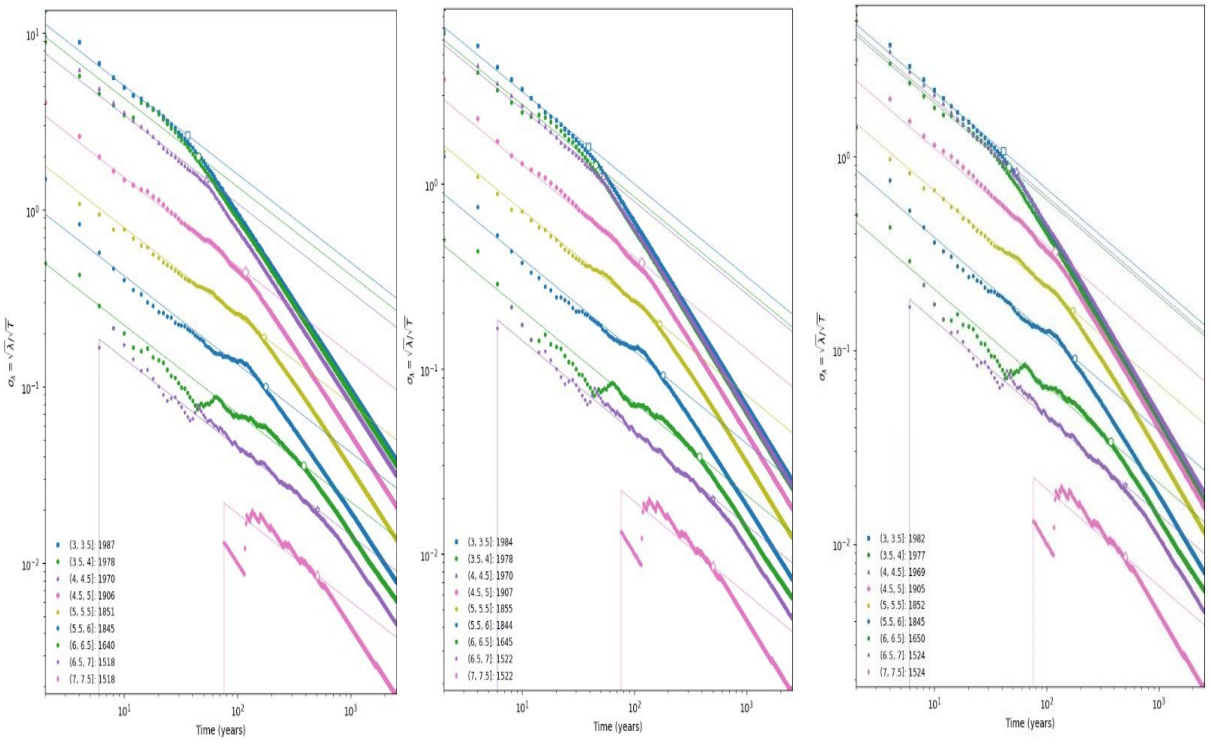


Figure 3. Assessment of completeness with the Stepp (1971) methodology. Declustering algorithms: Uhrhammer 1986 - left, Gruenthal (1985) - center, Gardner & Knopoff (1974) - right.

completeness of the BSHAP catalog. *Table 1* and *Figure 3* show the results that were achieved.

Table 1. Magnitude completeness intervals for the earthquake catalog.

M_w	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0	7.5
Viti	1996	1985	1970	1925	1890	1850	1650	1585	1500	1400

3.2 Seismicity parameters and characterization of seismic sources

Based on a thorough examination of the tectonic environment, known active faults in the region, seismicity rates, measured magnitudes, and focal depths, three seismic source models are distinguished, the so-called SSM1 (*Figure 4a*), ESHM (*Figure 4b*), and ASHM (*Figures 5a-d*). The SHARE and ESHM20 projects, as well as the study of Vamvakaris et al., 2013 are taken into consideration when delineating the areas that cover the bordering region (outside the study region) in all three models.

Different zonations are taken into consideration in order to account for the epistemic uncertainties related to the definition of seismic source zones. The ESHM model is a portion of the seismic source model of the ESHM20 project (Danciu et al., 2021), whereas the SSM1 model is equivalent to the corresponding model of the BSHAP2 project (Mihaljević et al., 2017). In the context of the GEM-IGEO project (KEP2022), a new seismic source model has been defined, the so-called ASHM model. ASHM is an alternative zoning that takes into consideration the Albanian tectonic map (Saccani et al., 2015), active faults in Albania and surroundings, the earthquake distribution, as well as the GNSS velocities.

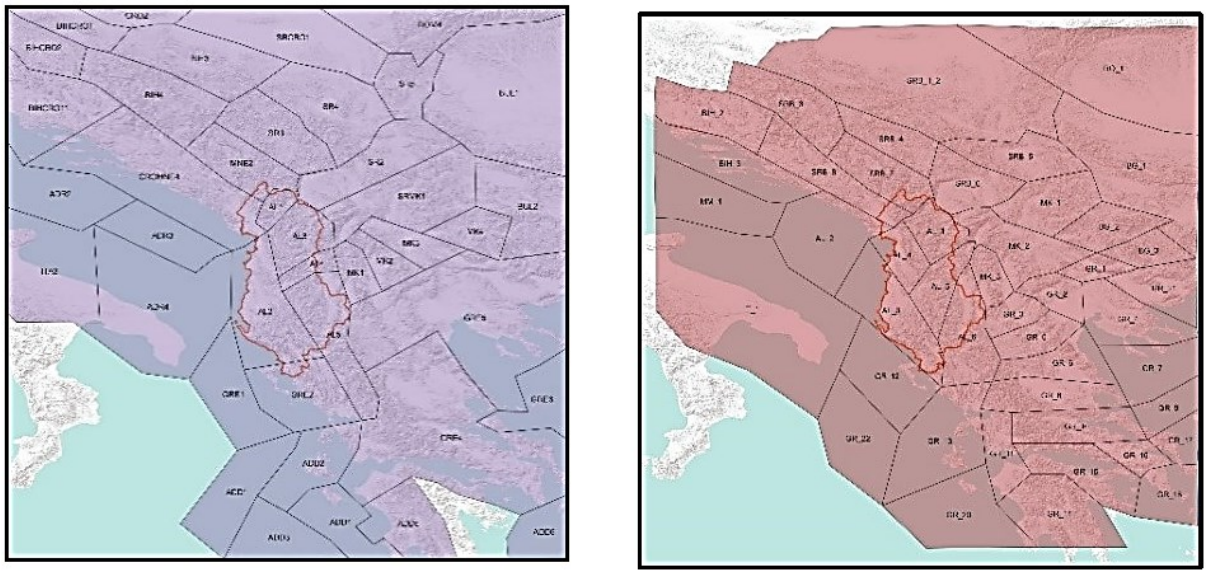
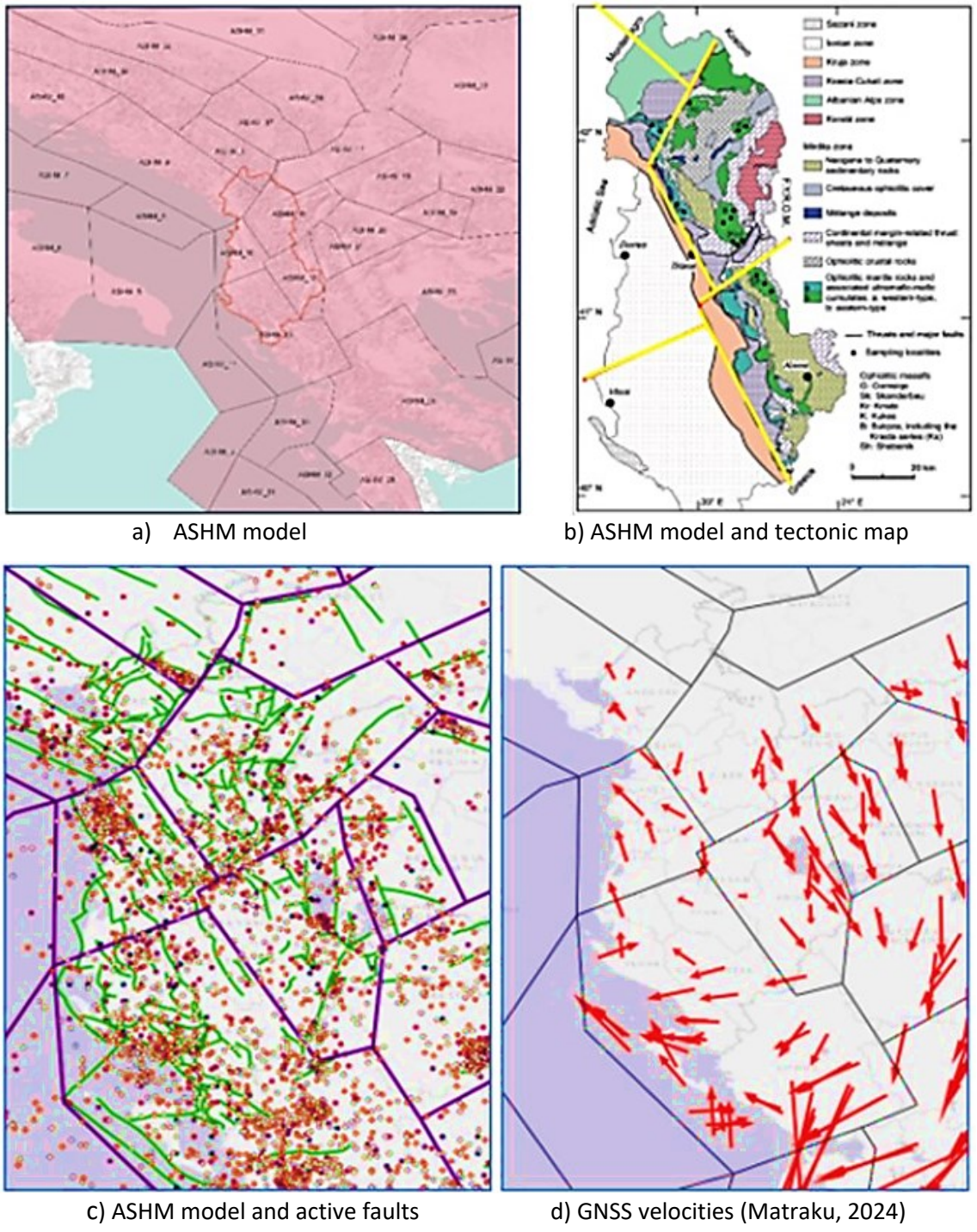


Figure 4. Seismic source models: a) SSM1 (Mihaljević et. al, 2017) - left, and b) ESHM (Danciu et al., 2021) - right, and their position vs. super-zone model (large colored polygons).

The super-zone model has been developed to enable a statistically consistent estimation of the *b* parameter. In addition to providing the information required for both fixed and adaptive spatial smoothing processes of seismicity rates, small zones within super-zones are defined in order to reflect more accurately local tectonic features.



a) ASHM model

b) ASHM model and tectonic map

c) ASHM model and active faults

d) GNSS velocities (Matraku, 2024)

Figure 5. ASHM seismic source model and the relevant information.

Other seismicity parameters (m_{max}, dominant style and fault orientations, distribution of hypocenters) have been estimated for smaller zones, delineated within alternative zoning

models: SSM1, ESHM, and ASHM, respectively. Frequency-magnitude distribution parameters vary across different seismic source areas. For each zone we used the truncated Gutenberg-Richter (GR) distribution, with maximum magnitude obtained from historical and modern seismicity:

$$l_m = l_{m_0} \times \frac{\exp[-b(m - m_0)] - \exp[-b(m_{\max} - m_0)]}{1 - \exp[-b(m_{\max} - m_0)]} \quad (1)$$

where: λ_m: average annual number of earthquakes with M ≥ m,
λ_{m0}: average annual number of earthquakes with M ≥ m_0,
m_0: minimum magnitude of engineering interest (in our case, m_0=4.0),
m_{max}: the maximum magnitude the seismic source can generate.

Estimated *b* values of a super-zone were used for all small zones that lie within that superzone. Estimates of the parameters *a, b*, and λ_m for each seismic zone are derived from the updated catalog analysis, using Weichert (1980), which considers completeness intervals for different magnitudes ranges (*Table 1*). For each area, two alternative estimates for the parameter *b* were used:

(1) estimation derived using the sub-catalog of the corresponding super-zone;

(2) *b=1.0,* which was obtained by applying Weichert's method for the study area (Lon: 15.5°-24.5°, Lat: 36.5°-45.5°), as a whole (*Figure 6*).

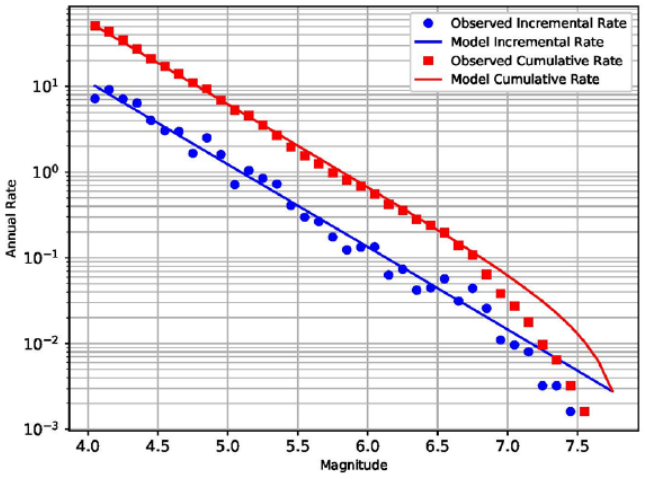


Figure 6. Frequency-magnitude distribution (*b=1.0*) for the study area.

While the superzone model has been developed for statistically consistent estimation of the *b* parameter, other seismicity parameters (m_{max}, dominant style and fault orientations, distribution of hypocentres) have been estimated for smaller zones, delineated within alternative zoning models: SSM1, ESHM and ASHM, respectively. Small areas better represent local tectonic features and provide the data needed for spatial smoothing procedures of seismicity rates, for both fixed and adaptive smoothing.

The magnitude of the maximum possible earthquake, m_{max}, is an important parameter with considerable influence on seismic hazard, at least for large recurrence periods. It is a difficult parameter to estimate, because the physical understanding of m_{max} is poor and the corresponding database is statistically very limited. In the SSM1, ESHM and ASHM models, for each zone, m_{max} is chosen considering the largest observed magnitude within it. Considering the uncertainties associated with this parameter, two alternative estimates for m_{max}, with weights of 0.6 and 0.4 respectively, are included in the corresponding branch of the logic tree,

adding 0.25 and 0.5 magnitude units to the observed maximum magnitude, respectively, in each seismic zone.

On the basis of the above analysis, and the estimates obtained using the maximum likelihood method (Weichert, 1980) that takes into account the periods of completeness of the earthquake catalog for different magnitude intervals (*Table 1*), for the SSM1, ESHM and ASHM models, for each seismic zone within them, Frequency-Magnitude Distribution (MFD) models have been built that characterize the probabilistic distribution of earthquakes in these zones. Figure 7 shows, as an example, the MFD distribution for the source zone AL2 (western area of Albania) of the SSM1 seismic source model.

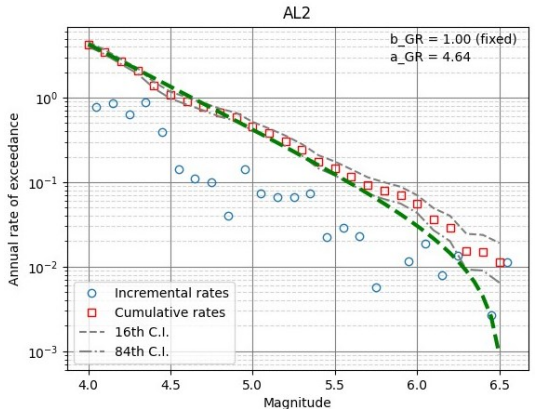


Figure 7. Frequency-magnitude distribution for the zone AL2 (Western Albania).

For the three adopted models of seismic sources in the study region [Lon: 15.5°-24.5°, Lat : 36.5°-45.5°], the epistemic uncertainties associated with the building of seismic source models (model selection, determination of Gutenberg-Richter parameters *a, b* and λ_m, taking into account the uncertainty of the maximum magnitude m_{max}, as well as the choice of the method of spatial smoothing of seismicity rates) are included in the logic tree scheme that was used for the seismic hazard assessment.

3.3 Ground motion prediction equations

Ground Motion Prediction Equations (GMPE) calculate the median and standard deviation of the intensity measure of ground shaking based on factors related to the path (source-site distance, etc.), the seismic source (magnitude, focal mechanism, etc.), and the effects of soil type (average velocity of shear waves in the upper 30 meters, basin depth, etc.). In the last 30 years, a large number of GMPE models have been developed, both global and local, which are used in different tectonic regimes. Local models have been developed using the local strong motion database, so they are expected to better reflect the regional tectonic characteristics. On the other hand, statistical uncertainties in local models can be greater compared to global models, if they are based on limited data sets, less stable.

In the framework of the KEP2022 project, a special study was undertaken (Brooks et al. 2024) to update the accelerometric database for the territory of our country (*Figure 8*) and neighboring regions, as well as to determine the most suitable GMPE models for seismic hazard assessment of Albania. Based on the statistical analysis of the residuals between some of the candidate GMPE models and our strong motion flatfile, the following models were selected as the best fit:

- K20, Kotha et al. (2020)
- L19, Lanzano et al. (2019)

- B20, Boore et al. (2021)
- CY14, Chiou and Youngs (2014)

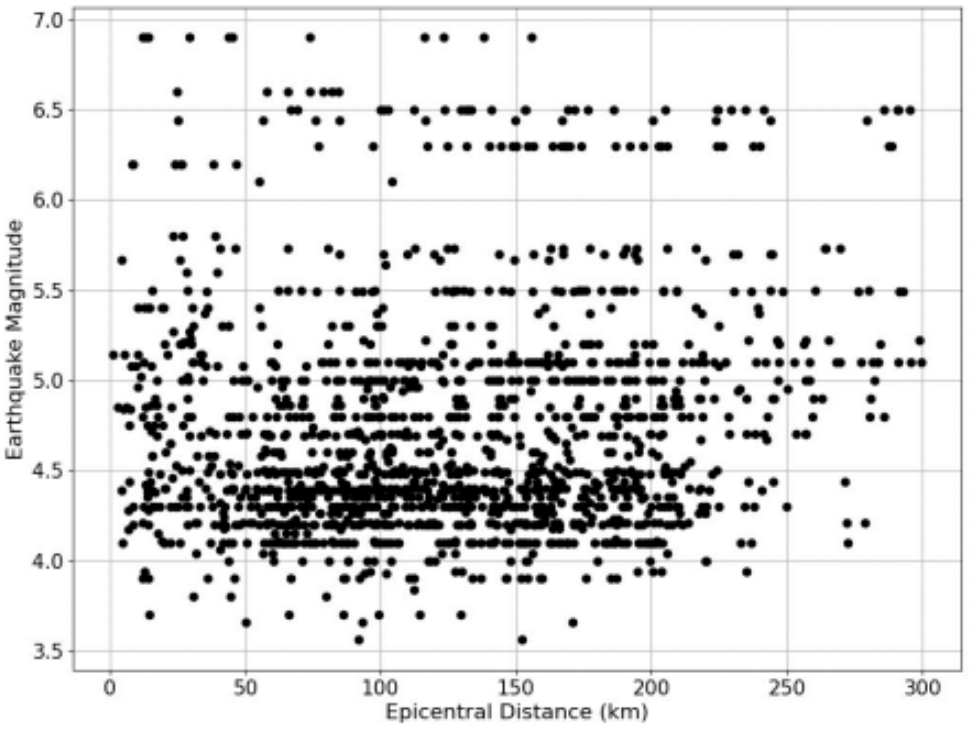


Figure 8. Magnitude-distance distribution of the Albania ground-motion dataset.

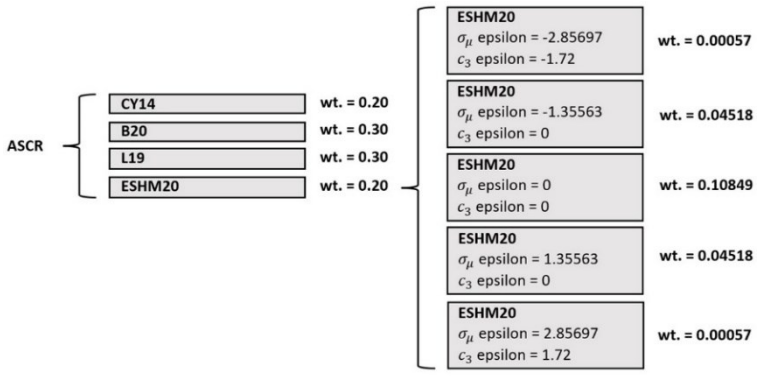


Figure 9. Logic tree for ground motion characterization (Brooks et al. 2024).

Substitution of Kotha et al. (2020) with the ESHM20 backbone model for Active Shallow Crust Regions (ASCR) enables capturing a wide range of epistemic uncertainty for prediction of the median ground shaking Intensity Measure. We selected only 5 central branches of the ESHM20 model, in order to increase the efficiency of the seismic hazard calculations, while sufficiently capturing the corresponding epistemic uncertainty. Figure 9 presents the logic tree scheme of the GMPE models that were used in our project for the assessment of the seismic hazard of Albania, as well as the corresponding weights of the selected models.

4. SEISMIC HAZARD ANALYSIS

4.1 PSHA methodology

Probabilistic Seismic Hazard Assessment (PSHA) consists of determining the relationship between any ground shaking parameter (PGA, PGV, SA, etc.) and the probability of exceeding it over a specified time interval, usually corresponding to the expected life of the structure. Then, the value of the ground shaking parameter to be used for assessing the seismic safety of the structure is chosen after determining an acceptable probability level for the structure and the site under consideration (e.g. 90% probability of not being exceeded in 50 years, which corresponds to a return period of 475 years).

Since there are few data on active faults and corresponding slip rates in the Western Balkans region, it is difficult to establish a reliable model based on the faults. Therefore, for the seismic hazard assessment we decided to use background-gridded seismicity approach, which take into account earthquakes that do not appear on modeled ruptures. The model is developed based on the assumption that future earthquakes will occur near the locations of historical earthquakes.

In general terms, seismicity modeling is based on the method of spatial smoothing of seismicity rates. Historical earthquake rates and a regionally consistent Magnitude-Frequency Distribution (MFD) are used to predict the rate of future earthquakes. The method takes into account the spatial variability of seismicity rates, and is used for regions where tectonic faults are not known or cannot be parameterized. The smoothed seismicity models are defined on a 10 km x 10 km grid in the spatial interval 36.5°-45.5° latitude and 15.5°-24.5° longitude. Seismic sources are modeled as sets of grid points located within the respective seismic source zones. In each cell of the grid, earthquakes with a magnitude greater than m_{min} that pass the completeness test (Table 1) of the regional earthquake catalogue are counted. Then, using the MLE (Weichert, 1980) method, the average annual rate of earthquakes was calculated, using the selected value of the *b* parameter and the number of earthquakes in each grid cell, adjusted according to the levels of magnitude completeness.

To take into account the epistemic uncertainties associated with the spatial smoothing of seismicity rates in the above grid cells, two methods have been used: the fixed kernel (Frankel 1995), and the nearest neighbor adaptive kernel (Helmstetter et al., 2007). Fixed kernel smoothing applies a two-dimensional (2D) isotropic Gaussian operator, while adaptive kernel smoothing applies smoothing distances that are based on the nearest neighbor parameter (Helmstetter 2007).

4.2 Incorporating epistemic uncertainties

In the present study, a logic-tree with 576 branches was designed for the seismic hazard analysis of Albania, combining different models of background-gridded sources and smoothed seismicity. Nodes in this logic-tree include:

1) Three declustering algorithms of the updated earthquake catalog: Gardner & Knopoff 1974, Grünthal 1985, Uhrhammer 1986.
2) Three seismic source models ASHM, ESHM and SSM1 (section 3.2).
3) Two alternative estimates for the *b*-value for each seismic zone in the respective ASHM, ESHM and SSM1 models: a) the estimate obtained using the super-zone sub-catalogs in order to obtain statistically stable estimates for the parameter *b*; b) *b=1.0*, which is obtained using the MLE (Weichert, 1980) method for the entire study area [lon: 15.5°-24.5°, lat: 36.5°-45.5°], as a whole.
4) Two alternative estimates for the maximum magnitude, m_{max} as explained in section 3.2.
5) Two alternative methods for spatial smoothing of seismicity rates: an isotropic Gaussian smoothing with a fixed kernel (Frankel 1995), and an adaptive kernel smoothing according to the nearest neighbours (Helmstetter et al., 2007).
6) Eight GMC models for shallow active crustal regions: Chiou & Youngs 2014, Lanzano et al. 2019, Boore et al. 2020, and five central branches of the ESHM20 model (Figure 9).

5. RESULTS AND DISCUSSIONS

The probabilistic calculations of the seismic hazard for each branch of the logic-tree described above, were performed using the OpenQuake 3.20 software (Pagani et al. 2014). The evaluations were carried out for engineering rock conditions, with an average shear wave velocity in the top 30 m greater or equal to 800 m/sec, which is classified as A category of the soil according to Eurocode 8 (CEN, 2004). The seismic hazard curves for PGA and a range of nineteen spectral accelerations (SA) varying from 0.05 up to 5 sec were calculated, which describe the annual rate of their exceedance for different levels of ground shaking. Evaluations were performed on 1177 grid nodes with a step of 0.1° longitude by 0.1° latitude, which lie within the polygon [lon: 18.4°-21.9°E, lat: 39.0°-43.3°N].

Based on the relevant seismic hazard curves, the new probabilistic seismic hazard maps for Albania have been constructed (*Figures 10* and *11*). For the 95- and 475-year return periods, the results are given in terms of maximum horizontal acceleration (PGA) in engineering rock conditions (V_{S30}≥800 m/sec). This corresponds to exceedance probability of 10% in 10 years and 10% in 50 years, respectively. The 95-year and 475-year return periods are linked to the damage-limitation requirement (PDLR=10%; TDLR=95 years) and the non-collapse requirement (PNCR=10%, TNCR=475-year), respectively, according to the Eurocode 8 standard (CEN, 2004). To make these maps more useful in the field, the seismic hazard has also been evaluated for every municipality and administrative unit in the country in terms of PGA (V_{S30}≥800 m/sec) for the return periods of 95 and 475 years.

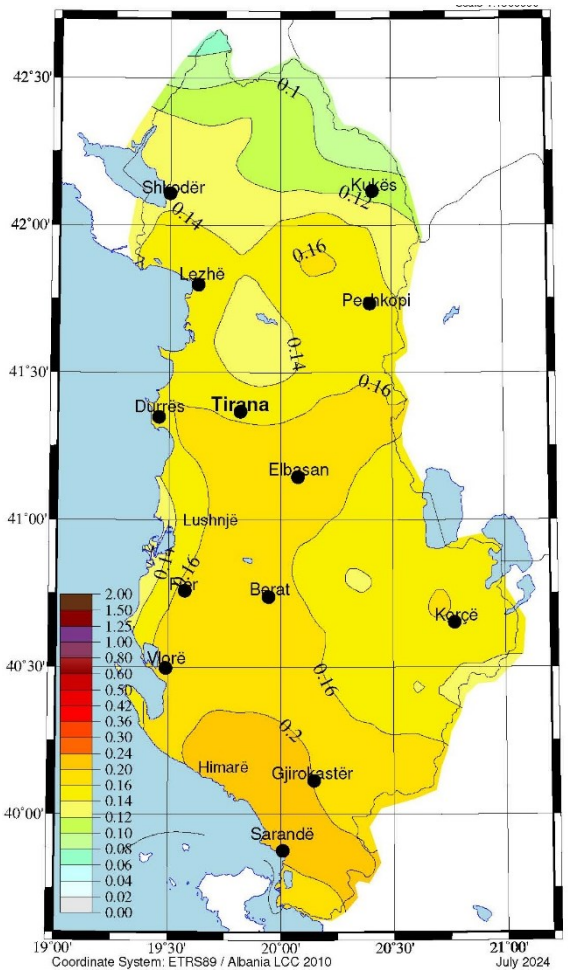


Figure 10. Seismic hazard map of Albania showing Peak Ground Acceleration for 10 % probability of exceedance in 10 years; soil conditions: VS30≥800 m/s.

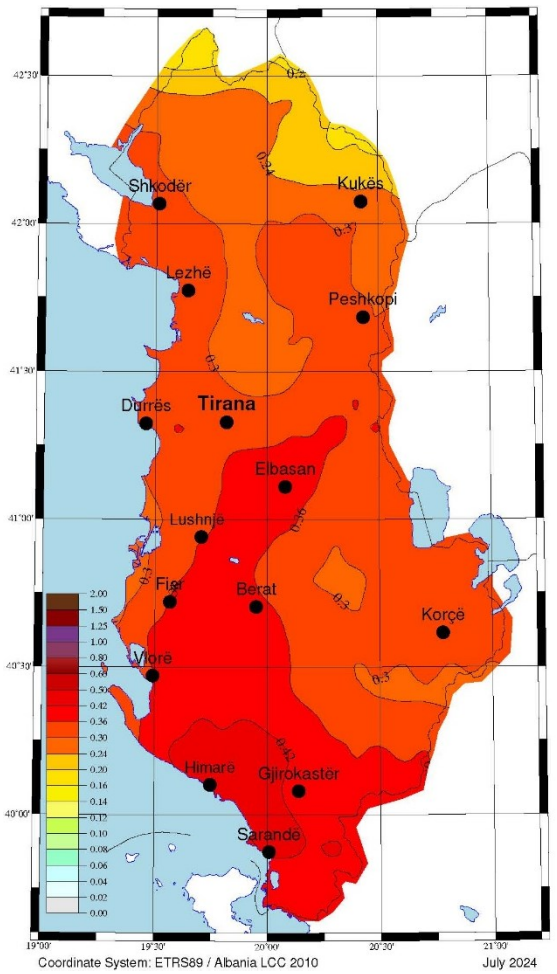


Figure 121. Seismic hazard map of Albania showing Peak Ground Acceleration for 10 % probability of exceedance in 50 years; soil conditions: VS30≥800 m/s.

The results obtained are in full compliance with the Eurocode 8 standard for seismic zoning and seismic design. As can be seen from the *Figures 10* and *11*, most of the territory of our country is characterized by a high seismic hazard, about 0.30g. The northeastern part of the country, northeast of the city of Shkodra towards Kukës, results in a lower seismic risk, 0.20-0.30g. The highest hazard is in the north-western part of the country, around the city of Shkodra, 0.30-0.32g, in the Lushnjë-Elbasan-Librazhd area (0.34-0.36g), in the Peshkopi-Pogradec-Korçë area (0.30-0.32g), and specifically in the southwestern part of Albania (especially in the Himara-Gjirokastra-Saranda region). Here, the PGA value corresponding to the probability of exceeding 10% in 50 years varies in the range of 0.40-0.43g.

This paper focused also on deriving the seismic hazard profiles of three distinct urban centers: Kukës, Berat, and Himarë, which represent varying geological and tectonic environments. Specifically for the zones under consideration the following results are obtained as shown in *Table 2*.

Table 2. Maximum accelerations (g) on Type A ground (agR), for recurrence periods 95 and 475 years.

Municipality	Administrative unit	Probability of exceedance	
		10% in 10 years	10% in 50 years
Berat	Velabisht	0.175	0.363
	Otllak	0.171	0.354
	Sinjë	0.184	0.380
	Roshnik	0.163	0.339
Himarë	Himarë	0.212	0.428
	Lukovë	0.208	0.422
	Horë-Vranisht	0.207	0.419
Kukës	Kukës	0.118	0.249
	Malzi	0.118	0.247
	Bicaj	0.136	0.288
	Ujmisht	0.141	0.289
	Tërthore	0.111	0.242
	Shtiqën	0.125	0.265
	Zapod	0.115	0.247
	Shishtavec	0.119	0.255
	Topojan	0.124	0.259
	Bushtricë	0.140	0.282
	Grykë-Çajë	0.136	0.277
	Kalis	0.146	0.294
	Surroj	0.140	0.288
	Arrën	0.152	0.309
	Kolsh	0.122	0.257

6. CONCLUSIONS AND RECOMMENDATIONS

The seismic zoning map created in 1979 (Sulstarova, et al. 1979) serves as the foundation for our present building code, KTP-N.2-89. This map is outdated, empirical, and lacks a probabilistic background. Instead of ground shaking intensity metrics like PGA, PGV, SA, etc., which are currently employed in modern design codes, this map describes macroseismic intensity (MSK-64 scale). In compliance with Eurocode standard 8, a reliable assessment of seismic hazard is required, as is the creation of new seismic hazard maps that will serve as the foundation for a new anti-seismic design code. The deadly earthquake that struck Durrës on November 26, 2019, with a magnitude of M_W=6.4, has sparked additional measures to enhance the Albanian design code. It is obvious that these technical standards need to be improved with features that align with EU standards, including Eurocode 8.

This paper focused on a new seismic hazard model of Albania, as well as deriving the seismic hazard profiles of three distinct urban centers: Kukës, Berat, and Himarë, which represent varying geological and tectonic environments. By analysing the probabilistic seismic

hazard (PSHA) for these cities, this study generated localized data on Peak Ground Acceleration (PGA) for two return periods, required for modern engineering standards.

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Phenomeno-Parametrism:
Translating Place Experience into Parametric

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Abstract

Parametric practices in contemporary architecture have the capacity to generate form and optimise performance. However, "place" is often treated as a problem that can be translated into measurable variables. As a result, central aspects of lived experience, bodily orientation, rhythms of movement, thresholds, cue density, atmosphere, and memory, tend to remain outside the generative logic, or they return only as stylistic or formal effects. This paper proposes "Phenomeno-Parametrism" as an approach that builds an operational bridge between the phenomenology of place and parametric design. In this framework, a "parameter" is not an isolated number; it is a rule, a relation, and a constraint that can shape patterns of perception and use.

The paper argues that parametrism can function as a methodological interface. It can make readings of place legible, comparable, and open to revision, without claiming to "measure" place as a single objective fact. The guiding question is: "What changes when parametric design is used to encode experience rather than only form and performance?"

The research is developed through a focused case study that examines how readings of "Genius Loci" can be translated into a generative rule set. The process is anchored in Kevin Lynch's framework of urban legibility paths, edges, districts, nodes, and landmarks—as presented in "The Image of the City" book. These elements provide a clear analytic structure and support the extraction of experiential indicators such as visual sequences, threshold intensity. The indicators are then reformulated as a reviewable parametric grammar. The aim is to produce variants that remain coherent with place character, while resisting the reduction of atmosphere to a purely aesthetic signature.

Keywords: *genius loci, phenomenology of place, Kevin Lynch, parametric architecture, generative rules, critical atmosphere.*

1. INTRODUCTION

Contemporary architecture is evolving amid advances in technology, computation, and complexity. Parametric design a process in which parameters (measurable factors) define and drive architectural forms is central to this shift: here, the architect creates not just a final form, but a system of relationships, rules, and dependencies that generate and modify that form. This method grants more control of geometry, better data management, and improved performance in structure, environment, and function (Woodbury, 2010). Yet, as tools expand, a theoretical and practical question arises: what happens to place when design relies more on computable logic?

In many cases, a place in parametric design is treated as a constraint, a physical context, or a set of inputs that influence form. While this approach has value, it is often insufficient. Place is not just topography, climate, solar orientation, airflow, or circulation; it is also how a person orients themselves, senses transitions, remembers urban sequences, experiences boundaries, distinguishes nodes, or identifies with environmental character. When these aspects are excluded from the generative process, architecture may become precise but weak in its relationship to experience. (Heidegger, 1971, pp. 145-149; Norberg-Schulz, 1980, p. 12).

This study explores whether parametric logic in architecture can move beyond a narrow focus on form and performance and engage more directly with the experience of place. The question is relevant to both theory and practice. Although parametric design is highly effective at producing formal variation, it does not always establish a meaningful relationship with its context, suggesting a gap in how knowledge of 'place' is incorporated. By considering perception and the way people inhabit space, this study examines how the epistemological foundations of architectural design specifically, how knowledge of place is generated and validated can support outcomes that are more responsive, grounded, and connected to place.

This study looks at both technical and knowledge-based questions, especially particularly concerning the types of knowledge included or excluded in parametric models. If these models only use measurable and easily coded data, the experience of space can be reduced to numbers. But if the system also includes things like orientation, rhythm, memory, and character, parametricism could become a richer language for design.

1.1 Background and rationale

This paper focuses on two main areas: the phenomenology of architecture and parametric design. From a phenomenological perspective, architecture is not understood simply as an object. Instead, it plays an active role in helping people orient themselves, develop a sense of belonging, and relate to their surroundings. Here, place is a meaningful structure experienced through bodily perception, sensory engagement, and memory (Heidegger, 1971, pp. 145–149; Norberg-Schulz, C. (1980). Genius Loci: Towards a Phenomenology of Architecture. Rizzoli.). Thus, place is more than a geographic location. At the same time, parametric design demonstrates that architecture can be developed by adjusting the relationships between its elements. This makes it a powerful design approach. However, a key issue remains: is it

possible for parametric design to engage not only with functional performance, but also with the lived experience of inhabiting a space?

This study is motivated by a gap in current practice and theory. Many parametric projects respond to climate, structure, or movement flows. Many phenomenological texts explore place, environmental character, and spatial experience. But there is no operative bridge between these two areas. What is missing is a method for showing how phenomenological ideas can be translated into design rules. This translation must occur without reducing phenomenological ideas to decorative or purely formal effects, especially because parametric design thinking is often developed through computationally structured design processes rather than through lived spatial experience (Bhooshan, 2017).

In this study, Genius Loci is a central idea. Here, it is not seen as a romantic or vague notion of authenticity, but as a way to describe the character of a place. This character is made up of spatial, perceptual, and cultural relationships, which together shape how people understand and experience a place. According to reviews of Christian Norberg-Schulz's work, for parametric design to address the idea of place, it needs to turn these relationships into structures that guide design choices. This paper does more than just criticize parametricism. The issue is not the technology itself, but how its parameters are defined. The real problem is that the inputs are too limited. If a model only includes climate, light, access, and geometry, it misses important aspects. But if it also considers perceptual order, sequence, threshold, rhythm, and memory, the model better reflects real experience.

1.1.1 Research question, objectives, and scope

The study is structured around the following question: How can the lived qualities of place be translated into parameters that can be used in architectural design? An additional question addresses: What is lost and what is gained when the phenomenology of place is introduced into parametric logic?

The first objective of the paper is to clarify the meaning of *Genius Loci* and to show why it remains important in the contemporary design debate. The second objective is to construct a methodological structure that links the phenomenological reading of place to a parametric system. The third objective is to propose a translation model. In this model, indicators such as orientation, thresholds, movement rhythm, visual sequences, and memory become generative rules. The fourth objective is to discuss the limits and risks of this approach, especially the risk that the atmosphere of the place may become only aesthetic.

The scope of the study is primarily theoretical and methodological. The paper does not provide a broad empirical study with extensive field measurements, but instead seeks to build a clear conceptual and operative basis for application in specific design cases. For this reason, Kevin Lynch is considered a key figure, as his model offers a conceptual structure that connects perception to spatial organization and facilitates the transition from description to rule (Lynch, 1960).

This study does not claim to turn experience into a closed formula. While the experience of

place is always more intense than any model can capture, experience can still be partially structured. Design works by selecting, relating, and ranking elements (Norberg-Schulz, 1980). Therefore, the real question is not whether experience can be completely modeled, but whether it can influence the generation of form.

2. LITERATURE REVIEW

The debate on place in architecture has been long and multifaceted. In some cases, place is treated as a historical and cultural context. At other times, it is a perceptual structure or a physical background for intervention. Within the phenomenological tradition, place holds a deeper status. It is not just an external frame for a building, but a reality experienced, understood, and inhabited. One of the most important figures here is Christian Norberg-Schulz. For him, architecture helps human beings dwell in the world and shapes a place's character. The concept of Genius Loci describes this character. It relates to identity, orientation, and a sense of belonging. Sometimes the built form does not fully comply with every rule, not because it is wrong, but because it aims to be closer to people or specific groups (Norberg-Schulz, 1980).

Building on these ideas, Martin Heidegger links building with dwelling. He argues that building is not just about making objects, but about creating spaces where people can live (Heidegger, 1971, pp. 145-149). Although Heidegger does not offer a specific design method, his philosophy shows why the experience of place should not be seen as secondary. Juhani Pallasmaa adds to this discussion by challenging the focus on vision in architecture and highlighting the importance of all the senses and the physical qualities of materials (Pallasmaa, 2005). This matters for this study because it shows that people experience place through more than just images—they engage with it through a range of sensory and existential connections.

On the other hand, the literature on parametricism has followed a different path. Instead of beginning with experience, it usually starts with the system or data. Robert Woodbury describes parametric design as a way of creating adaptable models in which a change in one part affects other parts (Woodbury, 2010). This makes parametricism highly suitable for managing complexity. Julio Monedero has emphasized that the term “parametric” often masks the fact that, in essence, what we are dealing with are relationships (Monedero, 2000). This observation is very important because it opens the door to a broader understanding of the parameter. If a parameter is a relationship rather than just a number, it can also include aspects that at first seem difficult to measure.

Patrik Schumacher developed parametricism as a new architectural paradigm. For him, parametricism involves continuous differentiation, variation, and adaptation at many levels (Schumacher, 2009). However, this view has critics. One main critique is that parametricism can focus too much on form. When this happens, it risks turning into a self-contained aesthetic. This critique matters for this paper. The aim is not to add another style but to shift parametricism’s center toward experience and the character of place.

Kevin Lynch offers an important point of connection. In The Image of the City, he describes the city as a legible structure. People construct the image of the city using elements such as paths, edges, districts, nodes, and landmarks (Lynch, 1960). This approach is valuable because it's not just philosophical. It also offers an analytical structure. Lynch's elements are not just theoretical. They can be used to analyze how spatial experience and orientation are organized.

Existing phenomenological approaches provide a strong conceptual basis for understanding place, but they rarely develop operative methods for translating lived experience into design rules (Alexander et al., 1977). Heidegger's discussion of dwelling establishes the existential importance of building, yet it does not offer a design procedure for parametric modelling (Heidegger, 1971). Norberg-Schulz explains place through orientation, identity, and Genius Loci, but his work remains primarily interpretive rather than computational (Norberg-Schulz, 1980). Pallasmaa expands the discussion by emphasizing embodied and multisensory experience, although his contribution is also directed toward perception and architectural meaning rather than rule-based design systems (Pallasmaa, 2005). In contrast, parametric design literature, including Woodbury, Monedero, Schumacher, and Bhooshan, explains relational modelling, variation, and computational design processes, but does not fully address how phenomenological qualities of place can become structured design inputs (Woodbury & Burrow, 2011). The gap, therefore, is not the absence of theory, but the lack of a clear methodological bridge between phenomenological interpretation and parametric operation (Hazbei & Cucuzzella, 2023). This study addresses this gap by advancing two main propositions: first, that the experience of place cannot be reduced to a single measurable factor; and second, that parametric design can facilitate the management of complex relationships. Rather than treating these ideas as separate, this paper integrates them to pose a central question: how can a design method be developed that both respects place and addresses the challenges of contemporary complexity?

One major gap in current research is the lack of a clear link between these two approaches. Some works focus on atmosphere, the feeling of place, and lived experience. Others look at algorithms, scripts, and parametric systems. What is missing is a common language to connect these views. This paper suggests that a parametric grammar of place could create this link by turning phenomenological ideas into practical design relationships.

At this stage, the study establishes its position. It does not propose a return backward, away from technology, nor does it advocate an undefined romanticization of place. On the contrary, it proposes expanding the scope of design rationality. Instead of limiting rationality to efficiency, it extends it toward experiential coherence as well. This move is important because it gives parametricism a broader, more responsible foundation.

3. METHODOLOGY

This paper follows a theoretical-analytical methodology with an interpretive and propositional character. It is not a laboratory experiment or a classical statistical analysis. The chosen

approach seeks to build a working model that can serve as a basis for further empirical developments. Accordingly, the methodology is not neutral. It is based on one conviction: place cannot be understood only as a group of physical data, but neither can it remain only at a poetic or descriptive level. Therefore, an intermediate method is necessary.

In this study, Figure 1 presents a workflow that establishes a conceptual and procedural framework for the research process, rather than functioning as a formal linear programming model. The diagram does not specify numerical decision variables, objective functions, or strict mathematical constraints; instead, it clarifies the transition from phenomenological reading to potential design indicators. At this stage, optimization terminology is intentionally excluded, and the method is introduced as a preliminary framework to inform future computational development.

This framework serves two main functions. First, it makes the overall process easier to follow by giving it a clearer internal structure. Second, it creates a common language that connects theoretical interpretation with the possibility of future computational or algorithmic development. In this way, the methodology goes beyond simple description and takes the form of an ordered sequence of decisions.

3.1 Description of research design and approach

The research design is mainly qualitative. It is based on theoretical analysis, conceptual comparison, and methodological formulation. This approach is appropriate for the study's object because the problem is twofold: one part concerns concepts, while the other concerns design operations. A quantitative method would be insufficient at this stage because it would require ready-made, standardized indicators. These indicators are still being constructed.

The paper's approach is also interdisciplinary. It draws elements from architectural theory, phenomenology, urban analysis, and the logics of parametric modeling. Place is not only a matter of form, nor only a matter of perception. It is precisely the point where form, experience, and cultural relationship meet.

The methodological process is structured as follows.

Step 1 – Define the conceptual framework

At this stage, the study's central framework is constructed. Here, the main concepts, the boundaries of the field of work, the category of place to be read, and the initial repertoire of phenomenological indicators are defined. In architectural terms, this is the stage in which the basic structure of the interpretive model is established.

Step 2 – Produce the first interpretive reading.

Here, a first reading of the system is carried out. Rather than understanding “LP” solely in a strictly mathematical sense, this paper reads it as the central platform on which the study's main relationships are organized. This stage produces the first version of the analytical structure and shows whether the initial model is sufficient to read the place.

Step 3 – Identify missing experiential conditions

At this stage, the gaps in the initial model are identified. These are not necessarily numerical violations. In the context of this study, they are elements of experience that are not adequately represented in the system. For example: unarticulated thresholds (transitions between spaces that are unclear or undefined), unread rhythms (difficult to perceive spatial or experiential patterns), areas with unclear identity (spaces lacking distinctive qualities), omitted sequences (missing experiential steps or progressions), or memory points (locations of significance) that the model fails to capture.

Step 4 – Add design conditions to the framework

If important elements of place emerge during the reading and are missing from the model, they are added as constraints, rules, or new conditions to the central model. In a future computational implementation, these would function as constraints, weights, thresholds, visibility rules, adjacency rules, or movement filters.

Step 5 – Develop generative design rules

After adding the new conditions, clearer generative relationships are produced. These may be translated into intervals, priorities, hierarchical logics, densities, porosities, exposure coefficients, or transformation sequences. This is the point at which experience begins to take shape as a parametric grammar.

Step 6 – Test specific experiential categories

At this stage, subproblems are tested. For example, only the threshold question may be tested, only the rhythm of movement, only the orientation network, or only the relationship between landmarks and nodes. This division helps the analysis avoid becoming too general and makes the process more controllable.

Step 7 – Evaluate spatial coherence.

Here, it is evaluated whether the resulting configuration preserves the character of the place and whether it is workable as a design logic. In this study, “optimal” is not understood as an absolute solution. Rather, it is understood as an acceptable level of coherence between the parametric structure and the experience of place.

Step 8 – Revise and recalibrate the framework

If the outcome fails to convincingly represent the character of the place, an improvement strategy is implemented. This may entail recalibrating the indicators, adjusting parameter ranges, modifying parameter hierarchies, or introducing additional analytical layers.

Step 9 – Establish criteria for methodological completion.

The process stops when the model reaches a sufficient level of clarity, coherence, and design usability. Therefore, the stopping criterion is not only technical. It is also critical: the model must be clear, usable, and connected to the real experience of place.

Expressing the methodology in workflow language is essential for consistency with the pseudocode figure and greater procedural precision. It underscores that the study extends beyond theoretical reflection and aspires to establish an operational procedure.

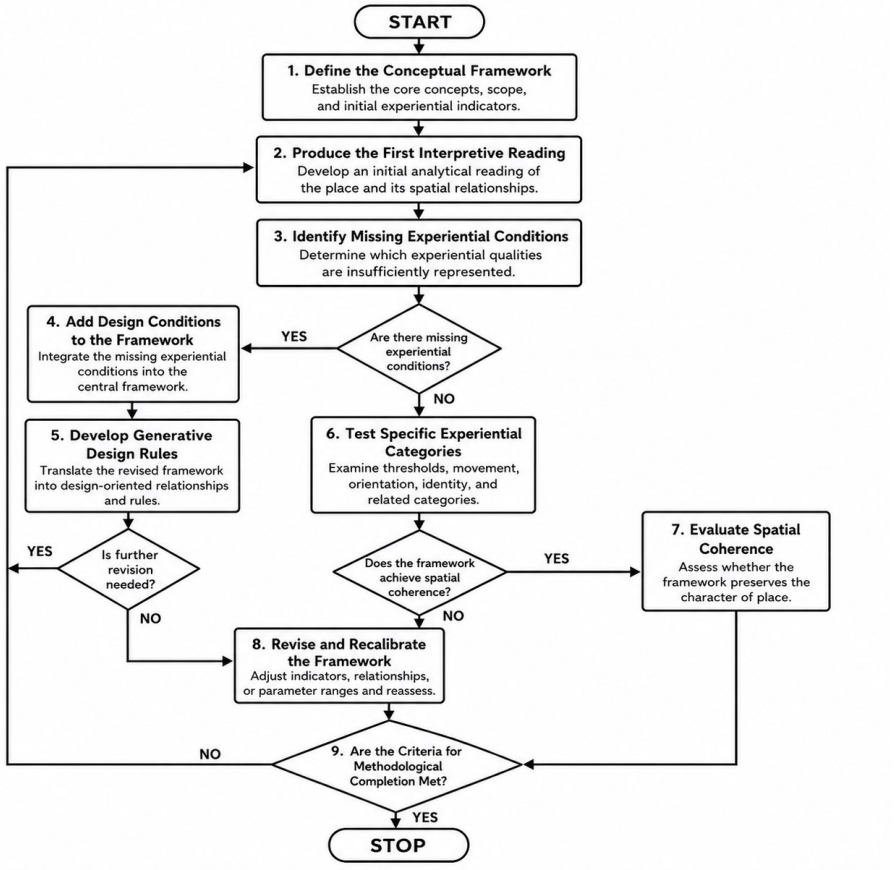


Figure 1. Pseudocode-based workflow structure.

3.2 Data collection and analysis methods

Although the study does not use a classical numerical database, it works with a set of analytical materials. These include theoretical categories, phenomenological descriptions, interpretive models, and analytical structures, such as Kevin Lynch's. The method of analysis is twofold. First, conceptual reduction is carried out, that is, the division of the experience of place into more understandable indicators. Second, parametric synthesis is performed, that is, the conversion of these indicators into design relationships.

For instance, the way individuals find meaning when moving between public and private spaces can be described using indicators such as spatial filtering, threshold frequency, material density variation, and changes in visual access. These qualities are then translated into model parameters or constraints. The goal is to organize these experiential qualities clearly while maintaining their complexity.

From a technical perspective, observations regarding spatial experience can be articulated through practical design terminology. Examples include the visibility gradient, which quantifies the extent of visibility along a path; threshold intensity, which measures the perceptual

strength of boundaries; path curvature ratio, indicating the degree of path bending; node density, representing the frequency of key intersections; landmark exposure coefficient, reflecting the frequency of landmark visibility; material transition rate, tracking changes in material composition; porosity index, assessing the openness or enclosure of a space; movement deceleration zones, identifying areas where individuals naturally slow down; and sequential compression or expansion values, which indicate spatial narrowing or widening along a route.

Each of these terms describes a different aspect of how people experience space, such as what they see, how they move, transitions, or how they find their way. The purpose of using this vocabulary is not to turn places into mechanical systems, but to give structure to qualities that are usually hard to include in design. Phenomeno-Parametrism is meant to connect real experience with practical design, not to replace one with the other.

3.3 Ethical considerations

Ethically, this study does not involve human participants, interviews, or the collection of personal data. Nevertheless, an ethical consideration arises regarding the interpretive method. When a designer articulates the essence of a place, there is a risk that individual interpretations may supplant collective experiences. Consequently, translation of Genius Loci into parameters must be approached with caution. Models derived must be recognized as open to revision, rather than representing absolute truths.

For this reason, in future stages, such a method should be complemented with field verification. Mental maps, observed walks, user evaluations, and perceptual analyses would help determine whether the parametric model is truly translating the character of place or only the author's interpretation. This is important for another reason as well: a parametric model that claims to represent a place without being tested with users can quickly become an appealing instrument, but one detached from reality.

4. RESULTS AND DISCUSSIONS

Still, there is an ethical issue in the interpretive method. When a designer tries to capture the essence of a place, personal views can sometimes take the place of shared experiences. For this reason, translating Genius Loci into parameters should be done carefully. Models created this way should stay open to change, rather than being treated as final truths.

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4.1 Objective presentation of findings

Below is a summary structure of the translation from phenomenological reading to parametric rules:

This table shows that the elements of the experience of place can be organized in an operative way. We are not dealing with a brutal reduction of experience, but with an attempt to articulate it in a design-oriented manner. This represents a significant shift. Many approaches speak about place in general terms, but they do not show how place actually enters the design process. Here, by contrast, place becomes part of the generative mechanism.

Additionally, the table illustrates that a parametric system need not originate with form; it can instead begin with the organization of experience. This represents a significant shift in perspective. Rather than using form as the starting point and subsequently justifying it with reference to place, this approach positions place as the foundation, allowing form to emerge from a deeper set of relationships.

Table1. Translation Syntax Table.

Analytical category	***Phenomenological reading***	***Preliminary operational indicators***	***Design effect***
Paths	rhythm, sequence, orientation	path curvature ratio; directional-change frequency; visibility corridor index; stop-point frequency	clearer movement structure
Edges	separation, transition, threshold	boundary permeability ratio; threshold depth; transition gradient; enclosure variation	more articulated transitions
Districts	identity, coherence, character	material continuity ratio; density range; programmatic clustering; repetition index	stronger spatial identity
Nodes	intensity, concentration, encounter	connectivity degree; dwell-time potential; spatial expansion ratio; convergence frequency	clearer gathering and orientation points
Landmarks	memory, recognition, reference	visibility frequency; contrast ratio; visual dominance score; reference-point distance	stronger recognition and spatial memory

4.2 Highlight significant patterns or data points

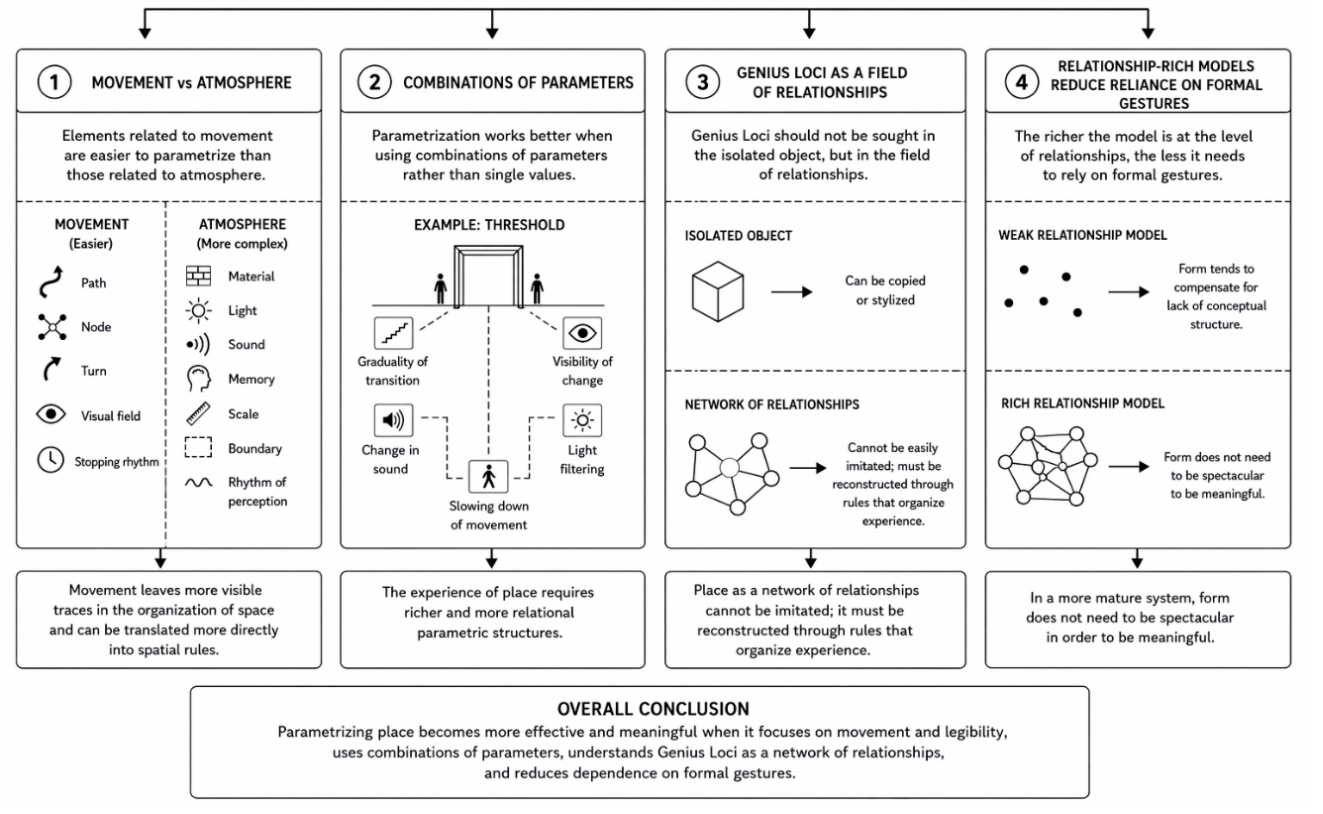


Figure 2. Conceptual relational model of movement and environmental components

The figure should be read as a conceptual relational diagram rather than as a formal optimization model. Its purpose is to show how different experiential categories interact, not to define a linear or non-linear programming problem.

One clear pattern from the analysis is that it is easier to parametrize elements related to movement than those connected to environmental character. Movement leaves visible traces in the organization of space. Features such as paths, nodes, turns, visual fields, and the rhythm of stopping can be more directly translated into spatial rules. On the other hand, atmosphere is harder to define. It depends on material, light, sound, memory, scale, boundaries, and how we experience these elements over time.

A second pattern is that the parametrization of place works better when it uses combinations of parameters rather than single values. For example, a threshold is not defined only by width or by material. It is defined by a combination of factors: how gradual the transition is, how visible the change is, how sound changes, how light is filtered, and how movement slows down. This means that the experience of place requires richer and more relational parametric structures.

A third pattern is that Genius Loci should not be sought in the isolated object, but in the field of relationships. This is a critical point. When a place is reduced to an image, it can be copied or stylized. When a place is understood as a network of relationships, it cannot be easily imitated. It must be reconstructed through rules that organize experience.

From this, a more general observation also emerges: the richer the model is at the level of relationships, the less it needs to rely on formal gestures. This is significant because part of the problem with parametricism appears precisely when form tries to compensate for the lack of conceptual structure. In a more mature system, form does not need to become spectacular in order to be meaningful.

4.3 Interpretation of results

The findings indicate a clear conclusion. Parametricism may be an effective tool for investigating the phenomenology of place. This is possible if the parameter definitions are reconsidered. When parameters are just technical inputs, experiential aspects stay disconnected. If parameters are instead seen as relationships, constraints, and organizing structures, experiential qualities can be integrated into the generative process.

This interpretation also has an additional implication. It shows that phenomenology should not remain only an interpretive discourse. It can also produce methodological effects. This is significant for architecture because theory and practice often remain separated. Not every element of experience can enter the model without losing something. This means that Phenomeno-Parametrism should not be seen as a total solution, but as a meaningful improvement in the way a project relates to place. Its value lies not in closing the problem, but in opening a more responsible way of working.

4.4 Comparison with previous studies

Compared with classical phenomenological approaches, this paper takes a further step toward operationalization. The texts of Norberg-Schulz, Pallasmaa, and Heidegger are fundamental for understanding the importance of place and experience, but they do not directly provide a usable system for modeling. On the other hand, compared with parametric approaches focused on performance or formal differentiation, this paper shifts the field of attention. The center is no longer only form, but the way form and spatial organization construct experience.

Compared with Lynch's model, this paper uses his categories not only for analysis but also for generation. This is a fundamental distinction. Lynch teaches us how to read the city. Here, it is proposed that this legibility should also serve as the basis for creating design rules.

In this sense, the paper's main contribution is to bridge phenomenology, urban analysis, and parametric logic—three rarely connected fields—demonstrating how their integration can advance both analysis and generation in urban and architectural design.

4.5 Implications for theory, practice, or policy

From a theoretical perspective, this paper argues that parametricism can be understood as an epistemology rather than merely a technique. It can become a way of knowing, organizing, and articulating place. From a practical point of view, this approach may help in projects where a more careful relationship with context is required. This applies to interventions in historic areas, in landscapes with strong identity, in urban regeneration, and in projects where orientation and character are highly important.

From a design policy perspective, this approach may also shape how place analysis is understood. Analysis would no longer be merely a preliminary phase that ends before design begins. It would become an active part of the generative mechanism. This would imply a more integrated way of working, in which reading place and producing form are not two separate moments.

5. CONCLUSIONS AND RECOMMENDATIONS

This paper explores how parametric architecture can engage with the phenomenology of place by linking the experiential aspects of phenomenology—such as experience, orientation, memory, and environmental character—with the organizational capacity of parametric design. Phenomenology offers insights into how places are experienced and understood, while parametric design provides methods for structuring and testing spatial relationships. The main challenge addressed is how to connect phenomenological insights with parametric processes so that each informs and strengthens the other.

The main conclusion of the paper is that this connection is possible through a broader understanding of the parameter. The parameter should not be limited to a number. It can also be a rule, a relation, a constraint, an interval, or a hierarchy. When understood in this way, it can also absorb aspects of the experience of place. This allows parametric design to move from the production of form toward the articulation of character.

An important contribution of this paper is the formulation of a parametric grammar of place—a set of organizing principles that relate experience to design. This grammar does not enclose a place within a fixed formula; instead, it creates an open system in which elements of experience can be organized and tested. In this way, Genius Loci—the spirit or unique character of a place—is not treated as decoration or as a critical slogan, but as an operative structure that can directly influence design.

This study identifies several limitations. First, it is mostly theoretical and methodological, with little testing in real-world situations. Second, turning experience into parameters is never complete, because some parts of a place cannot be fully captured. Third, there is a risk that a designer's personal view might be seen as the only correct one. This highlights the importance of use this method carefully and stay open to more testing.

A structured development timeline guides the process. The initial stage defines conceptual indicators and categorizes them into two primary domains: Movement and Environmental Components. The subsequent stage evaluates these indicators using field observation, pedestrian movement mapping, visibility analysis, material transition mapping, light and sound documentation, and user-based perceptual feedback. In the third stage, data are normalized to comparable scales, such as 0 to 1, to facilitate objective comparison of movement rhythm, threshold intensity, visibility frequency, and environmental variation. The fourth stage tests the indicators within a parametric design environment and refines them based on user experience comparisons. This sequential approach enables the conceptual

framework to evolve into a precise numerical model and avoids premature classification as a formal optimization problem.

The paper recommends that place analysis should not be just an add-on to architectural projects. Instead, it should be central to the design process. This shift enables parametricism to go deeper, helping manage complexity and encouraging greater sensitivity to place.

The value of Phenomeno-Parametrism is not in creating a new style, but in changing the main questions designers ask. Instead of only asking what forms can be made, it encourages a closer look at the experiences being shaped. This shift indicates a more responsible way of practicing architecture today.

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SESSION IV

Cultural Heritage

Architectural and urban heritage: Historic buildings / Sacred architecture / Historic urban environments / Cultural identity.

Conservation and preservation: Heritage conservation strategies / Conservation ethics / Preservation of historic structures / Protection of architectural values.

Adaptive reuse and transformation: Adaptive reuse / Contemporary interventions in heritage / Functional transformation / Urban regeneration.

Heritage resilience and structural safety: Seismic strengthening / Structural assessment of historic buildings / Risk mitigation / Integration of conservation and structural performance.

Heritage and urban change: Urban renewal / Heritage loss and demolition / Social implications of transformation / Balance between preservation and development.

Preserving and Adapting Sacred Architecture:
A Case Study of the Jazak Monastery

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Abstract

This paper examines the preservation and transformation of Orthodox sacred architecture in the multicultural border region of Srem through the case study of the Jazak Monastery on Fruška Gora. Particular attention is given to the Old and the New Church, two buildings that fulfilled the same liturgical function while developing under different historical and political circumstances. For a certain period, both churches coexisted, reflecting distinct social, cultural, and architectural conditions. The research applies a case study approach supported by comparative and morphological analysis, operationalized through defined parameters: spatial organization, structural system, material use, stylistic articulation, and functional continuity. The findings indicate that the Old Church preserved a modest Serbian-Byzantine architectural expression, characterized by reduced scale and simplified structural form, while the New Church incorporated Baroque elements and reflected greater institutional and material capacity under later political conditions. The study demonstrates that continuity in sacred architecture is often achieved not through static preservation, but through adaptation, reinterpretation, and selective integration of new influences. These results contribute to broader discussions on conservation strategies for religious heritage in culturally layered regions.

Keywords: *comparative analysis, heritage, sacred architecture, architectural transformation, churches*

1. INTRODUCTION

This paper focuses on the Jazak Monastery, one of the most important religious complexes on Fruška Gora (Medaković, 1990), with special attention to the Old and the New Church. These two buildings show how architecture in Srem changed over time under different social and cultural conditions. Srem has long been a region shaped by ethnic and religious diversity. This can be clearly seen in the way religious buildings were designed, used, and transformed. The Old and the New Church followed different paths of development, influenced by the context in which they existed. At the same time, they show how architecture can preserve Orthodox identity, but also reflect wider cultural interactions. Although both churches had the same religious purpose, they adapted differently to historical circumstances, community needs, and local conditions. The analysis looks at architectural, iconographic, and decorative elements, with particular focus on the iconostasis and frescoes. In this way, it becomes possible to see how traditional Serbian styles, such as the Morava and Raška schools, were either preserved or changed under the influence of Western European elements, especially Baroque. The development of the Jazak Monastery reflects the complex history of Srem, where Serbian Orthodox tradition intersected with Ottoman, Austro-Hungarian, and later Yugoslav influences. Through this layered context, the paper points to processes of preservation, adaptation, and transformation in Orthodox sacred architecture.

2. LITERATURE REVIEW

Previous research has looked at Orthodox monasteries and churches in Srem from different perspectives, including architectural, historical, and social aspects. Utvić (1990) focuses mainly on the Old Jazak Monastery, while the New Church is mentioned only briefly. This shows that there is still a need for a more complete analysis that includes both buildings. Medaković (1990) places emphasis on the stylistic and aesthetic qualities of monastic complexes. However, his approach is mostly descriptive and focused on visual and structural features. Davidov (1990) documents the destruction of Serbian cultural heritage during the Second World War but does not connect material losses with stylistic transformations, whereas Fajfrić (1997) emphasizes restoration interventions within the context of social change. An analysis of the existing studies shows that there is no integrated approach connecting architectural, decorative, and stylistic aspects. Many interpretations also overlook how the presence of different ethnic and religious communities shapes both the function and the appearance of churches. By using archival documents, cadastral records, and analyses of plans and photographs, it is possible to follow these changes more clearly and relate them to the multicultural context of Srem. This research is based on a comparative approach. It combines architectural analysis, archival research, and historical context in order to better understand how Orthodox churches in Srem have changed over time.

3. METHODOLOGY

This research adopts an interdisciplinary methodological framework that integrates architectural analysis, historical interpretation, and cultural studies in order to examine the transformation of Orthodox sacred architecture within the multicultural context of Srem. The primary research strategy is a qualitative case study focused on the Jazak Monastery, with particular emphasis on the comparative analysis of the Old and the New Church.

The comparative method is operationalized through a set of clearly defined analytical parameters, including: spatial organization (plan typology and volumetric composition), structural system (load-bearing principles and construction techniques), materiality (use of stone, brick, wood, and surface treatment), stylistic articulation (Byzantine, Morava, Raška, and Baroque elements), and functional continuity (liturgical use and adaptation over time).

Morphological analysis is applied to examine the formal and spatial evolution of the two churches, with attention to changes in architectural language and compositional hierarchy. This approach allows for the identification of both continuity and transformation within the built form.

Archival research, historical documentation, and visual analysis of plans, drawings, and photographic material complement the architectural reading, enabling a contextual understanding of socio-political and cultural influences on construction, modification, and preservation processes.

By combining these methods, the study moves beyond descriptive historical narration and establishes a structured analytical framework for interpreting sacred architecture as a dynamic system shaped by continuous interaction between material form, cultural identity, and historical change. These parameters are consistently applied in the Results and Discussion section to enable a structured comparison between the two churches.

This study contributes to the field by demonstrating how architectural analysis based on defined parameters can clarify the relationship between cultural context and material transformation in sacred heritage.

4. RESULTS AND DISCUSSIONS

This section presents the results according to the previously defined analytical parameters: spatial organization, structural system, material use, stylistic articulation, and functional continuity.

4.1 Geographical position and historical background

4.1.1 Geographical and historical background

Srem is located in the northern part of Serbia, within the province of Vojvodina, bounded by the Danube River to the north and the Sava River to the south, forming a borderland region

that historically connected Eastern and Western cultural influences (Đerčan, Bjelajac, Bubalo-Živković, Lukić, Gatarić, & Pogrmić, 2024) as presented in Figure 1. The geographical position of Srem directly influenced the formation, function, and transformation of sacral architecture, as the region historically operated as a frontier zone where political, religious, and cultural systems intersected. The Hungarian authorities strengthened control over their southern borders by settling Serbs in the area and granting privileges to Serbian nobility and despots, with Despot Đurađ Branković playing an important role in organizing the local community and preserving Orthodox identity (Davidov, 1990). The establishment of such a spiritual complex reflects efforts to preserve cultural identity. These efforts also influenced decisions related to location, structural design, and functional organization. After the Ottoman attacks on Hungary and the destruction of several fortifications in Srem, significant privileges and estates were granted to the Serbian population in the region (Davidov, 1990). This shift improved the economic position of the Serbian nobility and enabled the construction of monasteries as a way to preserve faith and tradition along the border with the Ottoman Empire. At the same time, it highlights the contrast between a wartime environment and the development of spiritual institutions. The period between 1526 and 1699, when Srem was under Ottoman rule, is recorded in Ottoman defters as a time marked by complex processes of multicultural coexistence (Utvić, 1990).

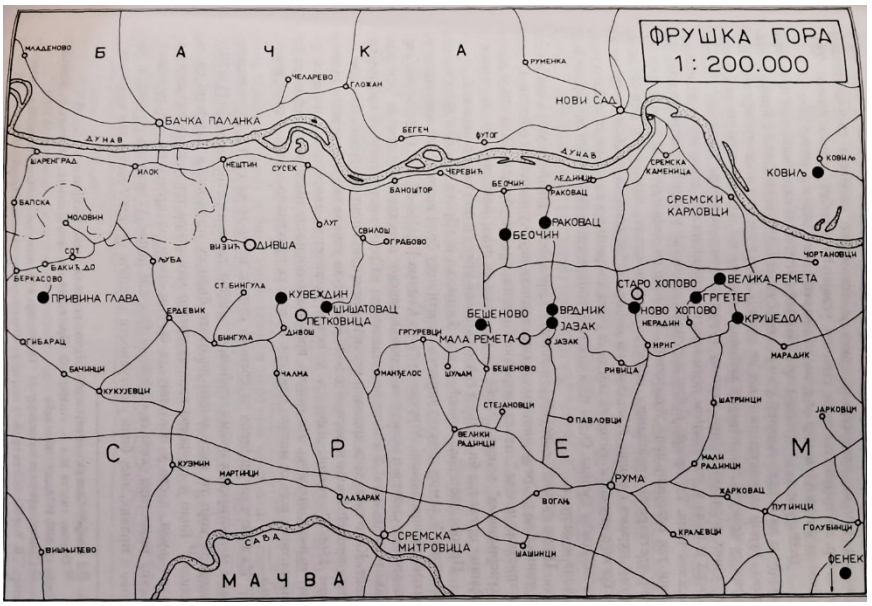


Figure 1. Map of Srem with marked monastery churches
Source: Fajfrić, 1997, p. 41.

4.1.2 Architectural Characteristics of the Surrounding Context

The analysis of late medieval structures in the Fruška Gora region shows that, at the time the monastery was founded, its architecture was strongly influenced by the Morava School (Kovačević & Kovačević, 2003). This indicates a continuous process of adaptation in which Byzantine architectural models were locally reinterpreted through regional building traditions.

Morava architecture is based on a simplified cross-in-square plan, but its facades are enriched with stone and ceramic decoration, which gives it a distinctive character typical of late medieval Serbia (Maltseva, 2022). This combination of structural simplicity and decorative complexity reflects a dual architectural logic, where construction pragmatics coexist with symbolic representation.

These features show how local builders expressed cultural identity and religious ideas through architectural details. By the mid-eighteenth century, Serbian artists were producing works that connected Serbian art with broader European currents (Lesek, 2001). In architecture, this is visible in the combination of Serbian-Byzantine elements and Western European styles, forming a layered and complex visual language shaped by historical and cultural interaction. The development of Serbian Orthodox church architecture from the 12th to the 18th century shows continuity of traditional styles, such as the Raška and Morava schools, while also adapting to changing cultural and political conditions (Paroškin, 2015). Orthodox church architecture brings together spiritual, functional, and artistic aspects, linking religious meaning with structural design (Ristić, 2017). In this context, the monastery can be seen as a physical reflection of how geographical and historical changes shaped Orthodox sacred spaces.

4.2 Demographic changes and the ethnic structure of Srem

Prior to the arrival of the Branković dynasty, most of the population was Hungarian; however, at the beginning of the fifteenth century a demographic shift occurred, resulting in the Orthodox population becoming predominant (Fajfrić, 1997). The coexistence of shifting ethnic demographics and stable political control created a complex environment in which religious architecture functioned as a marker of identity and continuity. At the same time, institutions such as the Jazak Monastery had to function within this multicultural and politically layered environment. Migration processes triggered by Ottoman expansion (Utvić, 1990). contributed to the reconfiguration of religious institutions, including the adaptation of monastic architecture to new socio-political conditions. Srem became a region of strategic importance with a complex demographic structure, where different ethnic and religious communities lived together under uncertain political conditions. In this context, architectural decisions related to the Jazak Monastery can be seen as responses to the need to preserve identity. They also show how demographic and religious factors shaped the organization and function of sacral spaces.

4.3 The Old Church of Jazak Monastery

4.3.1 Foundation and Motives for Construction

The first known mention of Jazak Monastery appears in 1522 in a manuscript transcribed by the monk Lavrentije (Milanović Jović & Momirović, 1990), establishing the temporal framework of its origin in the sixteenth century. The size of the tax (harach) paid by the monastery indicates the existence of substantial estates and considerable economic capacity (Fajfrić, 1997). Its economic strength, once recognized by the Hungarian authorities, was later

reduced under Ottoman pressure, while the monastery retained an important role in preserving faith and tradition between two opposing powers during wartime. According to tradition, the monastery was founded by Despot Jovan Branković and dedicated to the Presentation of the Most Holy Theotokos (Utvić, 1990). In the absence of direct historical sources, such traditions remain important because they provide a time framework that can be linked to the architectural features of the period.

4.3.2 Architectural and Stylistic Features

The reconstruction drawings allow for a formal architectural reading of the Old Church's spatial and structural organization as presented in Figure 2. Based on these, it can be inferred that the building had a cruciform plan with three apses and a single window on each. This plan typology confirms continuity with Byzantine-Serbian ecclesiastical architecture, indicating structural and spatial consistency with established sacral models. The church was relatively low and modest in size, constructed of stone with a vault covered by oak shingles (Utvić, 1990). Material simplicity reflects adaptive construction under constrained political and economic conditions, demonstrating a direct relationship between resource availability and architectural form. At the same time, the cruciform layout, building form and apses indicate the continuity of Serbian sacral tradition in present-day Hungary and a form of resistance to Ottoman-era assimilation and wartime pressures. Although simple in execution, the spatial organization and structural features point to established sacral models, adapted to local materials and building practices. This combination of modesty and symbolic meaning suggests a conscious effort to preserve cultural identity through architecture. Even today, remnants of frescoes can be observed in the ruins of the Old Church of Jazak Monastery (Utvić, 1990). Remaining fresco fragments indicate the existence of a developed interior iconographic program aligned with Serbian medieval painting traditions. Attesting to the monastery's once well-maintained material condition and its artistic sophistication can be observed from the exterior structure, the interior, adorned with frescoes, reflects the Serbian medieval tradition of mural painting.

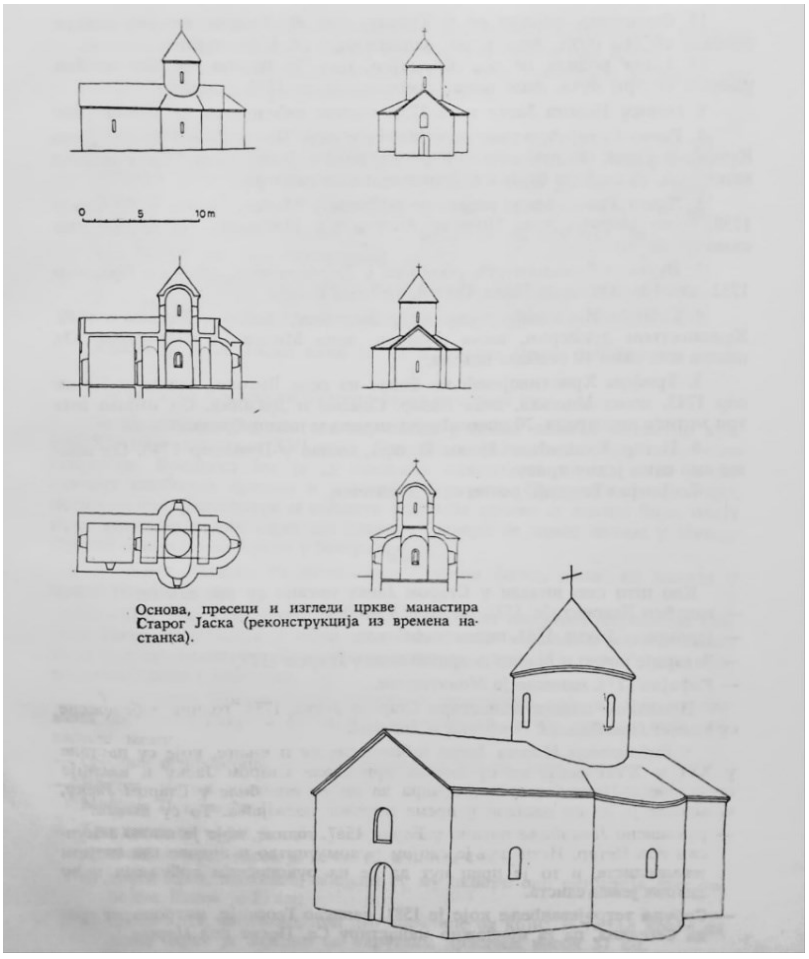


Figure 2. Drawing of the Old Church of Jazak Monastery
Source: Utvić, 1990, p. 15.

4.3.3 Symbolism and the Role in Preserving Religious Identity

In 1705, the relics of the last Serbian Emperor, Uroš, who was later canonized, were transferred to Jazak Monastery (Medaković, 1990). The relocation of relics significantly increased the symbolic and functional importance of the monastery within the regional Orthodox network. A nearby spring, believed to have healing properties as it flowed from beneath the place where Saint Emperor Uroš's relics were laid, played a key role in the cult's veneration, as even a healed visitor, who was Muslim, in 1710 expressed gratitude to the monastery with a silver gift (Utvić, 1990). This incident shows that the cult of Saint Emperor Uroš transcended confessional boundaries, attracting pilgrims from diverse backgrounds and establishing the monastery as both a religious and cultural center. The cult associated with the relics demonstrates the trans-confessional reach of sacred spaces in Srem.

4.3.4 The Regulation of Maria Theresa and the Suppression of the Monastery

The Old Jazak Monastery, converted into a female monastery without authorization and lacking estates, was officially abolished by Maria Theresa in 1774, with its property transferred to the new Jazak Monastery (Utvić, 1990). The Hungarian authorities' actions demonstrate

how state intervention controlled the status and functioning of religious institutions and also their economic capacities. These measures went beyond administration and influenced the architectural development of the monastery and its role as a spiritual and cultural center. The suppression of the Old Jazak Monastery reflects a broader strategy of combining religious control with economic regulation in Srem.

4.3.5 The Yugoslav Period – Destruction and Disappearance of the Old Monastery

The physical degradation of the Old Church resulted from a combination of neglect, material reuse, and socio-political discontinuity as presented in Figure 3. This sequence demonstrates how physical degradation, as a natural consequence of neglect and historical circumstances, acts as a critical factor in erasing the material testimony of cultural and spiritual tradition. Post-war ideological frameworks further limited restoration possibilities, contributing to the long-term material disappearance of the structure. This reflects the continuation of a strategy of control over Orthodox institutions, begun under Hungarian rule, as the earlier suppression of the monastery persisted through socio-political constraints during the communist period. The destruction of the Old Jazak Monastery was therefore not solely a result of age and neglect but also a consequence of long-term political and social influences that shaped the possibilities for the preservation and restoration of Orthodox sacred sites in the borderland, multicultural space of Srem.



Figure 3. Ruins of the Old Jazak Monastery Church, photograph from 1920
Source: Utvić, 1990, p. 19.

4.4 The New Church of Jazak Monastery

4.4.1 Construction context

As the Old Jazak Monastery increased in monastic membership and attracted a growing number of faithful largely due to the significance of Emperor Uroš's relics the need arose to construct a new monastery in proximity, and construction of the new monastery began in 1736 and was completed in 1741 (Utvić, 1990). The construction of the New Church was driven

by functional necessity and the need to accommodate increasing religious activity. The New Jazak Monastery is dedicated to the Descent of the Holy Spirit, and the relics of Emperor Uroš were transferred there (Medaković, 1990). This transfer demonstrates the intention to preserve the cult of the sainted emperor as a central element of the community's spiritual life. The chronological overlap between the decline of the Old Church and the construction of the New Church indicates institutional continuity rather than rupture.

4.4.2 Architectural and Stylistic Features

The New Church introduces more complex facade compositions and a combination of geometric and floral motifs, setting them apart within the Byzantine architectural heritage (Tadić & Gavrić, 2016). Intricate facade decoration and rich geometric motifs emphasize their visual and symbolic significance. This indicates that architectural articulation operates as a deliberate representational strategy, where decorative complexity reflects increased institutional and cultural capacity. The polychrome evident on the facade, blind arcades, cordon cornices, and playful rhythmic patterns represent clear hallmarks of the Serbian Byzantine tradition (Milanović Jović & Momirović, 1990). Furthermore, simultaneously illustrating how local craftsmen integrate international influences into their own aesthetic, preserving cultural continuity and adapting it to the specificities of their environment. Figure 4. Facade detail showing polychrome treatment, blind arcades, and rhythmic articulation of stone and brick, indicating the integration of Serbian-Byzantine and Baroque elements.



Figure 4. Detail of the facade Source: Medaković, 1990, p. 267

In addition to the Baroque tower, the church is characterized by its dome, evoking memory of the medieval period (Medaković, 1990). The findings show that the New Jazak Monastery represents a living example of the fusion of the Morava style with the Serbian-Byzantine architectural tradition. This is demonstrated throughout the monastery's facade, dome, and structural organization. However, the architecture of Jazak Monastery functions as a materialized indicator of historical, cultural, and political interactions in the region. The tower reinforcing the dominance of the Orthodox community through a Western European motif,

while creating a visual dialogue with the surrounding spaces as presented in Figure 5.



Figure 5. Church of the New Jazak Monastery
Source: Medaković, 1990, p. 268

4.4.3 Iconostasis, Frescoes, and Interior Design

Organizational changes within the Patriarchate and the arrival of teachers from Ukraine (Medaković, 1990) introduced new artistic influences into the interior design. The iconostasis represents a key example of cultural transfer, integrating Ukrainian Baroque decorative language into Orthodox liturgical space. Although the interior of the church was not painted (Milanović Jović & Momirović, 1990), the absence of wall painting shifts visual emphasis toward the iconostasis as the primary interior narrative structure. This creates a dialogue between traditional Serbian Orthodox aesthetics and Western European decorative elements. Each element, from the form of the iconostasis to the decorative motifs, carries both local and external influences. As a result, even in the absence of painted interiors, the presence of Ukrainian Baroque in the iconostasis demonstrates that minimal interventions can preserve the richness of visual and spiritual layers. The abrupt transition from traditional to Baroque

art is characterized by the use of vivid colors (Maricki Ostojić, 2007). Additional colorization enhances the visual emphasis of interior elements such as the iconostasis as shown in Figure 6.



Figure 6. Detail of the Iconostasis
Source: Medaković, 1990, p. 294

4.4.4 General restoration

Interwar restoration (Davidov, 1990), campaigns significantly upgraded the architectural condition of the monastery, reflecting renewed institutional investment in religious heritage. The focus on the renewal and preservation of architectural elements indicates how religion became a visible and affirmed factor of cultural and national identity due to the absence of Austro-Hungarian control. At the same time, this restoration reflects their responsiveness to the historical and cultural conditions.

4.4.5 Period of Destruction During World War II

The church of the Jazak Monastery survived physically intact, while the monastic residence suffered severe damage in a fire in 1942, and the roof was partially destroyed, including the corner between the southern and eastern sides (Davidov, 1990). World War II caused partial destruction of the monastic complex, while the church itself remained structurally intact, demonstrating differential vulnerability of architectural components. Figure 7 shows that the

church remained structurally stable. However, it was part of a larger monastic complex that suffered significant destruction. The lack of regular maintenance, together with the turbulent historical context, affected its condition. The Jazak church and its complex can be seen as a case study of how material and cultural heritage can be damaged, while still retaining their significance as spiritual and architectural testimonies, even in conditions of neglect. The damages disrupted physical fabric of the church and monastic buildings which lead to threatened their spiritual continuity and the cultural value of monastic assets (Davidov, 2006). This suggests the connection between architectural conservation and cultural memory. The findings show that the World War II further increased this vulnerability. Military operations and destruction affected the monastic residences and resources. As a result this shows how conflict can directly endanger the protection of heritage in the region.

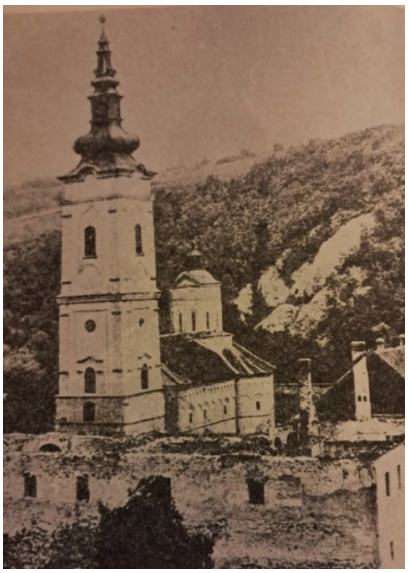


Figure 7. Jazak Monastery after World War II
Source: Davidov, 1990, p. 66.

4.4.6 Restoration and Contemporary

The restoration of the Jazak Monastery in the second half of the 20th century followed a prolonged period of neglect and destruction during World War II. Post-socialist restoration processes reflect renewed engagement with religious and cultural heritage as part of identity reconstruction. The relics of Emperor Uroš were severely desecrated in 1941 and temporarily transferred to Belgrade, only to be returned to the Jazak Monastery in 2001 (Medaković, 1990). The return of the relics simultaneously indicates both the continuity and fragility of cultural identity. The cult of the saint had, for centuries, brought together various ethnic and confessional communities. It functioned as a means of sustaining a shared spiritual and symbolic space in Srem. In contrast, its temporary removal shows how historical and political circumstances can disrupt this cultural continuity.

4.5 Architectural Continuity and Transformations

The Old Church demonstrates reduced architectural expression under constrained conditions, while the New Church reflects increased stylistic complexity and external influence.

(Milanović, 2008). The Old Church of Jazak, constructed under Ottoman administration and with limited resources, was conceived as a modest cruciform structure with three apses and without Baroque elements (Fajfrić, 1997). Its smaller scale and restrained architectural expression indicate not only continuity with Serbian-Byzantine tradition, but also clear limitations in terms of construction, decoration, and stylistic development imposed by unstable political conditions. The presence of fresco painting further reflects a reliance on traditional interior articulation typical of medieval Orthodox practice.

In contrast, the New Church of Jazak, built in the second half of the 18th century, represents a significantly larger and more architecturally developed structure. The introduction of a Baroque bell tower and a more articulated facade demonstrates a shift toward Western European influences and reflects improved material and political conditions (Medaković, 1990). Unlike the Old Church, the interior of the New Church is not characterized by fresco painting, but by a dominant iconostasis, indicating a transformation in the organization of visual and symbolic space.

This comparison shows that the two churches differ not only stylistically, but also in scale, architectural composition, and interior articulation. The Old Church reflects architectural reduction shaped by external constraints, while the New Church demonstrates expansion, adaptation, and selective integration of new stylistic elements. At the same time, both buildings retain the fundamental spatial and liturgical principles of Orthodox architecture, confirming that transformation occurs through modification rather than rupture.

4.6 Iconographic and Artistic Influences

The transition from fresco-based interior systems to iconostasis-centered visual hierarchy reflects a structural transformation in Orthodox visual theology. This shift reflects broader transformations in architectural and visual systems, directly linked to socio-political change. Such adaptation indicates a strategic modification of architectural and artistic language in response to the region's multiculturalism and political dynamics. At the same time it raising questions regarding the potential loss of the immediate spiritual experience that fresco painting had previously provided.

4.7 Multiculturalism as a Factor in Architectural Transformation

Multicultural conditions in Srem functioned as an active agent in shaping architectural transformation, rather than as a passive historical background. The architectural evolution of the monastery demonstrates continuous negotiation between Orthodox identity and external political frameworks. However, by decree of Maria Theresa, the Old Church was abolished, while the construction of the New Church, influenced by Hungarian political authority, led to the creation of a Baroque tower as a symbol of Western European influence. Nevertheless, the remainder of the building retained elements of the Serbian-Byzantine style, reflecting the community's effort to preserve local identity amid political and cultural transformation in the region. Comparative analysis shows that two buildings with the same function experienced very different outcomes, closely linked to attitudes toward Orthodox institutions. The Old Church was a result of administrative and political decisions, showing how external factors can shape the preservation of cultural heritage. In contrast, the New Church, as the result of a

compromise between local identity and state authority, demonstrates how architecture can be instrumentalized to maintain religious and cultural visibility. This contrast reveals the tension between tradition and imposed political structures. It also raises the question of whether architectural identity can be fully preserved under external pressure. Figure 8 presents a timeline showing the coexistence of the two monastic complexes and churches, located about one kilometer apart within the same ethnic environment, but treated differently by the multicultural community.

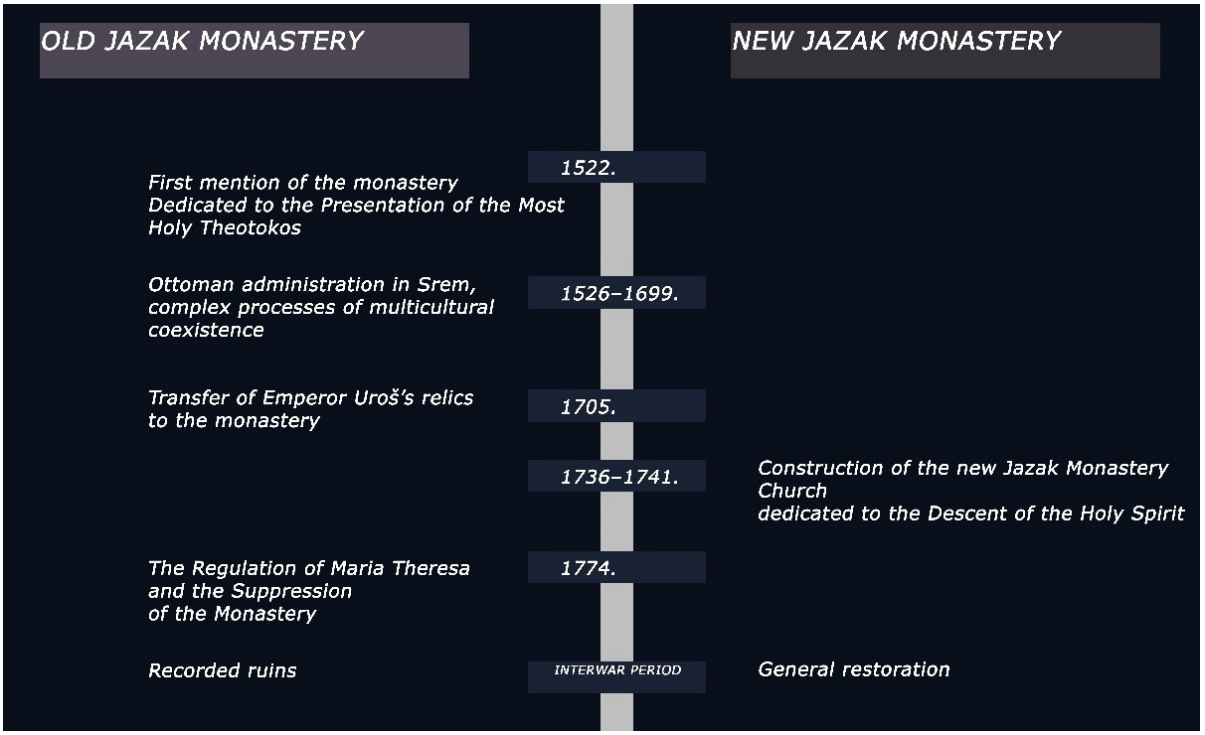


Figure 8. Comparative timeline of key historical events related to the Old and New Jazak Monastery. Source: Author

5. CONCLUSIONS AND RECOMMENDATIONS

The results show that the Old and the New Church represent two distinct architectural responses to historical constraints and opportunities.

The Old Church is defined by reduced scale, a simple cruciform plan, the presence of fresco painting, and the absence of Baroque elements, reflecting limited material and political conditions.

In contrast, the New Church is larger in scale and introduces a Baroque bell tower, more complex facade articulation, and a shift from fresco-based interiors to an iconostasis-centered spatial organization, indicating increased institutional capacity and openness to external influences.

These differences demonstrate that architectural transformation operates through measurable changes in form, scale, and spatial articulation, rather than through symbolic interpretation alone.

At the same time, both churches retain core liturgical and spatial principles, confirming that adaptation in Orthodox architecture occurs through modification of existing models rather

than their replacement.

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Monumentality Reconsidered: Heritage Preservation and Adaptive Reuse through the Theories of Robert Venturi and Aldo Rossi

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Abstract

Through enduring forms, monumentality in architecture embodies cultural identity and societal ideals, acting as a conduit for collective memory. This issue is addressed by both Aldo Rossi and Robert Venturi, although from different methodological and philosophical angles. In contrast to modernist simplicity, Venturi's idea promotes a multilayered complexity that reflects the subtleties of life and historical continuity. According to Venturi, monumental constructions should embrace contradiction, eclecticism, and context as vital manifestations of memory and cultural narrative rather than aiming for perfection of form. His method promotes an architecture that honors historical roots while embracing innovation and tradition.

On the other hand, Aldo Rossi frames monumentality as an inherent component of the urban landscape, serving as a symbolic and spatial reference point. Rossi views monumental architecture as a storehouse of collective memory that goes beyond simple function, emphasizing typology and permanence. According to his view, the "permanent" elements of cities, those typological forms that persist through the ages and provide continuity amid urban change, must be addressed by architecture.

Monumental architecture continues to shape our cities just like before, when we look into history, many areas and nations are shaped according to the monuments, and monuments shaped and become a part according to the areas, as a little example can be the great Yugoslavian monument that have a great impact in the architecture and the complexity of the life, after having faced great wars and chaos, they remain in their place, and everything around is adapting to their idea of design and approach. This can be a great example of both contractionary theories by Rossi and Venturi, which are historical, symbolic, and "ugly", and contain more elements and ideas. Together, these observations show that monumentality is a narrative technique that connects the past and present, complexity and clarity, memory and transformation, and more than merely a structural or visual element.

Keywords: *Symbolism, Collective memory, Urban Permanence, Typology, Contextual continuity.*

1. INTRODUCTION AND LITERATURE REVIEW

1.1 Rossi and Venturi

Within the definitions of a quality lifestyle and convenience, we have passed through certain stages of our lives, with or without our will. In this change, which ranges from a rural lifestyle to urbanization, there has been a transition across different levels and layers. Rossi studies many aspects of urban design and architecture in his book, “Architecture of the City.” Moreover, he includes the context of the monumentality in his studies, to be born like a monument, to be a monument, and to act like a monument. Venturi, on the other hand, challenges traditional notions of monumentality by celebrating complexity, embracing the ordinary, and creating contextual responsiveness and pluralism. The common idea is that monuments contribute to the continuity of the city by harmonizing with the existing texture, thus respecting archetypes. Similarly, the contextual responsiveness of architecture argues for a more nuanced integration within the surrounding environment. Although both Rossi and Venturi opposed the reductionist functionality of traditional modernism, they held differing views on the essence of historical truth in architecture. Rossi's theory of permanence is based on the idea that there are enduring urban "types" in architecture that can withstand changes in time and politics. His method is to create a perfect and uniform urban form and a timeless texture through the permanence and immutability in which monuments serve as permanent archives of collective memory. These universal claims, however, are rejected by Venturi as elitist abstractions unrelated to the unstable realities of contemporary urban life. According to him, the city cannot be reduced to timeless typologies since it is fundamentally constructed by contradiction. Rossi seeks permanence in continuity, whereas Venturi embraces ambiguity, variation, and even visual chaos.

The potential for cities to become "museum cities" or locked archives where formal repetition and nostalgia take priority over urban life is raised by Rossi's typological permanence. The breakdown of architectural coherence into spectacle and kitsch, however, is the opposite risk connected to Venturi's pluralistic inclusion. As a result, the argument between Rossi and Venturi is really ideological rather than just artistic: one fears the violence of forced unity, while the other fears the death of historical continuity.

Monumentality is used differently in the context of approaching the place. In some cities, there is the display of power, the feeling of being protected and safe. In some areas, it is to remember something or not to forget. The architect gives the meaning and the usage of the building while designing it, according to the needs, but there can be many more examples of monumentality in which the meaning is given by the protagonists themselves. A park, for instance, is a place where people gather, eat, walk, run, or do daily routines of life, but is the park a monumental area?

1.2 Foucault

The term “monumentality” or the idea of monumental architecture can be understood as the city’s main nucleus and spirit. As humans lived in rural areas before civilization, the main element for them was a landmark of the area they lived in, a sign, or a place they passed at least once a day. Many philosophers and ideologists have mentioned these elements as the heart of the city. Even in the prehistoric archives, we study the architecture and living quality of the city, which was created around a controlled monument. As we mention controlled monuments of the city, we can also study the concept of disciplinary power, studied and analyzed by Foucault, which has a similar understanding to the concept of monumentality of the city. (Stavrides, S., 2019). Viewed through the lens of the disciplinary field and Michel Foucault's concept of heterotopia, this contradiction becomes very clear. Monuments are seen not merely as cheerful urban symbols, but as spatial tools used by political and cultural regimes to legitimize themselves. Examining symbolism introduces considerations of power dynamics within monumentalism. Symbols are not just representations but tools of power, shaping narratives and contributing to the construction of cultural and societal norms (Figure 1).

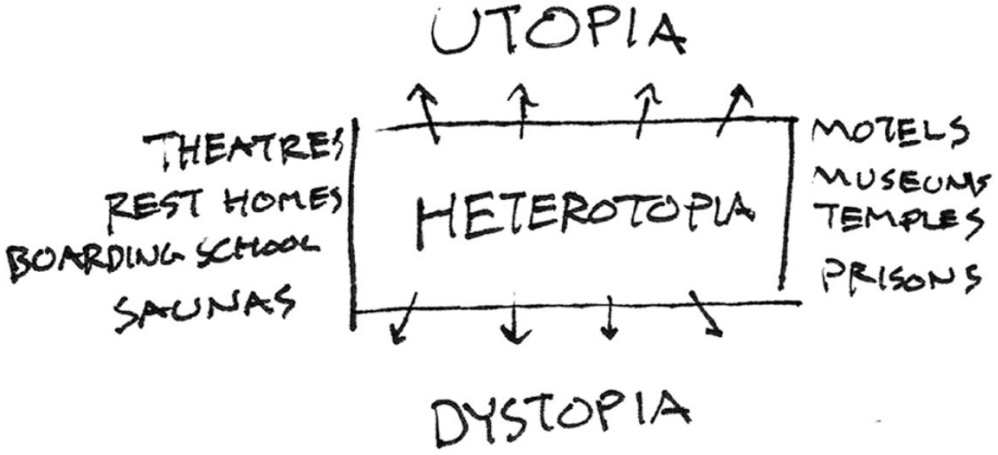


Figure 1. Michel Foucault, Other Spaces, 1967. Source: http://amachinetolivein.com/abecedarium/

Through well-planned spatial experiences, these buildings, rather than serving as neutral repositories of memory, take control of public or social perception. Monumentality thus becomes disciplinary; it orders bodies, directs movement, and frames historical interpretation. These monuments compensate for and guide imperfections in the surrounding urban fabric. We know that our lives were designed to be in fully controlled areas. These monuments are in the main part of the city, sometimes right in the middle of the city, in the heart of the crowd, and sometimes they are at the top of the mountain that sees that crowd very well. Their enormous presence conceals the modern city's decline in social continuity, human scale, and group involvement. Because fragmentation already predominates in the larger urban context, they seem like symbolic zones of unity. Living in a city or residential area

is a symbol of a certain order, and these symbols must be controlled according to specific topics, depending on the society you live in. Although we experience over time that being controlled or living a controlled life is not always a comforting term, being a member of such an environment without realizing it is being a thrall to such controls. The concepts of monumentality in the works of Rossi and Venturi, along with Michel Foucault's exploration of controlled areas, intersect in their consideration of architecture as a powerful tool in shaping and reflecting societal values, power dynamics, and disciplinary strategies. While monumentality focuses on the positive aspects of identity and symbolism, Foucault's controlled areas shed light on the more regulatory and disciplinary dimensions of architectural design.

Monumental architecture in the city acts in many ways like a symbolic message that represents specific ideas, values, or historical moments. A large area in a city fabric, on a larger scale, dominates its surroundings. Like a historical element that keeps its permanence alive, a monumental building must last, be sustainable, and belong. As a memorial, a memory that will remain, they tell historical events, figures, or cultural heritage, ensuring that these historical stories and acts are not forgotten and will continue to be a part of the city's identity. As part of the urban fabric, they sometimes act like the main places in the city, such as the parks and paths. Monumentality often provides artists and architects with the scene for their artistic expression and creativity; it can be a great inspiration for upcoming artists and events. It often employs a specific architectural language, which may include facades, statues, columns, an agora, a stoa, and other ornate features.

2. METHODOLOGY

1.3 Symbolism

In philosophical terms and ideas, symbolism preponderates over its physical form, becoming a dynamic, multi-layered aspect of human existence and experience. It intertwines with semiotics, existentialism, phenomenology, deconstruction, temporality, power/control dynamics, and postmodern pluralism, creating a rich wall of meaning within the built environment.

Both Rossi and Venturi have manifested their theories and ideas on monumental architecture inside the city and urban fabric, even in the rural areas; they recognize the role of monumental architecture in shaping cultural identity and preserving collective memory. Symbolism plays an important role in the aspect of the theory of the city, to become a symbol in an urban area, a city or a living area needs its identity and archetypes.

While Rossi's emphasis is on the direct representation of historical events, Venturi acknowledges the importance of architecture in embodying cultural values and societal narratives. Aldo Rossi evaluates monumental architecture within a traditional and historical context; for him, it is important that the permanence and the symbolic message given in it. (Rossi, A. 'The Architecture of the City', 1982).

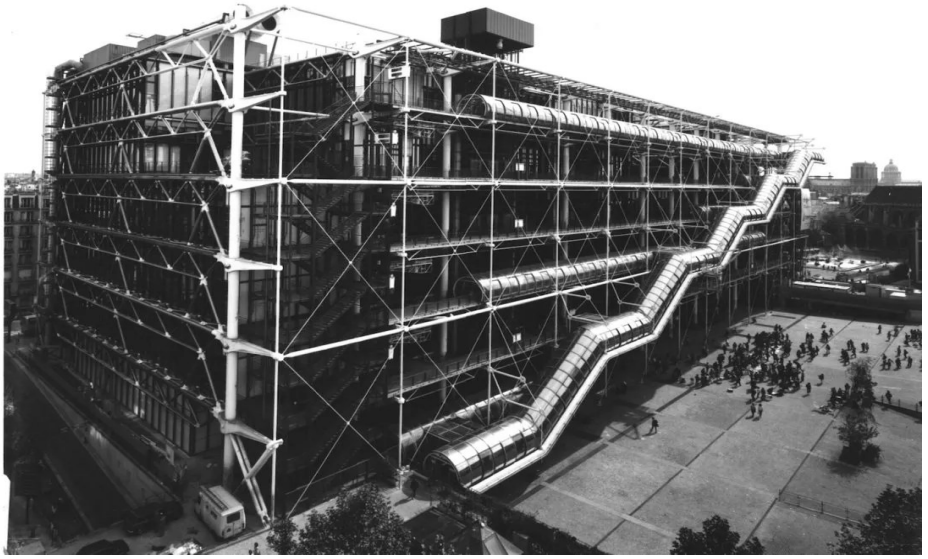


Figure 2. Centre Pompidou, Paris, 1971-77 Source: centrepompidou.fr

The most important of the common ideas that has been given great intensity in studies is the concept of symbolism. As symbolism is the idea that things or objects represent other things, in the books, we recognize the role of monumental architecture in shaping cultural identity and preserving collective memory, while Rossi, with very dogmatic theories and analyses, emphasizes the direct representation of the historical events, Venturi, according to the historical events, acknowledges the importance of architecture in historical values and social narratives. Together, these approaches contribute to a broader understanding of how symbolism appears in monumental architecture and theory. When we combine these two approaches, we reach the point of having both the history and archetypes behind the living and the complexity and dynamism of the monument, enriching the discourse on the interplay between architectural form and cultural representation. (Rossi, A., 'The Architecture of the City', 1982).

One of the most accurate examples that can be given on this topic is the *Centre Pompidou* in Paris by Renzo Piano (Figure 2). It stands as a symbol of modernity, integrating into the urban fabric of the city while departing from regular architectural forms. Rossi's emphasis on the integration of monuments into the city is evident in the Centre Pompidou's central location and open accessibility. On the other hand, Centre Pompidou embodies complexity also, challenging conventional aesthetics with its exposed mechanical systems and dynamic design. The building becomes a symbol through its form, using unconventional elements to express transparency and innovation. When it first opened in 1977, Centre Pompidou's architecture was revolutionary in many respects. Its design revealed a truth that only young people could have imagined. It was a building that subverted structuralism while being literally turned inside out in the skin-and-bones sense. The design embodied avant-garde modernity, giving the idea of the "monument" as it was then commonly perceived vitality and movement. Piano thought both in terms of form, with its distinctive primary-hued tubes being clipped and unclipped as

needed, and in terms of function, with the addition of unrestricted, multipurpose event spaces inside, a public piazza, and repositionable internal functions. Within this cultural complex, shape took on new levels of meaning and purpose, architecture became an event, and structure became a symbol.

Shared aspects include an emphasis on public engagement, as the Centre Pompidou invites interaction with its unique design and open plaza. The building allows for symbolic ambiguity, encouraging diverse interpretations from viewers.

Another iconic example in this case study must be the Yugoslavian monuments with the original name 'spomenik', like the Monument of Krusevo in Macedonia 'Makedonium' (Figure 3), which is the act of liberation and embodies collective memory through its bold and abstract design. Rossi's conviction in permanency is further called into question by the post-Yugoslav Spomeniks. Many of these monuments are now ambiguous relics with no clear communal significance, detached from the socialist political philosophy that created them. The question of whether architecture can actually sustain memory across drastically altered historical contexts is raised by the breakdown of its original symbolic narratives. Monuments show that symbolic openness and rethinking, rather than set ideological messages, are the source of permanency. A monument endures not because its meaning doesn't change, but because it can be appropriated, misconceived, or altered by subsequent generations to fit new cultural contexts. In this way, architecture's historical longevity is ultimately due to ambiguity rather than permanency. They are an essential component of the larger symbolic regime that allows people to give the past and present both personal and societal meanings. (Begić, M., and Mraović, B., 2014. pp. 13).

These monuments integrate with the natural landscape, departing from traditional memorial styles. In the context of Rossi, these monuments symbolize historical events and harmony.

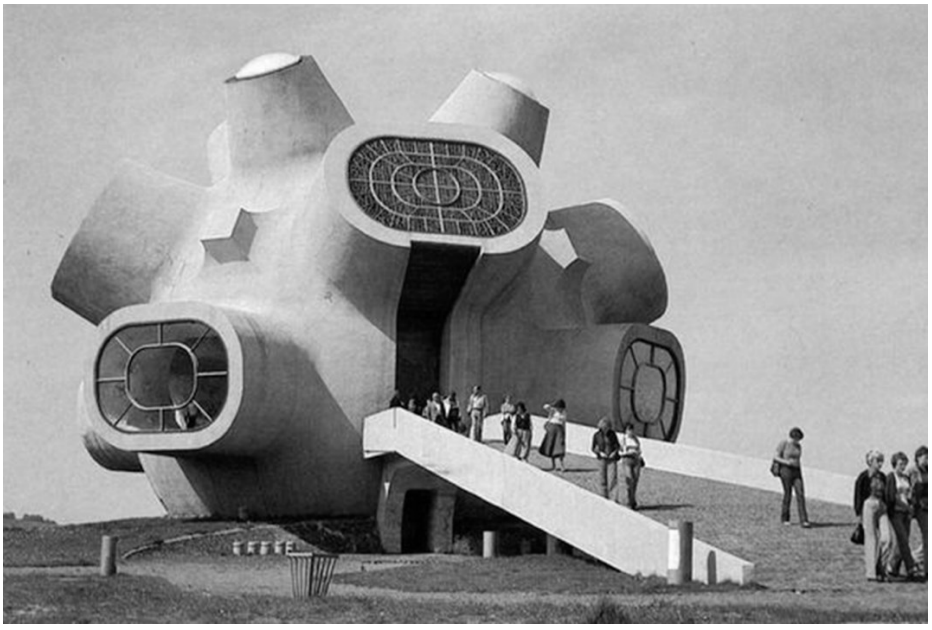


Figure 3. Makedonium, Krusevo-Macedonia, 1974. Source: Archives of the old city of Skopje.

2.2 Memory

Aldo Rossi believes that monuments should be integrated into the existing urban fabric. He explains the city as a complete mechanism, where both structure and form create a huge fabric. In the urban area, many elements make the existing approach to the architecture, artifacts, and monuments the main elements of this organization, and they should not remain isolated from the urban fabric but rather become part of the city's continuity and history. They should harmonize with the surrounding architecture and urban fabric and should share the same symbolic act they had before. Rossi emphasizes the symbolic power of architecture in representing and preserving collective memory. He writes about the fact that monuments represent the history and memory of the city. Rossi views urban artifacts, such as monuments, as symbols that transcend their immediate functional purpose. These artifacts objectify a collective understanding of the past and contribute to the overall cultural identity of a city. He believes in the existence of an architectural language that communicates through symbols. Symbolism is closely tied to the idea of tradition; the city should be considered as a place of historical and cultural layers. Where new architectural elements contribute to and build upon existing symbols, he studies monumental architecture as a form of symbolic expression. Monumental architectural elements have the power to represent and communicate the spirit and tradition of the city, appreciating its symbolic landscape and suggesting that the arrangement of elements must have a hierarchical and symbolic order, which allows residents and visitors to navigate the city. (Rossi, A., 'The Architecture of the City', 1982).

At this point, we can understand the theories of Foucault better. In his vision, the city becomes a collective symbol, and the arrangement of buildings, streets, and open spaces contributes to the creation of a symbolic urban form that reflects the identity, tradition, and history. Monuments and urban artifacts are viewed as powerful symbols that contribute to the narrative of the city and its inhabitants. According to him, urbanization and the culture of living in the city and in its peripheries are categorized within themselves conceptually and clearly.

This categorization is divided into buildings that are built by humans, as he calls the giant modernist buildings that function like a life machine, or buildings that are also human-made but have historical and artistic value, the ones that act like monuments and artifacts, but at the same time explain the symbolic values of the city itself. Trying to make these kinds of divisions and comparisons in architecture helps us to analyze and study the concept, to work on it, to accept it, and make it a locus, because it is not always very easy to accept different varieties, or, as the author mentions in his book, it is difficult to unite through inclusion rather than easy unity through exclusion.

Aldo Rossi's approach to monumentality is the reflection of his architectural philosophy; he examines the historical cities at their finest periods, deep inside history, takes the best parts from them, and works on them perfectly. As he did in his studies in Padua, the facades of the old city and Naples, the beauty in the chaos of the city, crowdedness, and order have been two of the best terms to explain the city of Naples, drawing the archetypes from it and

evaluating it in a very logical way. (Aymonino, C. 'La Città di Padova: Saggio di analisi urbana', 1970). For sure, all the design and building of the city comes from history and the rural areas before civilization. The understanding of the rural areas as the study of the modern city is the key to the new form of urban form. This cycle reminds us of the episodes of art movements towards simplicity, which started even before the Renaissance, following it, then a sudden departure from the baroque, overburdened, and again tending to simplification. He refuses simplicity and tries to keep it in the nucleus of design, evaluating the city as it was designed in its perfect way, because this approach shows how quickly people can adapt to a place or lifestyle. Rossi, in his book, refers to the concept of how cities were painted in the famous paintings, as simply as it can be. 'The Ideal City (La città ideale)' (Figure 4), the city is an object of study as well as a practical location; the great temple, the amphitheater, and the triumphal arch are regarded as monuments that both shape the character of the city and stand the test of time. Unlike modernists who believed that "form follows function," Rossi argued that urban forms are determined by more than just how they are used. The Città Ideale serves as an example of how a space's form, like the plaza, persists across centuries despite shifts in the specific activities that occur there.

The city must serve people as the object itself, but as we analyze human needs methodologically, we have a clear image that shows how adapted humans are to their artificial tools. The chaotic metamorphosis of the city has made the status of living more natural according to the terms of human dimensions in the modern city. Daily life and human activities lead people to use artificial tools to make life easier, and people's acceptance of this urge takes us to another dimension or another state of living, both methodologically and mechanically.



Figure 4. Fra Carnevale's La Città Ideale (c. 1480–1484)
Source: https://it.wikipedia.org/wiki/File:Fra_Carnevale_-_The_Ideal_City_-_Walters_37677.jpg

2.3 Diversity

Venturi's criticism of "classical" modernism also offers a framework for comprehending the common perception of monuments like the Pompidou as "ugly." The building purposefully opposes traditional monumentality based on harmony, dignity, and compositional unity with its exposed infrastructure systems and "skin-and-bones" style. According to him, one building or a human-made design can

contain and incorporate many different elements, ideas, and theories, most of them complex and contradictory. He embraces that one architectural monument has many languages; it cannot be one and powerful alone as an ideology. As we know politically, especially, monuments must define one thing, one idea, one approach; it must be strong and permanent, to exist even over the years when people reach, it has to say the same language as it is saying in the very beginning.

On one hand, he is not against communication and symbolism; he explains that to reach and be reachable can be evaluated into layers, and the protagonist can discover the journey of reaching himself by reaching it in a non-conventional way and allowing the interpretation by the viewer. He gives importance to the everyday life of the city itself as an urban fabric; the city can be discovered only by knowing the real life, the daily routine of the city. It would be more appropriate to consider an example from Venturi's book, Through the cohabitation of fractured classical references, asymmetrical proportions, and complex symbolic readings, 'Porta Pia Rome' (Figure 5), designed by Michelangelo, symbolizes contradiction in contrast to the strict uniformity sought by heroic modernism. The monument operates through the tension between order and disorder, rejecting artistic purity. This becomes especially crucial in the context of monumental reuse, as Porta Pia shows that architectural permanence depends on a monument's ability to absorb new interpretations throughout time rather than formal stability. Venturi challenges the modernist thinking rejection of ornament, and as a result, he presents the monument as a dynamic urban artefact that can adapt to changing political, cultural, and aesthetic meanings without losing its civic presence, rather than as a static historical artefact.

He argues that ornamentation, when used consciously and carefully, can carry symbolic meaning and contribute to the overall complexity of a building, thus opening a path towards monumentality. He accepts that the importance of monumental architecture is to attract attention, to be visible, and to be understood. Ornamental elements become symbols that convey cultural references or historical and cultural nuances. (Venturi, R. 'Complexity and Contradiction in Architecture', 1966, pp. 10).

As the monument must act like a landmark, like a giant element that will control the city, in contrast, Robert Venturi's theory is that the monument must be on the urban scale, like the urban fabric, to keep the continuity of the buildings, and remain simple. It must be reachable by its meaning and context, and not by its scale or dominance. This pluralistic approach welcomes diversity of architectural styles and ideas, elements, and references. Diversity allows a wide range of influences to be included in architectural design and theory. For him, the very important aspect of monumentality is to let the viewer or user engage with the building in a personal way, to give their thoughts and their meaning to the architectural building. He challenged the idea that monumental architecture should be singular, and his philosophy that values pluralism offered an alternative perspective to traditional architecture. (Venturi, R. 'Complexity and Contradiction in Architecture', 1966, pp. 40).

The claim to superiority and the claim to a final, closed, and unchanging identity are two claims that prevent deliberative interactions between diversity and must be given up for spaces for encounter to be formed within sufficient distances. Therefore, openness of identities and a clear relationship between various identities are necessary for encounter distance. It requires the system's power relations to be eliminated or questioned. Disciplinary authority, according to Foucault, is the process of categorizing and regulating identities. The distances between identities are spatial by nature in this concept of power interactions. (Foucault, M., The Order of Things: An Archaeology of the Human Sciences, 1994).

Although Venturi's notion of complexity and contradiction is distinct, both architects recognize the multifaceted nature of the urban environment. Rossi acknowledges the complexity of historical narratives and their impact on the city, while Venturi directly addresses the complexity within architectural form and meaning.



Figure 5. Porta Pia (1562-65)
Source: https://en.wikipedia.org/wiki/Porta_Pia

3. RESULTS AND DISCUSSIONS

What we have examined in the previous words, and the examples given, especially the comparison or coming together of the museum idea in the heart of the city of Paris, and the monument from the Jugoslav era in the small town of North Macedonia, shows us, how one idea is designed from some idologic reasosn, and how these important monuments or architectural works subsequently undergo certain encounters, acquiring different identities and new uses. The Pompidou and the Makedonium can be connected by their methods of material expression, despite their formal distinctions. By showing the structure of the building, circulation systems, and pipe-like facade to convey technological processes, the Pompidou strives for monumentality through mechanical transparency. Makedonium, on the other hand, uses symbolic abstraction to create emotionally charged collective narratives using raw concrete and sculptural geometry. These examples demonstrate that monumentality is achieved by symbolic abstraction, material expression, and spatial dominance rather than conventional hierarchy. They reflect two different paths of contemporary monumentality: one is communicative and technological, while the other is ideological and abstract. However, modern adaptive reuse methods show that monumentality now depends more on the ability of symbolic structures to be continuously reinterpreted than it does on formal stability.

Modern monuments endure because they enable society to reinterpret historical significance across time, not because they uphold a single reality.

One way to define "monumentality" or the concept of monumental architecture is as the central core and essence of the metropolis. When humans first began to live in rural areas before civilisation, a landmark, a sign, or a location they passed at least once a day served as their primary source of information. These components have been referred to as the city's core by numerous academics and ideologists. (Kovacs, D. Domus Magazine, 2020)

The findings support Rossi's opinion that the monument is a permanent urban remnant. The fact that monuments continue to exist directly connects to Rossi's assertion that they transcend purpose and act as carriers of urban memory. But the adaptive reuse and reinterpretation align with Venturi's notion of complexity and layered meaning. Instead of promoting distinct ideological narratives, consider tourism, cultural programs, and casual public use.

What we can learn from the result is that monumentality in modern and contemporary architecture should be seen as a dynamic state influenced by reuse and reinterpretation. But, historical cities, city centers, architectural buildings, and monuments demonstrate that architectural permanence may come together with shifting meanings, both reflecting Venturi's complexity and contradiction and verifying Rossi's concept of urban memory. (Stavrides, S*., 2019).*

4. CONCLUSION

While studying these two architectural theorists, besides all these contradictions, we also bump into some similarities. Both of them reject the concept of beauty; according to Rossi, there is no beauty in monumentality, and Venturi strongly advocates simplicity and the ordinary in monuments.

The more we explore, the more we recognize the beauty of plurality, the tension between tradition and innovation, the harmony of the ordinary lifestyle in the city, the crowdedness of the urban fabric, the balance between permanence and temporary, and the consistency between symbolic clarity and complexity.

In conclusion, monumental architecture is a linking element between the past, present, and future. It is the reflection of the experiences and values, it is the precious history and the ordinary of our daily life at the same time, and it is the meaning that a human seeks to find in the built environment.

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Seismic Performance Assessment of Historic Stone Masonry Buildings:
The Case of the Angonate Residence, Gjirokastër

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Abstract

Historic stone masonry structures constitute a fundamental component of architectural heritage; however, in seismically active regions such as the Balkans, their stability is highly vulnerable to earthquakes, necessitating conservation approaches that balance structural enhancement with the preservation of architectural authenticity. This study provides a general conceptual framework for the assessment and reinforcement of historic stone buildings, using the Angonate House (built around 1880) as a case study. Located in Gjirokastra, a UNESCO World Heritage Site, this building exemplifies the characteristic features of Ottoman architecture.

The methodology used includes digital documentation and structural analysis. The current condition of the building was assessed through field measurements and mapping of identified pathologies, combined with high-resolution photogrammetry to create an accurate three-dimensional geometric model. This model served as the basis for numerical simulations with the Finite Element Method (FEM) in ETABS. Modal and seismic analyses, conducted in accordance with Eurocode 8 and the National Technical Design Codes (KTP), revealed the building's dynamic behaviour and identified the main structural weaknesses.

Based on these results, a conservative intervention strategy is proposed, aiming at improving the seismic performance in harmony with preserving the historical integrity of the building. The proposed measures include the selective use of Fiber Reinforced Polymers (FRP), the

consolidation of the masonry through deep reinforcement and injection with chemically compatible mortar, as well as the installation of discrete fixing elements to improve the diaphragm action. This study shows that the synthesis of digital diagnostics, engineering assessment and conservation ethics constitutes a powerful and applicable methodology for the protection of historic masonry structures in environments with high seismic risk.

Keywords: *Architectural Heritage, Heritage Conservation, Structural Reinforcement, Structural Behavior, Finite Element Method (FEM).*

1. INTRODUCTION

Historical buildings constitute a special cultural and architectural asset for any society, documenting its social, historical and technical development. In the case of Gjirokastra, these buildings become the defining element of urban identity and national heritage. The city of Gjirokastra remains one of the most important historical and cultural centers of Albania, representing a rare example of an Ottoman settlement preserved in an exceptional state. Located in the south of the country, in the Drino valley, it lies on the slopes of the Gjerë Mountain (Figure 1), a key position that has dictated the formation of its urban structure and characteristic architecture.

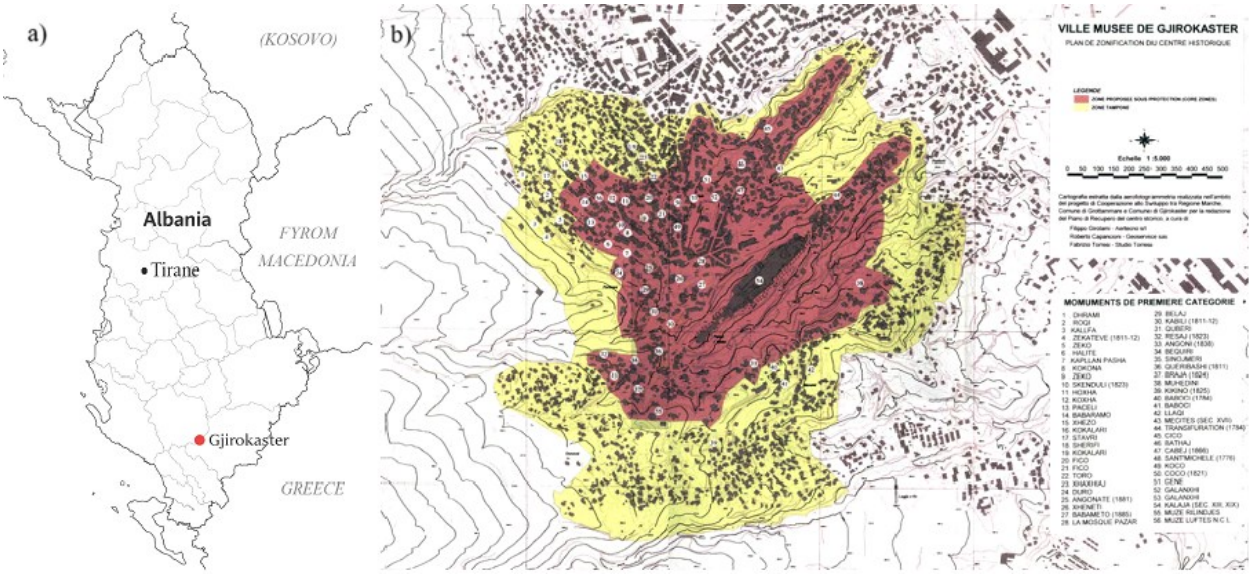


Figure 1. a-Map of the geographical location of Gjirokastra (Source:Author); b-Zoning plan of the historical center of Gjirokastra and the location of historical monuments (Source: UNESCO)

The beginnings of the birth of the city are associated with the construction of the castle during the 13th century, around which the settlement slowly developed. During the Ottoman Empire, Gjirokastra became an important administrative and commercial hub, without losing its special urban and architectural identity. The development of the city has been organic,

conditioned by the broken relief: the streets and neighborhoods have been laid out following the shape of the terrain, giving the city the unique appearance that is known today (Figure 2).

Among the features that distinguish Gjirokastra are, undoubtedly, the stone dwellings, known as “tower” or “kulla”, which represent a unique typology in the Balkans. These buildings, usually two to three stories high, were conceived to adapt to the changing seasons and daily needs, showing a harmony between the architectural form, the climate and the social structure of the time. Unlike Berat, where the dwellings appear more crowded, in Gjirokastra they take on a more monumental and isolated character, creating a unique urban landscape.

Since 2005, the city has been part of the UNESCO World Heritage List, an assessment that highlights its importance as evidence of Ottoman architecture and a traditional way of life that has managed to be preserved. However, today these values are facing real problems: the materials are degrading, there is a lack of continuous maintenance and the pressure of modern developments is increasing.

In this context, one of the most sensitive issues remains the improvement of the structural performance of these buildings, especially in an area with high seismic risk like Albania. Masonry constructions are by nature sensitive to horizontal forces, therefore any intervention requires special care so as not to damage their historical and architectural value.

This study is dedicated to this problem, which, through the case analysis of the Angonateve residence, aims to identify structural weaknesses and propose appropriate interventions, while respecting the basic principles of conservation and restoration. The main objective is to evaluate the seismic behavior of the Angonate Residence through FEM-based analysis and to propose compatible seismic retrofit strategies that preserve its architectural authenticity.



Figure 2. Panoramic view of the urban structure and vernacular architecture of Gjirokastra (Source: Author)

2. LITERATURE REVIEW

2.1 Main typologies of traditional houses in Gjirokastër

The architecture of traditional houses in Gjirokastër presents a clear typological development, influenced by topographical conditions, functional needs and the socio-economic strata of the inhabitants. The terrain plays a key role in the volumetric composition of the building. Most of the buildings are located on sloping terrain, generally broken and rocky, causing most of the houses to be developed with half a floor. Usually, the houses also include a courtyard, and large buildings can even have two courtyards. The structural system used in Gjirokastër buildings is with load-bearing masonry supported on continuous foundations. The masonry is built with stone, laid dry or with binding material.

The functions of Gjirokastra houses are organized in a vertical hierarchy. The lower floors, built of stone, were typically uninhabited and were used for housing livestock (katoi) and storing food reserves (qilari), rainwater (stera) and often a mill. The upper floors were designed with living areas, with large balconies, verandas or “çardak” with carved wooden railings, murals and other decorations. For security, the larger windows on the upper floors were equipped with wooden shutters (taraba) that were closed at night, and cross wooden bars.

The main entrances were located on the front facades. Side entrances were rare and were never located at the rear, as these positions were less visible and more vulnerable. The side facades had fewer openings than the main facades, while the rear facades, which leaned against the mountain slope, had minimal openings.

The upper residential floors of these houses were designed to reflect the hospitable nature and social status of the inhabitants. The main spaces included the living room, or as it was also called the fire room, and the guest room or guest room. In smaller houses, the guest room also served as a men's room (selamlik), while in larger houses this was a separate building. Three-story houses had large central halls or mezzanines to facilitate movement, equipped with the Turkish divan, a large sofa for entertaining guests. This design displayed the cultural values and hospitality of the inhabitants, despite the protective needs dictated by the external architecture.

According to the typology of development, buildings are classified into three variants:

- Perpendicular variant
- Single-wing variant
- Double-wing variant

Perpendicular variant

The perpendicular variant represents one of the earliest and simplest forms of housing organization. In this typology, the dwelling is developed with 2 or 3 floors, and in many cases, it is developed with a half-floor. The main function can be a dwelling or the role of an "outside room" of large dwellings. The internal organization is relatively simple and functional, with spaces that serve daily uses and with a less pronounced division of functions. The main

characteristic of this variant is the placement of stairs that make the transition from one floor to another on the exterior of the building.

Single-wing variant

The single-wing variant represents a more developed phase of the traditional dwelling, adopted by folk craftsmen. This variant can be found developed with half a floor, 3 floors or built with two blocks. Unlike the variant, the stairs are placed inside the building; the organizational method and the environments are more developed, creating a more articulated plan and a clearer functional division of spaces. In this typology, one of the most important elements is the creation of the reception area (room), which takes on a central role in the social life of the family. The additional wing can serve for auxiliary functions or for the expansion of the living spaces.

This variant shows an increase in architectural complexity and an improvement in spatial organization, reflecting a higher economic and social level of the residents.

The two-wing variant

The two-wing variant represents the most developed and monumental typology of housing in Gjirokastër. In this case, the building is organized around a central volume, with two side wings that create a more balanced and symmetrical composition. This organization allows for an advanced functional division, where the representational, living and auxiliary spaces are clearly differentiated. The upper spaces are more developed and often contain rich decorative elements, reflecting the social status of the family. From an architectural point of view, this variant is characterized by more articulated volumetry; the pronounced presence of protruding elements (such as gazebos); better integration with the urban landscape.

2.2 Materials and Construction Characteristics

The selection of local materials gave Gjirokastra the unique form for which it is still known today. The buildings constructed during this period optimally utilized the available local resources. The selection of building materials was also influenced by factors such as accessibility, durability, and sustainability.

The main structural material is stone, the widespread use of which has given the city the name "City of Stone". Limestone was widely used due to its wide availability in the area. For the construction of masonry it could be used and combined with lime-based mortar, which binds the masonry and ensures durability. Stone (stone slabs) was also used for roof covering. Wood was also very common, and its role varied depending on the type used. It was mainly used in floors and roofs (roof trusses), where it added flexibility and helped distribute horizontal loads throughout the structure.

From a mechanical point of view, the compressive strength of stone provides vertical load-bearing capacity, while the low tensile and shear strengths make masonry susceptible to horizontal seismic loads; the integration of wood offers some ductility and energy dissipation, but this depends on the integrity of the connections. The combination of stone, mortar and

wood creates a system resistant to vertical loads, but sensitive to seismic actions, where cracks usually develop at the corners of the wall, near openings and where the wood elements interact with the masonry, while the degradation of the materials, especially mortar and wood, further reduces the stability of the structure.

Knowledge of the mechanical-physical characteristics of the materials used is essential for the study of seismic assessment and for the design of appropriate and compatible interventions, as the behavior of the building to horizontal loads is directly influenced by the typology, materials and construction techniques.

2.3 Seismic behavior of masonry buildings

Masonry buildings constitute one of the most widespread typologies in historic areas, but at the same time also among the most sensitive to seismic actions. Their structural behavior is characterized by a high compressive resistance, but by a very limited tensile and shear capacity, which makes them particularly vulnerable to horizontal loads caused by earthquakes.

Under seismic conditions, masonry structures do not behave as monolithic systems, due to the often weak connections between the constituent elements. As a result, they develop different failure mechanisms, which depend on the geometric configuration, the quality of the materials and the integrity of the structural connections.

The most common failure mechanisms in masonry buildings include the following typical forms: out-of-plane failure, which occurs mainly from problematic connections between walls and other structural elements, causing the walls to lose stability in the direction normal to their plane; diagonal cracks (shear cracks), which are created as a result of shear forces developed during seismic activities. Another significant damage mechanism is the separation at the building corners, which arises from insufficiently strong connections between orthogonal walls, resulting in the structural elements behaving independently rather than as an integrated system. One commonly observed damage mechanism in historic masonry buildings is the separation at the corners, usually caused by weak or inadequate connections between intersecting walls. In these situations, structural elements may behave independently rather than as a cohesive system. Similarly, areas around openings, such as windows and doors, tend to be particularly vulnerable, as the reduction in load-bearing capacity in these sections can create stress concentrations, increasing the likelihood of local failure.

Wooden elements, including floors and roofs, also play a significant role in the seismic response of these buildings. When properly connected to the masonry, they can act as horizontal diaphragms, distributing seismic forces more effectively and enhancing overall stability. Nevertheless, in many historic structures, these connections are either insufficient or have deteriorated over time, which reduces their positive contribution to structural performance.

In addition to the materials and quality of the connections, the typology of the building also

directly affects its seismic performance. Buildings with a more regular organization and a more balanced distribution of mass and stiffness usually exhibit a more stable behavior during earthquakes, compared to those with irregular shapes or more complex configurations.

Due to the complexity of this behavior and the heterogeneity of the materials, the evaluation of masonry buildings requires the use of advanced analytical methods. In this context, the finite element method (FEM) constitutes an important tool for analyzing the distribution of stresses, deformations and identifying critical areas in the structure.

3. METHODOLOGY

This study focuses on the analysis of the seismic behavior and structural characteristics of traditional stone masonry buildings in Gjirokastra, taking as a case study the historic Angonate residence. The building, built in 1881, is a work of great architectural value. It is developed into two apartments, in front of the main one a two-story building has been developed, quite spacious, which performs the function of an "outdoor room" and partially opens onto the central courtyard, which has two small courtyards on its sides. The building has numerous and large windows, a balcony that is considered a unique element. It has a symmetrical composition and in some specific parts there are non-parallel developments due to the terrain.

The field survey included architectural measurements and the assessment of existing damages and pathologies, including cracks, mortar degradation and damage to the wooden elements of the floors and roof. The field studies were carried out within the framework of the "Restoration of Cultural Heritage" course held at the University of Polis and the support of DRTK Gjirokastër. To document the condition of the building, the main facade is presented below in photogrammetry and drone views.

In order to achieve the most realistic behavior of the structure, it is very important to determine the properties of the materials. The mechanical parameters of the stone masonry were based on the values reported in the literature for similar historical buildings, while the wooden elements were determined taking into account their anisotropic behavior and contribution to the overall stiffness. Equivalent data were obtained due to the lack of field data. The interaction between the structural components, especially at the wall-floor connections, was carefully considered, as these areas significantly affect the seismic response of these buildings. This approach allows a reliable interpretation of the analysis results and supports the identification of the most sensitive parts of the structure. The material properties were adopted from previous studies on comparable Ottoman-era masonry buildings in Gjirokastër and aligned with Eurocode recommendations.



Figure 3. Photogrammetry of the main facade. (Source: N.Vesho)



Figure 4. Drone photograph of the main facade of the Angonate building. (Source: (Vesho & Nika, 2025))

For the modeling of the structure, the ETABS v.21 software was used, which uses the finite element method (f.e.m), dividing the masonry panels into small square fractions of 1x1m. A 1×1 m mesh size was adopted to achieve a balance between computational efficiency and numerical accuracy.

The walls were modeled according to the simple "shell thick model", with thicknesses corresponding to the dimensions measured during the field survey process, specifically 100 and 80 cm. The foundations were modeled as a continuous beam, connected with needle joints every 1 m and the presence of springs to create the cooperation of the foundation structure. While the roof is modeled as a sloping base with wooden beam elements. Stone masonry structures have large seismic loads due to the weight of the materials used. Initially, we created the model in ETABS, as follows. A shell-thick modeling approach was selected to realistically represent the in-plane and out-of-plane behavior of thick masonry walls. The foundations were assumed fixed at the base level. Dead loads included the self-weight of masonry and roof components, while live and seismic loads were assigned according to Eurocode 8 and Albanian Technical Codes.

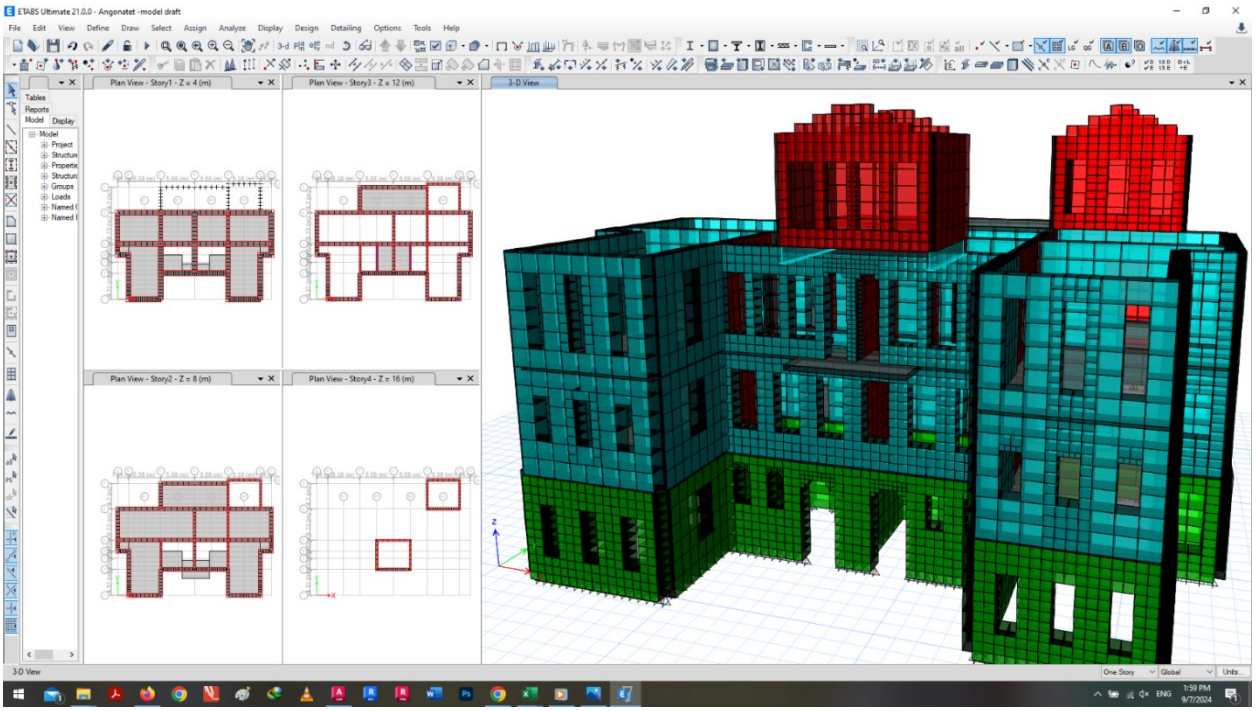
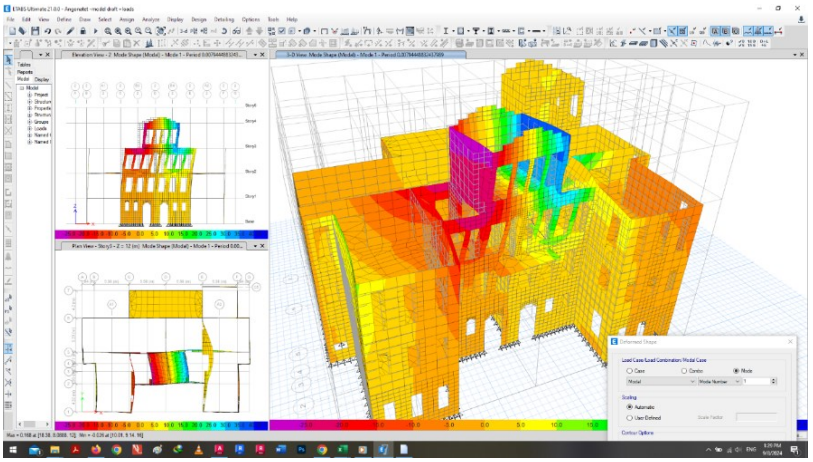


Figure 5. 3D modeling in ETABS according to f.e.m. Building plans and axonometric views. (Source: Author, ETABS v.21)

For the case study, the material parameters of the masonry, slabs and cover during the work on creating the model in ETABS were taken into account the current conditions of the object and the assessment made during the field visits. We have also based ourselves on the results obtained from the literature for similar concrete cases for these typologies of objects. Modal analysis determines the natural frequencies, mode shapes and periods of a structure. These are critical for understanding how the building will react to dynamic loads such as earthquakes or wind. Three modes have been generated for our object. Modal analysis identifies the first important forms of modal vibration, periods and natural frequencies, the latter presented in Table 1. Through this analysis, a basic determination of the seismic performance of the structure is provided. In order to better analyze and have more achieved results, inter-story displacements and drifts are studied.



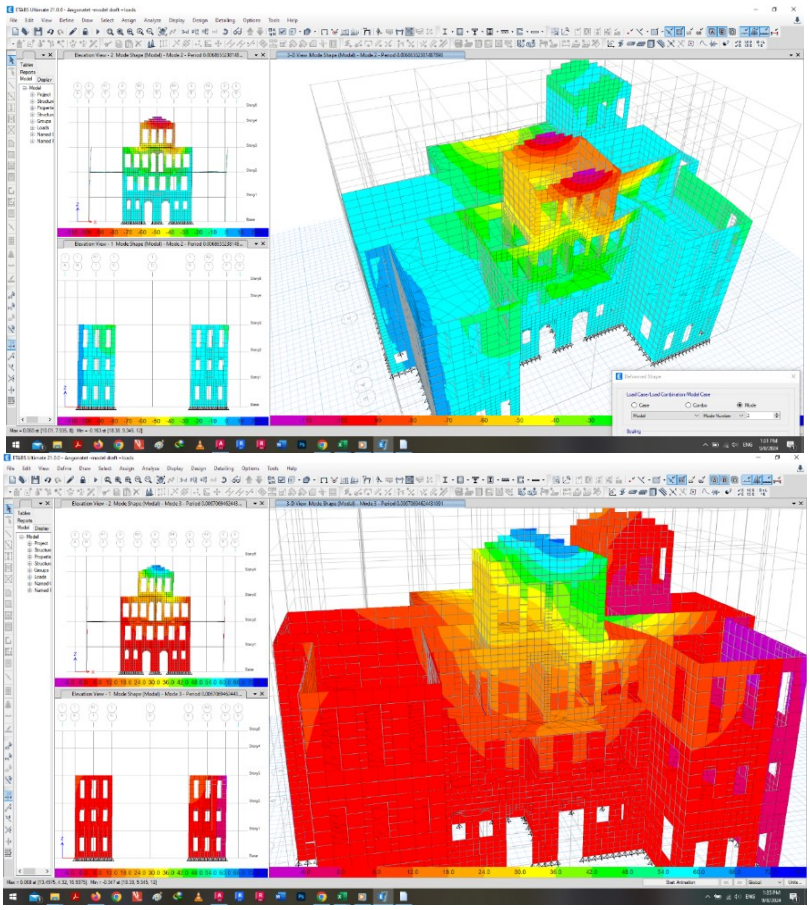


Figure 6. Seismic vibration modes; first, second and third mode in plan and facade (Source: Author)

Table 1. Modal periods and frequencies. (Source:Author)

Case	Mode	Period	Frequency	CircFreq	Eigenvalue
		sec	cyc/sec	rad/sec	rad²/sec²
Modal	1	0.008	125.873	790.8861	625500.8072
Modal	2	0.007	145.655	915.1793	837553.1587
Modal	3	0.007	149.099	936.8176	877627.2222
Modal	4	0.006	155.856	979.2716	958972.859
Modal	5	0.006	157.708	990.9072	981897.1234
Modal	6	0.006	162.002	1017.8883	1036096.62
Modal	7	0.006	166.828	1048.2127	1098749.765
Modal	8	0.006	177.933	1117.9847	1249889.817

4. RESULTS AND DISCUSSIONS

The period for mode 1 (as shown in Fig. 6) is very short. This indicates that the structure is quite stiff, thus indicating that it resists significant deformations during low-frequency dynamic loadings such as seismic events. The deformed shape shows the displacement contours, with the areas near the roof (especially the “tower”) experiencing the highest deformation (red areas), indicating that this part of the building is most responsive to lateral forces in mode 1. The walls, especially at the lower levels, experience much less displacement (yellow to green colors). The extremely short modal periods indicate a highly stiff numerical

response of the structure, likely influenced by the large wall thicknesses and the simplified assumptions adopted in the FEM model.

The deformations are concentrated in the upper parts of the building, meaning that the upper floors of the structure are more flexible compared to the lower parts. Although the structure exhibits global stiffness, the concentration of deformations in the upper levels indicates local vulnerability mechanisms, especially in the roof and tower areas.

The period for mode 2 is also short. This indicates stiffness, usually for buildings with many symmetrical elements like this one. The deformation is also more complex in the dome area and the upper structures, which still show significant displacements (red areas), but the displacement at the lower levels remains minimal (blue and green colors).

Mode 2 involves rotation around a vertical axis, which means that different parts of the building move in opposite directions, especially the dome part, which may be twisted. Regarding the distribution of the seismic load (Fig.7), a large concentration is observed in the foundation of the building, while regarding the displacements of the mezzanine floor they reach their maximum in the upper area, especially in the roof (tower) part.

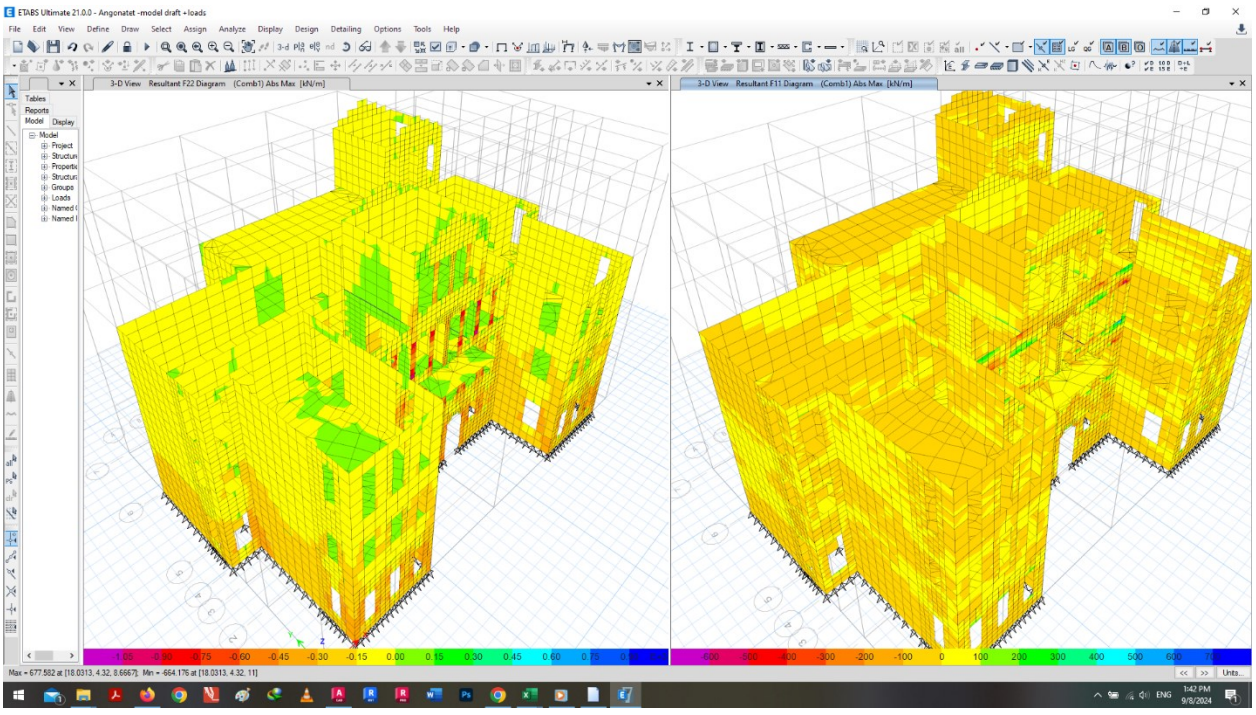


Figure 7. Seismic load distribution according to the first load combination COMB1. (Source:Author)

Proposals for “seismic retrofit” interventions.

To strengthen the structure and improve its performance during seismic activities, taking into account the weaknesses observed in the modal analysis, including the larger displacements in the upper parts, several measures can be taken. All proposed interventions follow the principles of minimum intervention, reversibility, and material compatibility recommended for heritage structures.

The upper levels, especially the dome, which has larger deformations, need to be improved in stiffness. An effective way to achieve this is to reinforce the dome with materials that increase its stiffness. Another method can be to add steel frames or additional concrete reinforcements that can provide the necessary stiffness. Also, modern materials such as fiber-reinforced polymers (FRP) can be used to strengthen these parts without adding much weight. Another method to strengthen the upper levels is to place steel braces or diagonal reinforcements. They can be placed in the walls under the dome to help distribute seismic forces during an earthquake, reducing large deformations.

Mode 2 analysis shows signs of torsional deformation, where different parts of the structure rotate in opposite directions. This is usually due to uneven distribution of mass or stiffness in the building. To reduce torsional effects, it is important to ensure that the mass of the building is distributed symmetrically. Any areas with excessive mass or stiffness concentrations should be adjusted to minimize torsional movement during earthquakes. Adding retaining walls in critical areas can help resist torsion. These are vertical walls of reinforced concrete that provide stiffness and help transfer horizontal forces to the foundation. By placing retaining walls in peripheral parts of the building or in areas of large deformation, torsional movement can be reduced. Fiber Reinforced Polymers (FRP) can improve both the strength and ductility of existing structural elements. FRP can be wrapped around beams and walls to increase their load-bearing capacity without adding much weight. This is particularly useful for preserving the building's historical elements, while also ensuring earthquake resistance. The model does not fully account for material degradation, discontinuities, and nonlinear cracking behavior typical of historic masonry.

5. CONCLUSIONS AND RECOMMENDATIONS

The restoration of a historic building should aim to preserve authentic and original elements. For historic buildings, structural interventions should be as minimally invasive as possible, maintaining a balance between restoration and protection of original features.

Given that Gjirokastra is in an active seismic zone, it is essential to take measures to reinforce the structure against earthquakes. For the Angonate House, this could include adding steel or concrete reinforcements, while preserving the appearance and integrity of the building. Based on the modal and seismic analyses performed using ETABS software, issues were noted with stiffness, deformations and displacements in the upper part of the structure, and torsion.

The Angonate House is composed of two main buildings and an additional part. The typology used is stone masonry, which has the function of bearing loads and maintaining stability. As can be seen from the images above, from the modal analysis, almost 60% of the masonry has lost its bearing capacity. There are areas with large cracks in the masonry due to high stress concentrations. Also, the additional building part affects the increase in stress in the main structures. To solve this problem, we suggest that an anti-seismic joint be placed between the additional and the main buildings.

Also, to avoid subsidence in this area, there is a need for foundation reinforcement. Another problematic part is the socles. All the socles have problems with stability, where one of the socles in the habitable building has fallen and two socles in the other building, which is uninhabitable, have also been destroyed.

Therefore, it is necessary to intervene to prevent the collapse of other slabs and to repair those that have collapsed. The slabs that are irreparable can be replaced with steel frames hidden/captured in the masonry. Another solution could be to intervene with stilts, a traditional method.

From the analyses carried out, another problem found is the displacements in the roof section, which is partially destroyed. For this problem, we propose dismantling the roof and replacing it with a new supporting structure, trusses with wood or steel material. While regarding the tiles, we suggest replacing them with authentic tiles, so that the original characteristics of the house are preserved. The study is limited by the absence of in-situ mechanical testing and the use of linear elastic FEM assumptions. Future studies should include nonlinear analysis, experimental material testing, and validation through ambient vibration monitoring.

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Future Heritage by Design:
New Design Approaches to Heritage Reuse

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Abstract

The conversation around architectural history has undergone a substantial alteration due to the growing demands of urbanization, climatic change, and sociocultural change. Heritage, which was once thought of as a field of conservation and preservation, is now being reexamined as an active and dynamic part of modern design practice. Adaptive reuse has become a crucial tactic in this changing environment, allowing ancient buildings to be transformed while retaining their cultural relevance. This essay investigates the idea of "future heritage by design," looking at how cutting-edge design strategies are reinventing how historic structures are used in the twenty-first century.

The study emphasizes the importance of adaptive reuse in bridging the past and future as it critically examines the relationship between sustainability, architectural innovation, and heritage conservation. The study examines how new approaches—like digital technologies, participatory design, and circular economy principles—are changing the practice of legacy reuse through a thorough analysis of academic literature and theoretical frameworks. The paradigm shift from static preservation to dynamic transformation—where heritage structures are viewed as dynamic entities capable of accepting new functions and meanings rather than as frozen artifacts—is given special attention.

The results of this study indicate that hybridity, adaptability, and multidisciplinary integration are becoming more and more characteristics of modern heritage reuse. Innovative approaches that promote user participation, challenge conventional ideas of authenticity, and contrast old and contemporary aspects are being used by architects and designers. Adaptive reuse is acknowledged as a crucial strategy for lowering environmental impact and fostering resource efficiency, and sustainability has emerged as a major concern.

In the end, this essay makes the case that the notion of "future heritage" signifies a fundamental change in how cultural heritage is understood. Instead of concentrating only on

preservation, it highlights how design influences how historic surroundings may develop in the future. The study highlights the potential of adaptive reuse as a revolutionary and sustainable design strategy and adds to ongoing discussions in architecture and urbanism by putting forth a comprehensive and forward-looking framework.

Keywords: *adaptive reuse, heritage conservation, future heritage, design innovation, cultural identity*

1. INTRODUCTION

Architectural discourse has traditionally revolved around the link between the past and present. Buildings have levels of meaning that go beyond their physical existence because they are tangible representations of cultural ideals. However, the function of heritage architecture is changing significantly in the modern era, which is marked by fast urban growth and environmental difficulties. Historic buildings are increasingly seen as resources that can aid in future development rather than only as things to be preserved.

One of the most important tactics in this change is adaptive reuse. It entails transforming old structures for new purposes while preserving its cultural and historical relevance. This strategy is part of a larger movement in architectural thought that prioritizes resilience, sustainability, and cultural continuity. Adaptive reuse provides a more ecologically conscious and culturally aware option than destruction and new building.

Building on this change, the idea of "future heritage by design" proposes that heritage should be actively shaped through design in addition to being preserved. By presenting the notion that modification might increase rather than decrease heritage value, this viewpoint challenges conventional conservation methods, which frequently place an emphasis on authenticity and little interference.

The purpose of this research is to examine how new design strategies are redefining heritage reuse in modern architecture. It aims to comprehend how designers strike a balance between innovation and preservation, how technology developments impact design procedures, and how social and environmental factors influence adaptive reuse tactics. The study advances knowledge of the changing role of heritage in the built environment by tackling these issues.

2. THEORETICAL BACKGROUND AND LITERATURE REVIEW

The literature on architecture and urban studies has addressed the idea of adaptive reuse in great detail. It is widely understood to be the act of adapting already-existing structures to new uses in order to prolong their lifespan and maintain their cultural importance. Beyond this technical description, however, adaptive reuse is becoming more widely acknowledged as a complicated and diverse process with aspects related to culture, society, the economy, and the environment.

In the past, authenticity, integrity, and little intervention were the guiding ideals for heritage building conservation. Conservation methods, influenced by charters like the Venice Charter, sought to prevent historic buildings from being altered. Even while these ideas are still crucial, modern realities like urbanization, financial strains, and shifting social demands have put them to the test.

Scholars have advocated for a more adaptable and dynamic approach to heritage conservation in recent years. Adaptive reuse is thought to be a means of balancing development and preservation, enabling historic structures to continue to be useful in contemporary settings. This strategy is in line with the idea of sustainable development, which aims to strike a balance between social, economic, and environmental factors.

One of the main claims made in the literature is that adaptive reuse lessens the environmental impact of building, which promotes sustainability. Reusing existing buildings lowers waste and the demand for new materials because they contain substantial amounts of embodied energy. Additionally, adaptive reuse promotes the circular economy's tenets of recycling and reusing resources rather than throwing them away.

The contribution adaptive reuse makes to cultural continuity is another significant feature. Heritage structures provide people a sense of identity and belonging by acting as physical reminders of the past. Designers can create places that satisfy modern needs while preserving cultural heritage by repurposing existing structures. The idea of future heritage is based on this dual role of innovation and preservation.

The significance of interdisciplinary approaches in heritage reuse is further shown by recent studies. Adaptive reuse projects are shaped by engineers, architects, urban planners, historians, and community stakeholders. This cooperative approach guarantees that all viewpoints are taken into account, resulting in more comprehensive and long-lasting results.

3. METHODOLOGY

This research adopts a qualitative and interpretative methodological approach, aiming to explore the evolving design strategies associated with heritage reuse through a critical synthesis of existing knowledge. Rather than relying on primary empirical data, the study is grounded in an extensive review and analysis of academic literature, theoretical models, and interdisciplinary perspectives related to adaptive reuse, architectural conservation, and sustainable design. This approach is particularly suitable for examining complex and conceptually driven topics such as “future heritage,” where the objective is not to measure quantifiable variables but to understand emerging paradigms, design philosophies, and conceptual frameworks.

The methodological framework is structured around three main components: literature review, comparative analysis, and interpretative synthesis. The literature review forms the foundation of the research and involves the systematic examination of peer-reviewed journal articles, academic books, conference proceedings, and policy documents. Sources were

selected based on their relevance to key themes such as adaptive reuse, sustainability, circular economy, digital technologies in architecture, and participatory design. Priority was given to recent publications in order to capture current debates and innovations in the field, while also incorporating seminal works that have shaped the theoretical foundations of heritage conservation.

Following the literature review, a comparative analytical approach was employed to identify similarities, differences, and evolving trends across various theoretical perspectives. This stage involved examining how different authors conceptualize adaptive reuse, how design approaches have shifted over time, and how contemporary practices respond to broader socio-environmental challenges. By comparing diverse viewpoints, the research is able to highlight the multidimensional nature of heritage reuse and the increasing convergence of architectural, environmental, and social considerations.

The final stage of the methodology consists of interpretative synthesis, through which the findings of the literature review and comparative analysis are integrated into a coherent conceptual framework. This process involves critically reflecting on the identified themes and drawing connections between them in order to articulate a comprehensive understanding of "future heritage by design." The interpretative nature of this stage allows the research to go beyond descriptive analysis and contribute to theoretical development, proposing new ways of thinking about the relationship between heritage, design, and future urban development.

In addition, the study adopts an interdisciplinary perspective, recognizing that heritage reuse cannot be fully understood within the boundaries of a single discipline. Insights from architecture, urban planning, cultural studies, environmental science, and digital innovation are combined to provide a holistic view of the subject. This interdisciplinary approach reflects the complexity of adaptive reuse projects, which often require collaboration between multiple stakeholders, including architects, engineers, policymakers, and local communities.

Although this research does not include detailed empirical case studies, it draws on generalized observations from documented projects and established practices in order to support its arguments. This allows for a broader conceptual exploration while maintaining relevance to real-world applications. The absence of primary data collection is acknowledged as a limitation; however, the depth and breadth of the literature analysis compensate for this by providing a robust theoretical foundation.

Overall, the chosen methodology enables a comprehensive and critical exploration of contemporary heritage reuse practices. By focusing on conceptual analysis and theoretical synthesis, the research contributes to a deeper understanding of how design approaches are evolving and how they can shape the future of heritage in a rapidly changing world.

4. EMERGING DESIGN APPROACHES IN HERITAGE REUSE

The transition from preservation to transformation is one of the most important advancements in heritage reuse. Modern conservation strategies acknowledge the necessity

for adaptation and change, whereas older conservation strategies prioritized the preservation of historic fabric. This change reflects a more comprehensive view of legacy as a dynamic, ever-evolving concept.

New architectural features that contrast with the existing structure are frequently incorporated by designers in modern projects. This method, which is sometimes called hybridization, fosters communication between the past and the present. Historic masonry is complemented with glass, steel, and other contemporary elements, creating combinations that are both inventive and reverent. These designs welcome the presence of several architectural languages and recognize the passage of time rather than trying to recreate the past.

The growing emphasis on user-centered design is another significant trend. Adaptive reuse initiatives now take user needs and experiences into account in addition to architectural considerations. This entails interacting with communities, learning about their beliefs, and incorporating their suggestions into the design process. Heritage reuse initiatives are guaranteed to be inclusive and socially meaningful through the use of participatory design techniques.

Additionally, digital technologies are revolutionizing the reuse of heritage. More precise documentation and research of historic structures are made possible by technologies like virtual reality, 3D scanning, and Building Information Modeling (BIM). With the use of these technologies, designers can evaluate structural conditions, investigate various design possibilities, and visualize interventions prior to implementation. Additionally, by offering immersive and interactive experiences of historical buildings, digital platforms improve public participation.

Sustainability is still a major consideration in modern design methodologies. Adaptive reuse is inherently sustainable, as it reduces the need for new construction and preserves existing resources. To improve the environmental performance of repurposed buildings, designers are also incorporating renewable energy systems, increasing energy efficiency, and utilizing sustainable materials. This all-encompassing strategy guarantees that heritage reuse advances more general sustainability objectives.

5. CHALLENGES AND LIMITATIONS

Despite its many advantages, adaptive reuse presents several challenges. One of the most significant is the tension between preserving historical authenticity and introducing new interventions. While innovation is necessary, it must be carefully balanced to avoid compromising the integrity of the heritage asset.

Regulatory frameworks can also pose challenges. Heritage buildings are often subject to strict conservation laws that limit the extent of modifications. Navigating these regulations requires collaboration between designers, authorities, and stakeholders.

Economic considerations are another important factor. Adaptive reuse projects can be costly,

particularly when extensive repairs or structural reinforcements are required. Ensuring financial viability often involves creative solutions, such as mixed-use developments or public-private partnerships.

Technical challenges are also common, as older buildings may have structural issues, outdated systems, or hazardous materials. Addressing these issues requires specialized knowledge and innovative engineering solutions.

6. DISCUSSION: TOWARDS THE CONCEPT OF FUTURE HERITAGE

The concept of *future heritage* introduces a critical shift in contemporary heritage discourse by redefining heritage not merely as a legacy inherited from the past, but as an active and evolving process shaped by present-day interventions and future aspirations. Rather than understanding heritage as a static collection of preserved artifacts, buildings, or cultural practices, this perspective emphasizes its dynamic nature and its capacity to generate new meanings across time.

Within the field of architecture, future heritage highlights the role of design as a mediating instrument between historical continuity and contemporary transformation. Architects are not only responsible for safeguarding existing cultural values but also for creating conditions through which heritage can remain relevant and meaningful for future generations. In this sense, architectural interventions become acts of cultural production, contributing to the ongoing construction of collective memory and identity.

This approach challenges traditional conservation paradigms that have often prioritized material authenticity and physical preservation above all else. While these principles remain important, contemporary heritage theory increasingly recognizes that excessive emphasis on permanence may limit the capacity of heritage sites to respond to social, economic, and environmental change. Future heritage therefore advocates for adaptive strategies that balance preservation with innovation, allowing historic structures to evolve while maintaining their cultural significance.

The notion of future heritage is closely connected to the concept of adaptive reuse, which enables existing buildings to acquire new functions without erasing their historical character. Through adaptive interventions, heritage becomes a living resource capable of supporting contemporary urban life while retaining traces of its past. Such practices demonstrate that continuity is not achieved through immobility but through carefully managed transformation.

Furthermore, future heritage aligns with broader discussions on sustainability. Reusing and adapting existing buildings reduces material consumption, minimizes demolition waste, and extends the life cycle of the built environment. In this context, heritage conservation becomes not only a cultural responsibility but also an ecological strategy. The preservation of embodied energy and material resources reinforces the relevance of heritage within contemporary sustainable development agendas.

Another important dimension of future heritage is inclusivity. Traditional heritage frameworks

have frequently privileged dominant historical narratives, often excluding marginalized communities and alternative forms of cultural expression. Future-oriented approaches encourage more participatory and democratic processes, recognizing multiple interpretations of heritage and promoting broader social engagement in decision-making. Heritage is thus understood as a shared cultural resource whose value is continuously negotiated among diverse stakeholders.

Ultimately, future heritage represents a conceptual framework that bridges conservation and innovation, memory and change, tradition and contemporary design. It calls for a rethinking of architectural practice, where heritage is no longer perceived as a constraint on creativity but as a catalyst for experimentation, adaptation, and cultural continuity. By embracing transformation while respecting historical significance, future heritage offers a sustainable and forward-looking vision for the preservation and development of the built environment.

7. CONCLUSION

Adaptive reuse has emerged as one of the most significant approaches in contemporary architectural practice, offering an effective response to the environmental, cultural, and social challenges facing the built environment in the twenty-first century. Rather than relying on demolition and replacement, adaptive reuse promotes the transformation of existing structures into spaces capable of accommodating new functions and contemporary demands while preserving their historical and cultural significance. As such, it represents a sustainable and culturally sensitive alternative that contributes to the long-term resilience of cities and communities.

This paper has examined the evolving relationship between heritage conservation and architectural design, focusing on the ways in which adaptive reuse is reshaping traditional understandings of preservation. Through the analysis of emerging design approaches, it has demonstrated that heritage is no longer perceived solely as a static legacy of the past but increasingly as a dynamic and evolving resource that can generate new cultural, social, and economic value. Contemporary interventions within historic structures reveal that preservation and transformation are not necessarily opposing objectives; rather, they can coexist through carefully considered design strategies that respect historical significance while embracing innovation.

The discussion has highlighted several key themes that characterize current approaches to heritage reuse. Transformation has been identified as a fundamental aspect of adaptive reuse, allowing buildings to respond to changing societal needs while maintaining continuity with their historical context. Hybridity has emerged as an important design strategy through which old and new elements are integrated, creating meaningful dialogues between different temporal layers of the built environment. Similarly, user engagement and participatory processes have been recognized as essential components in ensuring that reused heritage remains socially relevant and responsive to the needs of diverse communities. Technological innovation, including digital documentation, simulation tools, and advanced construction

techniques, further expands the possibilities for sensitive and sustainable interventions in historic structures.

At the same time, the study has acknowledged the complexities and limitations associated with adaptive reuse projects. Balancing conservation requirements with contemporary functional demands often involves difficult decisions regarding authenticity, material intervention, and economic feasibility. Regulatory constraints, technical challenges, and competing stakeholder interests can complicate the design process and influence project outcomes. These challenges demonstrate the necessity of interdisciplinary collaboration among architects, conservation specialists, planners, engineers, policymakers, and local communities. Only through such collaborative approaches can adaptive reuse projects successfully negotiate the tensions between preservation and development.

A central argument developed throughout this research is that the future of heritage lies not in the passive protection of historic fabric alone, but in its capacity to adapt, evolve, and remain meaningful within changing social and environmental contexts. This understanding is encapsulated in the concept of *future heritage by design*, which proposes a shift from heritage as an object of preservation toward heritage as an ongoing process of cultural production. Within this framework, architecture assumes a critical role in shaping how future generations will experience, interpret, and value inherited environments. Design becomes not only a tool for conservation but also a mechanism for generating new forms of heritage significance.

Furthermore, the concept of future heritage by design aligns closely with broader objectives of sustainable development. By extending the life cycle of existing buildings, reducing material consumption, and preserving embodied energy, adaptive reuse contributes to environmental sustainability while simultaneously strengthening cultural continuity. It encourages a more responsible use of resources and promotes urban regeneration strategies that prioritize both ecological resilience and cultural identity. In this sense, heritage conservation becomes an active contributor to sustainable urban futures rather than a separate or isolated concern.

Ultimately, this research suggests that adaptive reuse should be understood not merely as a technical intervention but as a broader cultural and architectural practice that redefines the relationship between past, present, and future. The concept of future heritage by design challenges conventional preservation paradigms by embracing change as an integral component of heritage value. Through adaptive, innovative, and inclusive design approaches, architects have the opportunity to transform historic buildings into living assets that continue to serve society while preserving collective memory. In doing so, they contribute to the creation of more sustainable, resilient, and culturally rich urban environments capable of responding to the challenges and opportunities of the future.

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SESSION V

Spaces of Connection: Art and Design for an Interspecies and Interdisciplinary Environment

Art, architecture and interdisciplinary design: Art–architecture relationships / Cross-disciplinary practice / Experimental design / Research-based creative processes.

Human and non-human environments: Interspecies design / Ecological relationships / Human–environment interaction / Alternative spatial narratives.

Critical and speculative approaches: Critical design / Speculative design / Spatial perception / Relational art and architecture.

H Adaptive and post-industrial environments: Adaptive reuse / post-industrial landscapes / Urban regeneration / Transformation of existing spaces.

Representation, heritage and material experimentation: Urban photography / Digital heritage interpretation / Textile upcycling / Material reuse / New cultural narratives.

Heritage as Narrative:
Building City Image Through Adaptive Reuse in Durrës

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Abstract

Adaptive reuse is a powerful approach to breathe new life into our cultural heritage. It helps giving a fresh meaning to the past, manage historical sites more effectively, and boost tourism. This study examines how a modern urban narrative can be constructed using the cultural heritage of the city of Durrës, Albania. It also explores how historical spaces can be transformed into vivid spaces for cultural events and analyses adaptive reuse strategies. Durrës, as one of the oldest cities in Albania, is characterized by a complex historical identity where ancient, medieval, and modern eras coexist amid urban expansion and the demands of seasonal tourism. This paper aims to change this perspective by considering heritage as an active space that merge social interaction and cultural experiences rather than being just a static object to be preserved. Through some case studies, the project investigates the possibility of converting historical buildings and spaces in Durrës for short-long-term cultural applications. This may include performances, art exhibitions, multimedia installations, and cultural events inspired by the local history and identity. Artist *Ibrahim Kodra* is cited as an example of how regional art can be connected to broader global narratives. Using a methodology that includes historical and spatial analysis, case studies, and assessment of potential, the research argues that an adaptive reuse strategy oriented towards cultural narrative and visitor experience can contribute to sustainable urban regeneration. This approach can help redefine the image of Durrës as a city with a vibrant cultural identity, moving beyond its current stereotype as a primarily seasonal tourist destination.

Keywords: *Cultural Tourism, Urban Regeneration, Cultural Heritage, Historical Buildings, Identity*

1. INTRODUCTION

Durrës, as one of the most ancient cities in the history of Albania, represents a complex urban palimpsest where several historical layers are intertwined, from Illyrian, Roman, Byzantine, Ottoman, Italian, Socialist and Post-Socialist. These historical stratifications create a rich, but fragmented historical identity that is incompatible within the contemporary life of the city. (MANAHASA EDMOND, 2023) Being a city oriented towards archaeological and maritime tourism, its development aligned with this orientation has created an imbalance between urban space, culture and economy.

This has resulted in many iconic historical buildings and structures being left in neglect or not being given the appropriate level of attention. It is worth mentioning the *"Royal Villa of King Zog,"* a 1930s building that served as the summer residence of King Zog at the time, located on the hill of Durrës in a strategically advantageous position, offering panoramic views of the entire city from all angles. (Semini, Çapeli, & Nepravishta, 2014) (Figure 1)



Figure 1. The "Royal Villa of King Zog," *in 1941 and 2024*. Source: Author

Another equally important building is the former *"Hotel Vollga,"* also built in the 1930s, which has gone through many transformations throughout its history, changing its name several times, from the Italian occupation until 1940 as *"Hotel dei Dogi,"* then during the German occupation as *"Majestic,"* and later during the communist period when it took the name *"Vollga."* (Channel, Top Channel, 2016). (Figure 2)



Figure 2. Former *"Hotel Vollga" in 1938 and 2025*. Source: Author

Another important archeological site worth mentioning is the *Byzantine Forum*, which dates back to the Byzantine period from which it takes its name. (Figure 3)



Figure 3. Byzantine Forum in 2015 and in 2026. Source: Author

The forum is a public space and was built during the reign of the Roman Emperor Anastas in the late 6th century and served as the administrative, commercial, and social center of the city. (Hoti, 2003) These three sites are collectively characterized by the tension between heritage conservation and urban functionality.

Following the collapse of the communist period and the indiscriminate, unregulated urban transformation throughout the city, the priority shifted toward the development of new contemporary architectural buildings. This led to a significant number of historic buildings remaining static, isolated, deterioating and economically inactive. This paper explains how adaptive reuse can help address this issue by putting these buildings as an active component of urban life. This research reconceptualizes heritage not simply as a matter of object preservation, but as a narrative medium which identity, memory, and cultural continuity are conducted through spatial experience. Heritage spaces can be more vibrant and interesting by using inclusive display strategies that engage users in multi-sensory and interactive ways.

2. LITERATURE REVIEW

Adaptive reuse is a detailed approach that connects heritage conservation with the needs of modern sustainable urban development. (Douglas, 2006) argues that adaptive reuse means giving old buildings a new purpose, while preserving their historical value and character. Also, (Bullen, 2011) mentions that this approach is profitable for the environment and the economy, especially because it minimizes the demands for new interventions. Research has shown that the historic buildings in city of Durrës, particularly those from the early 20th century that belong to Italian period, have a lot of architectural and cultural value. These buildings are not solely old, they are part of the city's identity and its path toward modernization. (Semini, Çapeli, & Nepravishta, 2014).

However, many buildings have been pushed to the margins of contemporary urban life overlooked, neglected, vandalised, or left underutilized because they no longer integrate easily into the way people live, work, and move though cities today. In response, (Manahasa & Dorel, 2021) suggest a considerate alternative that explains how adaptive reuse offers a sustainable solution to preserve these objects, while simultaneously introducing new functions that make their long-term maintenance applicable. This proposal for the *"Royal Villa of King Zog"* demonstrates how historic buildings can be revitalised through cultural programs and spatial transformations. It is worth mentioning that such proposal, aimed at preserving structures of such importance with distinguished architecture that reflects the history of their respective periods, has a meaningful impact on the image they forecast in the city. As Durrës has gone through several different periods of transition, these valuable buildings have long been victims of vandalism, negatively impacting not only the historical and cultural values they carry, but also the image reflected by their neglected condition. Beyond the revitalization of these buildings, recent literature highlights the role of experiences and narratives in heritage spaces.

This is because tourists and visitors need to seek interactive things and immersive environments, rather than just passive observations. It is worth mentioning that immersive exhibitions, such as the Van Gogh Immersive Experience, have redefined how art is presented and consumed. (Shiyang, 2022) (Figure 4)



Figure 4. Immersive Van Gogh Exhibit in 2021. Source: What's Up Fort Worth

A case like this exhibition was held for the first time in Albania, where, as part of the Dutch Cultural Week, the exhibition of some of Van Gogh's works was opened at the Digital Arts Gallery in Korçë, Albania. (Channel, Top Channel, 2024) This marked the beginning of many other exhibitions of this kind in the city of Korça, promoting art while also attracting both local and international visitors. (Figure 5)



Figure 5. Immersive Van Gogh Exhibit in 2024, Korçë. Source: Top Channel

This approach opens new possibilities also for cities like Durrës to reinterpret their heritage through art. One of the famous artists originally from Durres, is the painter Ibrahim Kodra, who could serve as a starting point for this immersive art initiative. The essential movements in his painting are Cubism and Abstractionism. He is the founder of a Neo-Cubism that was also recognized by Pablo Picasso, who studied, experimented with, and refined it, creating his own metaphysical-geometric aesthetic. His paintings consist of elegant geometric figures, understood both as a synthesis of reality and as a return to the primordial simplicity of human-created art, qualities that are echoed in the ancestral culture of Primitivism. In Ibrahim Kodra's artistic exploration, Pablo Picasso's Cubism had a profound influence, particularly following

their friendship in Rome in 1948. Indeed, several Spanish newspapers that wrote about Picasso referred to Kodra as "the last Post-Cubist in Europe," reflecting the impact of Picasso's legacy on his work. (Lleshi, 2018) The work of Ibrahim Kodra, as a local famous artist, provides a strong foundation for this strategy, as his artistic legacy connects local culture with international modernism.

3. METHODOLOGY

The Methodology of this research focuses on qualitative and interdisciplinary framework. This integrates historical inquiry, spatial and urban analysis, and case study evaluation in order to investigate the potential of adaptive reuse as a tool for building a new image of contemporary urban narrative in the city of Durres. The study focuses primarily on the examination of archival documents and historical literature with the aim of understanding the development and significance of the selected buildings, particularly the *"Royal Villa of King Zog."* This because the villa is a remarkable iconic landmark positioned in the heart of the city. Particular emphasis is placed also on the former Hotel Vollga, which both with the villa represent significant moments in the modernization of the city during the early twentieth century. Also, the Byzantine Forum reflects a deeper archaeological stratification of the urban landscape. The relationship between heritage sites and the urban fabric is analysed with a focus on accessibility, visibility, and their integration into social life. By examining how accessible, visible and well-connected a heritage site is, and how well it integrates with the everyday functions of the city, this paper closely examines the movement patterns, infrastructure and spatial order of the city. The aim is to understand where these sites stand in relation to everyday urban life: whether they function as active, inhabited places, stand as overlooked or neglected

areas, or remain detached from the world around them. By mapping these relationships, the study reveals the extension to which heritage sites truly belong to, or remain excluded from the social and economic rhythms of the city. In parallel, the methodology includes a comparative case study approach of three selected cases: *"Royal Villa of King Zog"* and *"Hotel Vollga,"* that represent enclosed spaces, whereas the *"Byzantine Forum"* constitutes as an open public space. Each case study is evaluated based on its current condition, historical value, and its potential for adaptive reuse. Furthermore, the methodology takes an interpretive, design-focused approach. Instead of considering heritage as something rigid and subtle, it should be treated like a narrative tool that can create deep, immersive and expressive experiences. Ibrahim Kodra's work plays an important role here by acting as a bridge between the local identity of Durrës and the wider world of art. His influence shows how site-specific stories can be built through visual and spatial ideas that speak to both locals and international visitors. Also, this approach brings in a speculative, forward-looking side. Adaptive reuse isn't just about practical or technical adjustments anymore, it becomes a creative and cultural strategy, one that reshapes how we connect the past with the present. However, although the three sites can embrace this strategy, the methods in which adaptive reuse will be applied are

different. This is because the former *"Hotel Vollga"* and *"The Royal Villa"* are buildings that have deteriorated and have been vandalized over the years, one more than the other, therefore, the intervention techniques used for their revitalization are also different. This includes restoration, conservation, reinforcement and rehabilitation façades. It is worth mentioning that the Byzantine Forum is an archaeological site and the methodology of applying adaptive reuse can be possible through tools like AR/VR and digital projections to recreate the historical appearance of the forum without interfering in it.

In the end, the proposed ideas and scenarios are assessed using a qualitative framework. This helps keeping the research harmonious, balancing preservation with fresh thinking. By weaving together theory, analysis, art and design, the study builds a complete method. It shows that adaptive reuse can spark urban regeneration and become a powerful way to shape a vibrant, coherent identity for the city of Durrës.

4. RESULTS & DISCUSSIONS

Adaptive reuse gives new life to old buildings and forgotten spaces, and for a city like Durrës with its rich and layered history, it's one of the most efficient and sustainable moves a place could make. Instead of letting historic structures sit empty or crumble into relics of the past, this approach turns them into lively, useful parts of the community, while still honouring their character and aesthetic. They stop being dusty memories and start becoming places where people can gather, work and create. This doesn't just only keep the damage away, but sparks real economic energy, drawing visitors, hosting local culture and making room for artist and small businesses. Eventually, these buildings aren't just rescued, they are brought back into the city's daily life, where history and present finally can merge.

One of the main things of adaptive reuse, is that it doesn't just bring old buildings back to life, it helps foster the 'urban activation'. More than simply attracting visitors, it is about creating opportunities for people to connect, share experiences, and strengthen the sense of community. When an old building or public space is given a new function, transforming into a museum, art gallery, cultural centre, or a venue for performances, it becomes a vibrant meeting point drawing in all kinds of people (tourists, local residents, artists, students, and creative entrepreneurs) In doing so, it becomes a real driver of social and economic power, bringing positive change to the whole neighbourhood about it.

In this context, art becomes an essential bridge between a space and the people who move through it. Immersive art, in particular, has taken on growing importance in recent years because it offers multisensory experiences that indeed draw visitors in. Using digital tools like 360-degree projections, virtual reality and interactive installations, historic spaces can turn into environments where visitors are no longer just watching from the sideliners, they become part of a living history. This method does not just deepen the experience, it also makes culture more appealing, especially to younger audience, who expect more dynamic and practical ways to connect with it.

An inspiring example of this approach is the model of immersive art exhibitions, which have achieved considerable success in various cities around the world. Based on this model, one can imagine the transformation of Durrës' urban spaces through the integration of the art of Ibrahim Kodra, one of the most important figures of Albanian modern art. His works, defined by abstract forms and bold colours, lend themselves beautifully to digital reimagining and the construction of immersive environments. By projecting images onto walls, floors, and ceilings, and interweaving them together with sounds and storytelling, a unique experience can be created that draws the visitor deep into Kodra's artistic universe. (Figure 6)



Figure 6. Immersive "Ibrahim Kodra Experience" in former "Hotel Vollga". Source: AI

A key element of this strategy is to adapt interventions to the nature of the space. Interior spaces, such as the *"Royal Villa"*, present very favourable conditions for the development of comprehensive permanent exhibitions. These spaces allow for better control of lighting, acoustics and technological infrastructure, enabling the creation of sustainable and functional experiences throughout the year. A museum of this type would serve not only as a tourist attraction, but also as an important tool for the cultural education of the community and for the promotion of Albanian art in a modern approach. (Figure 7)



Figure 7. Interiors of the "Royal Villa of King Zog". Source: Visit Albania

From another perspective, spaces such as the former *"Hotel Vollga"* present great opportunities for adaptability and transformation. Being less constrained by defined functions, these spaces can be used for a wide range of activities, such as temporary exhibitions, artistic performances, festivals and multimedia installations. This flexible nature helps to maintain the interest of the public, enabling the creation of a dynamic and constantly evolving cultural program. In addition, these spaces can function as an important platform for young artists, offering them a space to experiment and present their creativity. (Figure 8)



Figure 8. Interiors of the former “Hotel Vollga” in 2025. Source: durresalbania_

Open spaces, such as the Byzantine Forum, require careful treatment due to their archaeological importance. However, this does not exclude the possibility of their activation. On the contrary, through temporary and non-invasive interventions, such as projections on existing structures, outdoor performances or temporary installations, cultural activities can be organized that preserve the integrity of the site. Open spaces, such as the Byzantine Forum, require careful treatment due to their archaeological importance. However, this does not exclude the possibility of their activation. On the contrary, through temporary and non-invasive interventions, such as projections on existing structures, outdoor performances or temporary installations, cultural activities can be organized that preserve the integrity of the site. This has not only reinforced its role as a landmark for the city, but has also given it an additional function beyond its primary one as a tourist and cultural attraction. Considering this example, it could be possibble applying the same approach to other spaces that are equally important to the city's historical identity. From a broader perspective, when a city incorporates art into its adaptive restoration strategies, it helps create an integrated urban narrative. This narrative reveals how the city’s historical layers, from antiquity, through the medieval periods, and into the modern day, are unified through a shared contemporary language. As a result, visitors no longer perceive the city simply as merely a collection of historical fragments. Instead, they experience it as a dynamic, living organism that is constantly growing and changing. This perspective becomes especially important for cities like Durrës, which, despite having a rich and complex heritage, often struggle to communicate its history to visitors in a meaningful way. Through this perspective, visitors no longer feel like they are just looking at ruins; they feel connected to a place that is still very much alive.

Furthermore, this approach encourages a fundamental shift in the way a country thinks about tourism. Instead of relying almost exclusively on beaches and standard recreational activities, a city can begin to move towards offering richer cultural and emotional experiences. Visitors are no longer drawn to simply see monuments, but to truly experience them through stories, art, and technology. This not only increases the quality of what is offered to visitors, but also gives the city a distinct advantage in an increasingly crowded global marketplace. Finally, adaptive reuse supported by art plays an important role in strengthening local identity. By placing figures like Ibrahim Kodra at the heart of a city's narrative, a community deepens its connection to its cultural heritage and presents it in a fresh and engaging way. This not only strengthens the pride within the community, but also helps building a distinctive and sustainable image for the city on the international stage. In this context, art and heritage are no longer seen as relics of the past, but as powerful engines for development in the future.

5. CONCLUSIONS AND RECOMMENDATIONS

This study aimed to examine whether adaptive reuse could do more than simply save old buildings in Durrës. What has been proven is that heritage, when treated as an active narrative rather than a frozen object, carries real potential to reshape the way the city is perceived and experienced. The three case studies, the *"Royal Villa of King Zog",* the former *"Hotel Vollga"* and the Byzantine Forum, each showed different opportunities, but also a common problem: they have been neglected by the rapid and often unplanned growth of the city. None of them currently function as part of everyday urban life, and their isolation weakens both their preservation and the city's cultural image. What became clear during the research is that preservation alone is not enough. Keeping a building standing does not automatically make it meaningful to people. The more useful question is: what happens inside it and who is invited inside? This is where the idea of narrative becomes practical. By connecting adaptive reuse to a cultural story, a story that draws on local figures like Ibrahim Kodra and on inclusive, visitor-centred experiences, these spaces can move from being neglected remnants to active sites of memory, art, and social exchange. The comparison between the enclosed buildings and the open Byzantine Forum also showed that no single strategy works everywhere. Indoor spaces like the Villa and the Volga Hotel offer control over lighting, technology, and security, making them suitable for comprehensive permanent or semi-permanent exhibitions. The Forum, due to its archaeological sensitivity, requires lighter and more temporary interventions. But even there, projections or seasonal performances can activate the space without damaging it. The Durrës Amphitheatre already proves that archaeological sites can successfully host cultural events, so there is no reason why the same principle should not be applied more widely. Another important finding is that this approach changes the logic of tourism in Durrës. The city is currently known almost exclusively as a summer beach destination, which leaves it empty and economically fragile for most of the year. Cultural reuse based on inclusive art and local heritage narratives offers a way to extend the tourist season and attract a different type of visitor, one interested in history, art and experiences rather than just sun and sea. This

change would not replace coastal tourism, but would balance it, making the city more resilient.

Finally, the research confirmed that adaptive reuse works best when it is not treated as a purely technical or architectural problem. It is also a cultural and social problem. The most successful transformations examined were those where the new function respected the old structure but was not afraid to add something contemporary. Ibrahim Kodra's work is a good example of how local identity can be connected to international art movements without losing its specificity. His neo-cubist language, with its geometric clarity and strong colours, translates well to digital and immersive formats, and since he was from Durrës, his name carries authenticity.

Based on these conclusions, several recommendations emerge. First, local authorities and heritage institutions need to move away from a purely conservative mindset. Protecting a building is not the same as activating it. A change in policy is needed so that adaptive reuse proposals are assessed not only on their respect for the historic structure, but also on their ability to generate public use, cultural programming, and economic activity. Second, any reuse strategy must begin with a clear narrative framework. In the case of Durrës, the figure of Ibrahim Kodra provides a ready-made cultural anchor. A comprehensive permanent exhibition of his work in the *"Royal Villa"*, combined with rotating temporary installations in the former *"Vollga Hotel,"* would create a coherent cultural route. The Byzantine Forum could be connected to this route through summer evening projections or sound installations that refer to the visual language of Kodra without physical alterations.

Third, investments should go into lightweight and reversible technological infrastructure. Projection mapping, spatial audio, and interactive digital installations will not require drilling into ancient walls or permanent construction. This makes them suitable even for sensitive archaeological sites. The success of the comprehensive Van Gogh exhibition in Korça shows that the Albanian public responds positively to this format, and there is no reason why Durrës should not expect something similar.

Fourth, the city should develop a year-round cultural calendar that activates these spaces during all seasons, not just in summer. Winter and spring events, exhibitions, workshops, artist residencies, film screenings, would maintain visibility and foot traffic, supporting nearby businesses and reducing the seasonal decline that currently defines Durrës.

Fifth, collaboration with artists, curators, and technologists should be formalized through open calls or residency programs. Young Albanian artists, in particular, need platforms to experiment with digital and inclusive media. Linking their work to heritage sites would give them visibility, keeping cultural programming fresh and locally based. Sixth, a feasibility study should be conducted for each of the three sites, focusing on structural safety, accessibility, and the cost of installing digital equipment. *"The Royal Villa,"* for example, requires roof repairs and upgraded electrical systems before any public use. Without basic infrastructure, even the best cultural program will fail.

Seventh, community engagement should be part of the process. Local residents often feel

disconnected from heritage sites that are fenced off or left empty. Public consultations, school visits, and participatory design workshops would help build a sense of ownership and reduce the risk of vandalism, which has already damaged several historic buildings in Durrës.

Eighth, funding should be sought from multiple sources: national cultural funds, EU heritage programmes and private sponsors interested in corporate social responsibility. The inclusive arts model could also generate revenue through ticket sales, memberships and merchandise, which would help cover maintenance costs and reduce dependence on state budgets.

Lastly, Durrës needs a clear branding strategy that communicates its transition from a seasonal beach town to a year-round cultural destination. This is not about inventing a false identity. It is about telling a real story, one with layers of history, forgotten buildings given new life, and a local artist whose work speaks to the world. If done well, this narrative could set Durrës apart from other Adriatic coastal cities and give it a lasting cultural footprint.

Ultimately, adaptive reuse is not a quick fix. It requires patience, coordination, and a willingness to experiment. But the alternative, leaving these buildings to decay behind fences, is far more costly, both financially and culturally. This research has shown that Durrës has the raw materials for a meaningful transformation. What is missing is not the potential, but a deliberate strategy to unlock it.

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The Extraordinary Everyday

Children's Spatial Agency as Anti Monumental Practice

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Abstract

This research explores how the design of children's daily environments are designed to encourage familiarity and repetition as promoters for imagination, agency and growth. The study investigates how children perceive and modify their spatial surroundings through play and everyday activities using a phenomenological and theoretical approach. Throughout this ongoing process of re-engagement, the ordinary becomes extraordinary and the stable architecture is reimagined as a changing landscape of exploration.

According to this study design innovation does not arise from novelty or spectacle, but rather from renewal through the perception of the familiar as something genuinely new. Utilising the notion of anti-monumentality, this research proposes that children's spatial interactions represent a form of ephemeral architecture. The difference between traditional monuments and the new ones is that the new ones try to keep memory alive in a permanent way. The child's anti-monument whether a cushion fort, a ritualised threshold or a claimed corner, emphasises on the process of making rather than on the finished final outcome.

Utilising a phenomenological and theoretical framework, this research shows how children perceive and change their surroundings through play and everyday activities. Children become co-creators of space instead of only users thanks to these gestures. The fields of design research and child development can be effectively analysed within a shared analytical framework. Spatial design questions the tension between architectural permanence and the dynamic spatial practices of play, thereby enhancing an interdisciplinary approach.

It concludes that the spontaneous spatial reinvention characteristic of children can inform a more empathic and resilient approach to urbanism, where the ordinary is understood as a site of continuous and radical renewal.

Keywords: *Participatory design, transformation, design anthropology, co-creation, spatial semiotic*

INTRODUCTION

Innovation is frequently linked to novelty, spectacle and large-scale interventions that clearly alter the urban environment in discussions of architecture and urban design today. The experiences of space are often more dramatic when it comes not to the great gestures, but to the small, repetitive interactions that make up everyday life. This paper begins with viewing the ordinary spaces: hallways, corners, thresholds, living rooms and other transitional zones. Their meanings go further than their purpose when these environments are inhabited by children. Children can reinterpret the built environment through play, routine and improvisation by using personal agency, imagination and exploration.

Repetition is the trait of every day environment of a child; the same routes, objects and spatial arrangements that they face daily. Instead of creating familiarity, as the repetition is a generative state in which children play games with space, they reinvent the space over and over again. Minor actions such as reorganizing the objects, claiming neglected niche, creating games based on the specific features of the space, demonstrate a kind of spatial practice which provokes the traditional architecture. During such situations, architecture is no longer a fixed structure but a changeable environment that is influenced by interaction. What seems to be ordinary from the eyes of an adult, becomes extraordinary through the child's capacity to reinterpret and reinhabit space.

Within this context, this paper presents these practices through the context of anti-monumentality, suggesting that the spatial practices of children can be used as an inverse of the traditional architectural monuments. Children's spatial constructions are changeable, fluid and process-oriented, whereas monuments strive for permanence, stability and the preservation of memory in solid form.

An example of children building temporary architectural constructions is a cushion fort, a popular step that makes a stage, or the repetition of a doorway into a border between the fantasy worlds. These actions do not have permanency as their value, but they are product of the processes of creating, destroying and reforming space. As a result, the interaction of children with space may be interpreted as a continuous dialogue of space, which values experience and change, more than already determined design results.

Based on this, the main research question that will guide this study is:

How do children's everyday spatial practices in domestic environments challenge conventional architectural notions of permanence and design authority?

This study uses a phenomenological and theoretical method to answer this topic. Through embodied engagement, it investigates how children view and interact with their surroundings. It focuses on the small things people do on a regular basis that affect how they use space and senses.

The goal is to understand how interactions between the user and the intended environment give rise to spatial agency. Daily habits and recurrent acts exhibit these relationships. The child is viewed in this framework as a co-author of space rather than as a passive occupant. The results indicate that children's everyday spatial creativity can inform more adaptable

approaches in architecture and urban design. A better understanding of temporary and process-based spatial practices allows designers to reconsider relationships between permanence and change, authority and participation, structure and play. In this way, the everyday setting is no longer seen as given, but it is dynamic and constantly redefined through use.

LITERATURE REVIEW

Children and Space

The relationship between children and space has been explored across psychology, urban studies and architecture. The developmental theories early flourished focus on the importance of the spatial interaction in cognitive development and the creation of mental structures. Jean Piaget, for example is one of the most important figures that stated that children develop knowledge by actively interacting with the environment. Space should not be considered a place where development is formed, but a place where learning and perception occur.

Further philosophers were no longer concerned with cognitive development, but rather the experiential and social aspects of space. As an example, Kevin Lynch, in “The Image of the City”, assumes that people create a mental map of the city, which contains paths, edges, districts, landmarks and nodes. Even though Lynch concentrated primarily on the adult sense of urban settings, his theoretical paradigm offers an effective perspective to view how children perceive the space. Nodes can, in specific instances, be perceived as intuitions of space being heightened. In the case of children, these nodes are not necessarily the monumental points that the planners define, but quite small ordinary places: a corner, the area under a table or a step that is familiar to a child in a courtyard.

On the other hand, the work of Aldo van Eyck has also influenced architectural discourses of everyday environments. Van Eyck believed that cities needed to be planned as systems of human scaled environments that were participatory and imaginative with projects, like of his most famous works, Amsterdam playgrounds. His writings opposed the rigid functionalism of modernist planning, with its focus on ambiguity, play and the significance of intermediate spaces within which children and adults are free to interact.

In spite of these contributions, large part of architectural theory has been historically focused on monumental shapes and form design purposes. Architecture was approached in works like “Towards an Architecture” by Le Corbusier as an order, proportion and rational structure. Likewise, such theoretical considerations as the essay “Structure as Form” by Luigi Moretti, investigated the logic and structural integrity of the architectural space. Although these views have been essential to the architectural theory, they tend to prioritize the view of the architect over the user.

Contrary to this, cultural theorists like Walter Benjamin have focused on the importance of everyday experience and changeability of ordinary space. The thoughts expressed by Benjamin about childhood and wandering around the city show that the city can be

rediscovered with the help of games and reinterpretation.

When taken as a whole, these perspectives suggest that spatial meaning is created during life rather than being determined by design. Particularly, children interact with space in ways that frequently go beyond or change architectural intent.

The Poetics of the Ordinary

"The Poetics of Space" by Gaston Bachelard may be considered as a main focus for a theoretical inquiry diving into the "Extraordinary Everyday". Bachelard does not discuss architecture as the sequence of blueprints, but as the nest of the human soul. For him, the house is our first universe, a space where the imagination can retreat from the overwhelming spectacle of the outside world. This study focuses on Bachelard's concept of the corner as the fundamental unit of anti-monumental design.

According to Bachelard, all corners of a house, all angles of a room are a symbol of imagination. A corner to an architect is a technical necessity, an architectural junction, an intersection of two planes of a monument, but to the inhabitant especially the child, is a place of becoming, a place where physical boundaries of the room give way to the infinity that the mind can imagine. When a child hides in a corner, they are not just sitting, they are claiming the space, mostly by building a psychological shell. This is what the anti-monument does first, converts a fixed geometrical point into an active location of agency. The corner becomes an active part of the space that children can stay by letting them expand their inner world of imagination.

Another element presented by Bachelard is the phenomenology of the miniature. He states that when we magnify a small area, we do not merely see the smaller version of the world, but we see the more intense version of the same. Being in a room, the macro world of the city disappears, and the miniature world of the textures of the room becomes monumental. According to Bachelard, the values of intimacy do not exist in the huge halls, but in drawers, chests and nooks. To the child, this is his whole world.

From Monument to Everyday Solutions

Despite the fact that modernist theory of architecture has conventionally emphasized order, scale and monumentality, the more recent approaches are placing greater emphasis on the role of everyday spatial practices. Theorists now question the idea that the architectural meaning is primarily formed by the designer or the experience of people who use it.

In urban theory, Aldo Rossi's "The Architecture of the City" emphasized the significance of collective memory within urban form. However, Rossi argues that cities can be created not only of functional planning, but of layers of cultural significance that rise over time. Although the main concern of the analysis by Rossi is related to the monuments and typologies in cities, the emphasis on memory preconditions the understanding of how ordinary places can achieve the status of importance due to their frequent utilization and experience.

Cultural theorists such as Walter Benjamin have used everyday urban life to show how new and unexpected meanings can emerge. Benjamin's ideas about childhood imply that children

often experience urban environments differently from adults. They don't take the roots that were expected of them. Instead, they search for hidden areas, abandoned passages and marginal spaces. Through play and exploration, these kinds of environments allow people to use their imaginations and view things in new ways. They question the idea that space is defined by design, arguing that meaning is derived by daily interactions between people.

Research Gap

Despite the fact that architectural theory, urban perception, and childhood development have all been thoroughly studied, the relationship between these disciplines has not received enough attention. The importance of spatial interaction in children's learning has been repeatedly emphasised by psychological research. In contrast, architectural theory has primarily examined the formal and cultural aspects of the built world. However, children's active reinterpretation and transformation of ordinary architectural places is rarely addressed in their work.

Most architectural discourse still favours the scale of the monument, the building, or the city. On the contrary, the space that organizes the lives of children on a daily basis, the corners, the thresholds, the furniture and the familiar paths are often forgotten or even considered as minor. In addition, theorists like Bachelard and Benjamin have emphasized the possibilities of common spaces, but their writings do not specifically cover how the daily activities of children can be used as a way of spatial production. Therefore, there is still little theoretical knowledge about how children reinvent everyday spaces into meaningful places through routine gestures, play and repetitions.

By shifting the focus toward children's spatial practices, this study conceptualizes everyday play as a form of anti-monumental architecture. Instead of going through big design changes, it investigates how small, everyday spaces can become places of imagination, agency and growth by people interacting with each other every day.

METHODOLOGY

This research adopts a qualitative, observation-based methodology. The study investigates how the child reinterprets the home's spatial dynamics. The goal is to examine the differences between the space the architect designed and the space the child that lives in makes. Direct observation and thematic coding are employed as the primary research tools. The methodology utilises phenomenological approaches to architectural analysis, regarding children's spontaneous spatial behaviours as significant acts of spatial production rather than just play. The research uses observation and coding. The method is based on phenomenological approaches to architectural analysis and sees children's spontaneous movements in space as acts of spatial production rather than play.

Observational Mapping

Over the course of four weeks, the study was conducted in a single domestic environment. Observations were made at three set times every day—morning, lunchtime, and late

afternoon—to take into consideration the shifting spatial activity and light. A non-participatory role was maintained throughout by remaining present but passive so as not to interfere with the child's spontaneous behaviour. Data was collected using field notes and sketches and time-lapse drawings, focusing on repeated activities, spatial transformations and interactions with architectural elements such as thresholds, corners and transitional spaces. (See Figure 1 and 2).

Temporal Changes

Documenting how natural light and shadow changes the room throughout the day (See Figure 5).

Object Tracking

The movement of loose parts (furniture, cushions and textiles) was tracked to see how the child constructed temporary structures out of daily domestic objects. (See Figure 1 and Figure 4).

Tools of Analysis

The observational data was analysed using two tools for architectural analysis. Each tool was selected to highlight on a different aspect of the child's spatial behaviour. They constitute the analytical framework of the study.

Sectional Study

The room was analysed in section. Particular attention was given to transitional spaces such as window sills, doorways. Rather than treating them as empty gaps or purely technical details, this study approaches them as threshold spaces. These are the most significant ways that spaces interact. (See Figure 3) The sectional drawings were compared to the field notes of the observations to determine the architectural elements that had the most repeated child interaction. Then, keeping spatial evidence in mind, the three coding categories were created.

Thematic Categorization

To recognise and label the child's spatial behaviours, a coding system was created. Three categories were used to classify the observed behaviours: Claiming, Hiding and Transforming. (See Figure 4) Throughout the whole observational record, each category was applied consistently. The behaviours were reviewed and categorised on two separate occasions, one week apart. When categories overlapped, the field notes were re-examined to resolve the uncertainty. This process ensured that the three categories were used consistently to classify behaviour.

The Theory of the Blanket Fort

According to the methodology framework, the Blanket Fort is the ideal form of anti-monumental architecture. The research demonstrates that the user, rather than the architect, is the genuine designer of the space by examining how minor, transient alterations can entirely change the permanent arrangement of a room. This method lets us see the amazing potential that is hidden inside. (Figure 1)

Ordinary everyday objects do not only apply to domestic environment but can be extended to the public and urban places where modular and temporary interventions, modelled after the forts of children, create flexible and interactive urban forms (see Figure 7).

Coding the Small Actions

Thematic coding in this research acts as a link between child development and architectural theories. Children's behaviours are not examined through a psychological lens. Instead, they are treated as spatial interventions. Analysis of the observation notes revealed three common themes. Each theme becoming a challenge to the architect's intended design.

Claiming

The category of the Claiming includes the instances during which a child establishes their territorial boundaries without using the walls that are permanent. At home this often takes the form of bordering behaviours, including organization of a line of objects. Toys, for example, or change of floor surfaces and pieces of furniture arrangements to state a transition and mark the beginning of a new space. This rather small action undermines the traditional floor designs by showing that walls can be imaginary and temporary. It is a perfect example of soft architecture, where the child occupies the space through the act of presence and not through building (see Figure 4).

Hiding

The code for "Hiding" is perhaps the most profound design act in a child's behaviour. Whereas the architect mostly favours visibility and free plan designs, children actively seek the opposite. Based on this analytic code, concealment is a complicated spatial production. The secret place may be under a dining table or a sofa and a wall. In any case, the child is in need of a nest as Bachelard claimed. By coding these moments, the research highlights a basic human need for concealing space, a need that monumental modernism often fails to provide. (See Figure 4).

Transforming

The code for "Transforming" identifies the Anti Monumental gesture of re-authoring a programmed object. This can be translated when a staircase becomes a mountain, or a bathtub becomes a sea. This kind of transformations is purest, most immediate as well as speculative design. By coding these changes in affordance, shows that the child is not a passive user of a house, but a co-author who opposes the single application proposed by the designer.

These three codes, Claiming, Hiding and Transforming allowed this research to redefine the shared lived house and rediscover it again through the eyes of a child. In this way, the everyday domestic space becomes not an architectural closed container, but a field of play, routine and reinvention. As a result, coding provides analysis wider than observation, with the means to provide a structured way of understanding how the production of the "Extraordinary Everyday" is made by small spatial rituals.

To conclude, the results can be added to a wider discussion of the concept of spatial agency

in children and its consequences on architectural design. Children do not just inhabit ready-made spaces, but they redefine and temporarily recreate them to the extent that they interact with. In this pattern of claiming, concealing and transforming, the work describes how the temporally created spatial practices undermine the idea of architectural permanence by creating an equivalent layer of lived architecture, which is played out in the ordinary realms of everyday life.

RESULTS AND DISCUSSIONS

Innovation through Repetition

The current discussion illustrates that novelty in the case of children is a cognitive, but not a material need. By repetition, the daily practice of living in a familiar threshold, the child finds out newness. When a child turns a regular hallway into a river or a mountain pass, they will be involved in a speculative design act and therefore criticize the functional definition of a hallway that the architect gave, by exploring its multimodal temporalities (See Figure 1). This observation comes in line with the notion of everyday tactical interventions as developed by Certeau, where the users creatively re-engineer space in their way, as opposed to following the prescribed plan.

As a result, repetition turns into a mechanism of spatial agency. It allows the children to explore, reinterpret and acquire the built environment constantly, demonstrating that architectural meaning is formed with each use rather than being fixed.

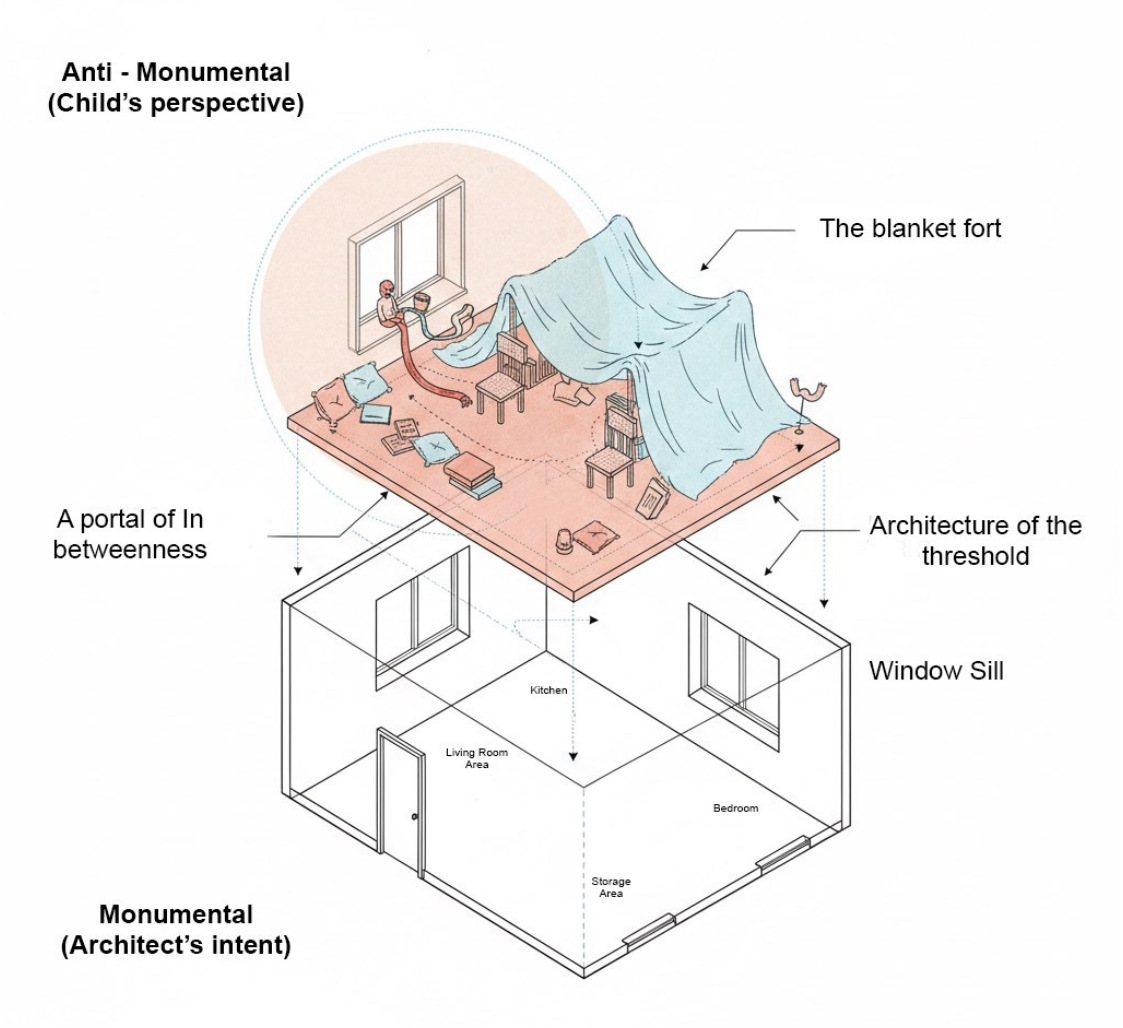


Figure 1: Child vs Architect

This diagram illustrates the opposition of fluid spatial utilisation of the child and the predefined floor plan of the architect. The child redefines architecture as a negotiation process and not a form of end-state facilitated by temporally deployed objects like furniture and blankets.

The Anti-Monument as Process

As case studies, a "blanket fort" or a "cardboard castle" are taken into consideration. These structures are characterized by a great level of technical complexity as they are essentially ephemeral. The child builds a new interiority by using the so-called loose parts; blankets, pillows, chairs, shadows, etc. (See Figure 4). This relation, very humanly and instinctive, shows how the creative mind of a child and the material world create a temporal sanctuary. The fort is not meant to be a monument, but rather constructed to be demolished, it's worth is entirely in the act of its building. This strategy reflects the idea proposed by Moretti, structure as form, according to which the material substance is not solid and plays an active role in the formation of meaning.

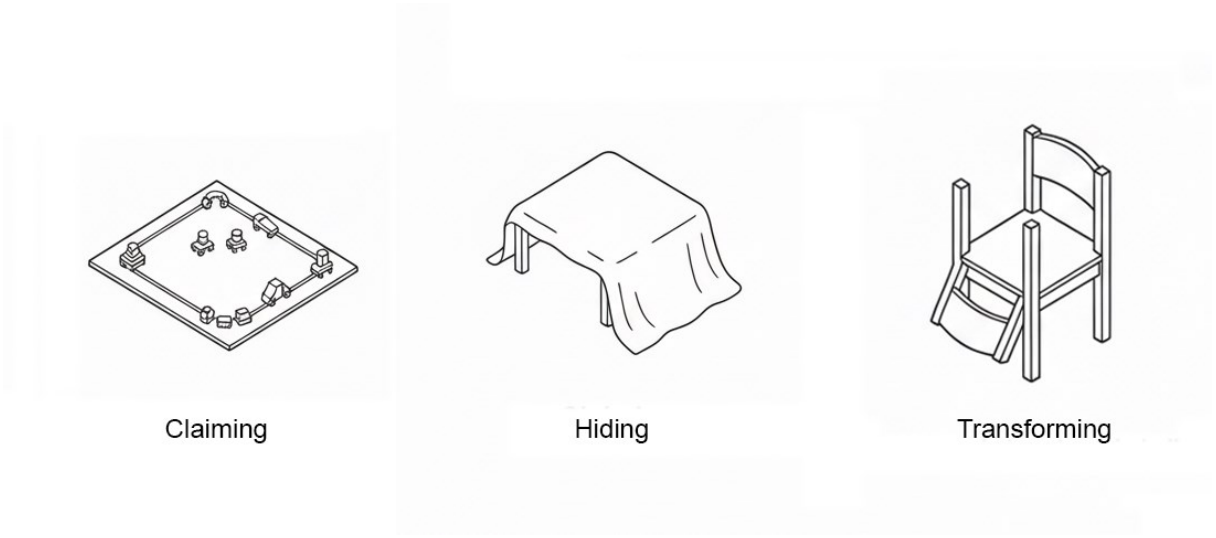


Figure 4: Taxonomy of Child Spatial Behaviour

The taxonomy of the child's spatial behaviours, such as making new structures out of objects, hiding to build nests and claiming space. These behaviours demonstrate the process of reconstruction of architectural meaning in the process of active use.

The Architecture of the Threshold

When the monument is the centre, the ultimate, earthy weight of a building, then the threshold is the border. In the traditional architectural practice, doorways, window sills and porch steps are often marginalized down to the technicality of a detail. They are regarded as intermediate spaces, simple openings which can help in transferring bodies between the external and the internal. Nonetheless, the threshold can be uncovered as the most cognitive dense space of the home when a phenomenological lens is imposed on the daily life of a child (See Figure 3). This observation supports the citations that Bachelard made about intimate spaces and affirms the concept introduced by Lynch of the presence of nodes as the focus of the human experience.

The Window Sill Getaway

Consider the window sill. To an architect is a practical solution, intended to either discharge water, or to support glazing. But the child perceives it in a completely different aspect. (See Figure 3). The ways in which the child sets up toys, stones, or discovers objects on the sill are speculative acts of design, which creates narrative connections between the inner and outer worlds. This confirms the idea of Huizinga about play as an area of experimentation and imagination, which explains how the ordinary components of architecture can gain extraordinary meaning due to simple interventions.

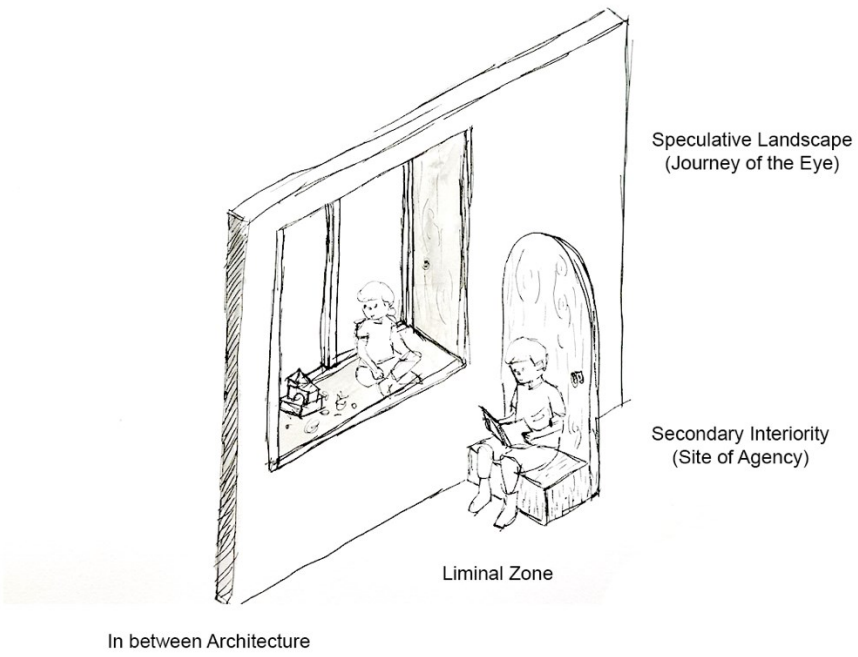


Figure 3: In between spaces

Sectional description of doorways and windows as occupied spaces between the inside and the outside. According to a child, such junctions create new spatial impressions and superimposing interiors.

A Portal of In Betweenness

The doorway is perhaps the most interesting getaway of the house. Doors are created by architects to ensure privacy and sound control, whereas children use them as borders. Sitting in between a doorway is a constant inhabiting a room by being not here either there. This in-betweenness effect is a direct challenge to the tendency of the architect to divide space into functional areas (e.g., The Bedroom vs. “The Hallway”). (see Figure 2).

When a child builds a toll booth or a border crossing in a door, they make a radical reconstruction of the city structure and prove that there is not only physical blocking, but also social and imaginative one. This micro action causes the adult to stop and act into the spatial creativity logic of the child. The monumental of the interior solution then collapses to become a relational art of living. The child shows that innovation does not require the destruction of walls but can also be achieved by playing negotiating the openness of the in between.

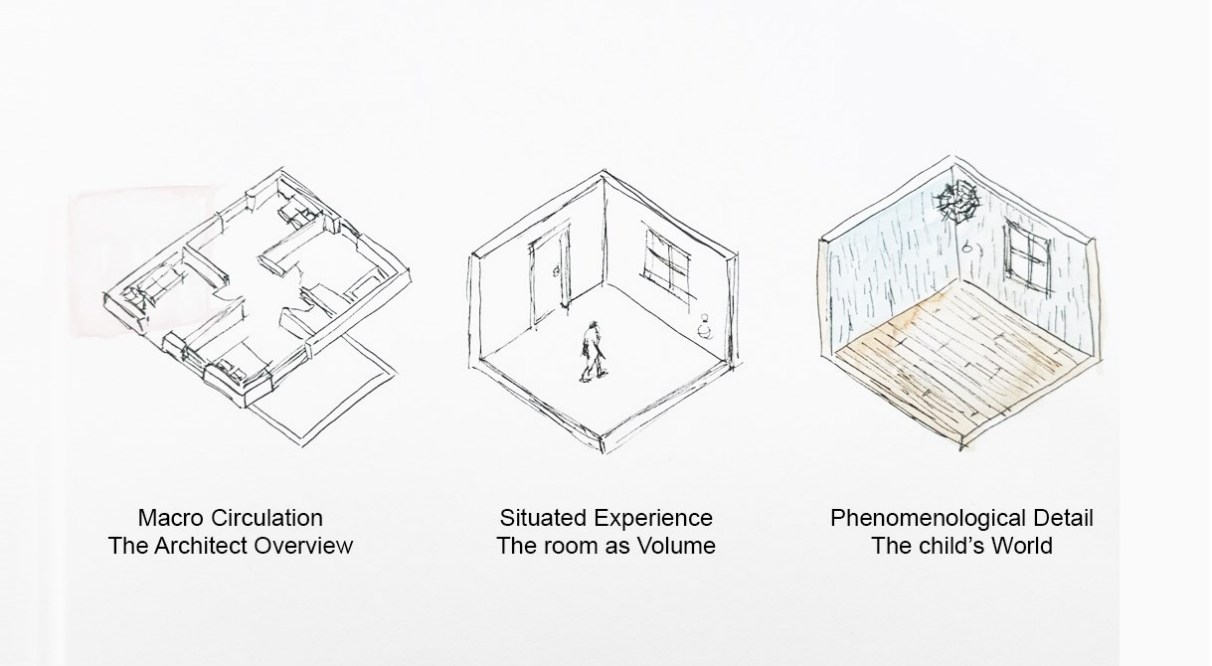


Figure 2: From Abstraction to Phenomenology

A multi-scale diagram, which follows how one can go from architectural abstraction to phenomenological specificity. Starting with the traditional floor plan, then the spatial volume of the room and finally on to the experiential viewpoint of the child where seemingly insignificant niches come together to create the complex micro-gnomic worlds.

From Circulation to Stasis

The subversion of the threshold is brought to the final stage by turning circulation space into a place of stasis. According to the traditional theory of architecture, corridors and stairways are designed to be used for the act of movement, rather than presence and being. However, the child always chooses these so called non spaces to have the strongest moments of play. The child disrupts the flow that is production oriented, which defines domestic circulation by sitting in the stairs or lying sprawling in a landing. Such a practice of remaining in a space that dictates passing is an excellent indicator of modern-day concerns with efficiency. The Extraordinary Everyday is seeing into the small acts of moments of pause. By understanding the threshold agency to design, a way out of the strict, functionalist paths can be taken and a more porous, empathic architecture can be sought that will allow the spontaneous creation of the anti-monuments of the inhabitant.

The view from the fixed point

There is a big, almost shocking irony in the fact that the study of movement and play is done in a physical stillness. Although the Extraordinary Everyday was imagined through the prism of the kinetic agency of a child, it is as well informative to assume the perspective is mostly by being still. As soon as the horizon is surrounded by four walls there is a radical compression of scale of perception. The furniture of the room, the fixed installations, the ceiling, they all become the Monuments of the room. The Anti Monuments of the micro-scale take the centre

stage in their place. You start to observe how the dust shows under a single ray of sunshine, or how the afternoon light rewrites the texture of a linen curtain, making a map of light and shadow (see Figure 6). To the child, the physical distance which is frequently restricted by the boundaries set by the environment or the adult, so their main attention to details is their main survival strategy of imagination. In case the child is unable to modify the monumental construction of the house, they get to dive into the smallest, almost undetectable elements of the house. The floor becomes lava, a knot becomes a stone or the rug becomes a way into a lost forest. Such a notion of fixed-point phenomenology suggests that the most accommodating and sensitive architecture does not necessarily have more square feet, but can have an infinite amount of detail. It is a structure that identifies eye that lingers.

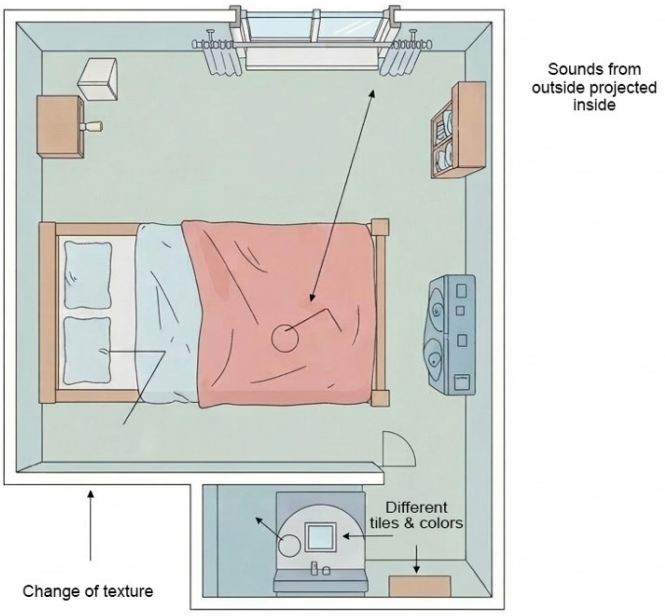


Figure 6: A Fixed Point

A fixed-point sensorial map that accentuate the mood, textural and sound of the room. It demonstrates that the restricted scope of movement may in fact enhance your perception of the space and the way you experience it.

Light and Shadow

Time makes itself an architectural material developing from a fixed point. In the modern design, buildings are often seen as something that exists in a still form to be photographed in idealised fraction of time. Nevertheless, the feeling of limited mobility proves that a room is a relational system that is constantly changing. The 10.00 AM room with its cool morning blue light has a different functional and psychological perception than the 4.00 PM room, where the long orange shadows of the golden hour stretch across the floor in the walls. (see Figure 5) Children are skilled in moving through this time structure. They do not have to change a hundred rooms when they can live in the hundred separate versions of one room that changes

through the day. They are masters of this changing architecture. Taking their toys to seek the cosiness of a patch of sunshine, or retreating into the shadowy corner as the evening falls. These are time Anti Monuments, they are ephemeral, do not mark the floor plan, yet they constitute an extreme reappropriation of the spatial experience.

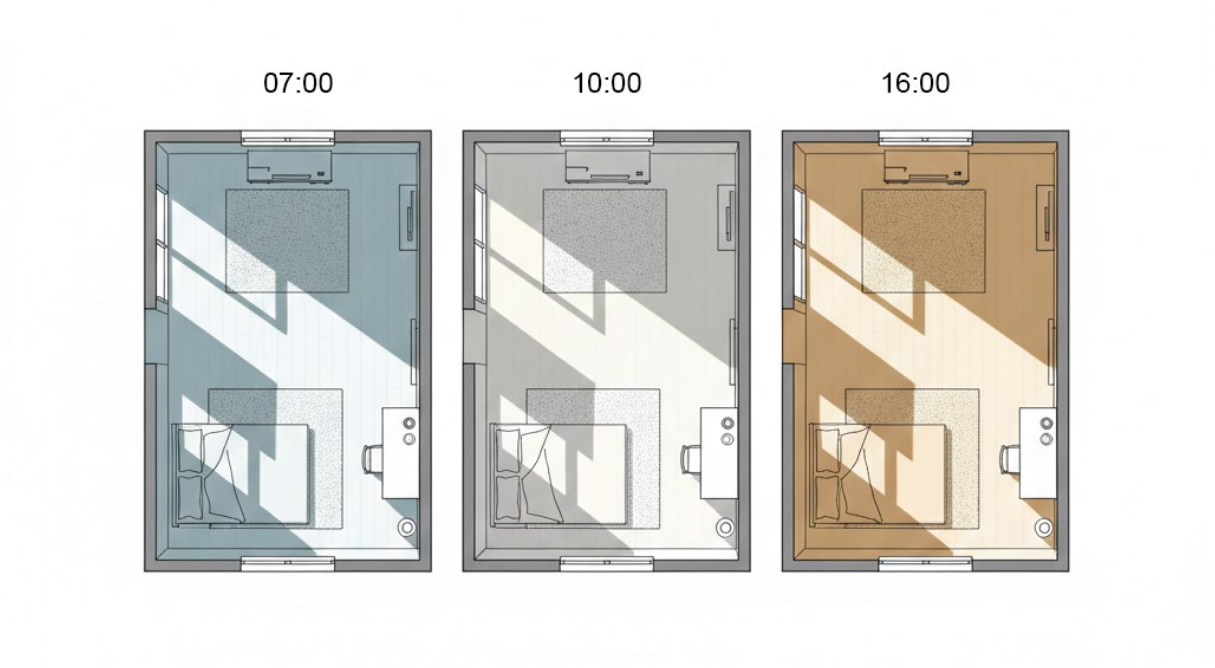


Figure 5: Light and Shadow

A 12-hour experiment on the light that changes the appearance and configuration of the room in each hour of the day. The walls and furniture are the same, yet the light changes and brings new atmosphere and different spaces.

Towards a "Quit" Change

When the extraordinary is to be found within the established limits of a given room, then perhaps the aim of design is not after all to achieve radical change, but to be sensitive to the present state of things. Based on domestic settings it is seen that ephemeral, procedural spatial practices can inform urban design. With the application of Anti Monumental strategies of the child on the scale of a city, an urban space may be envisioned in the context of flexibility and participation, where process becomes prioritised over permanence, similarly to the way the child rethinks their thresholds and corners at home (see Figure 7). The architects can achieve a more robust perception of space by learning through the stillness and concentration of play of the child. They start appreciating the incomplete architecture, which are spaces that do not require a particular productive activity, but rather encourage occupants to observe, to linger, to recreate. The Extraordinary Everyday reminds us that imagination does not need any monument, it only needs a crack in the surface of the ordinary through which a new world can be seen.

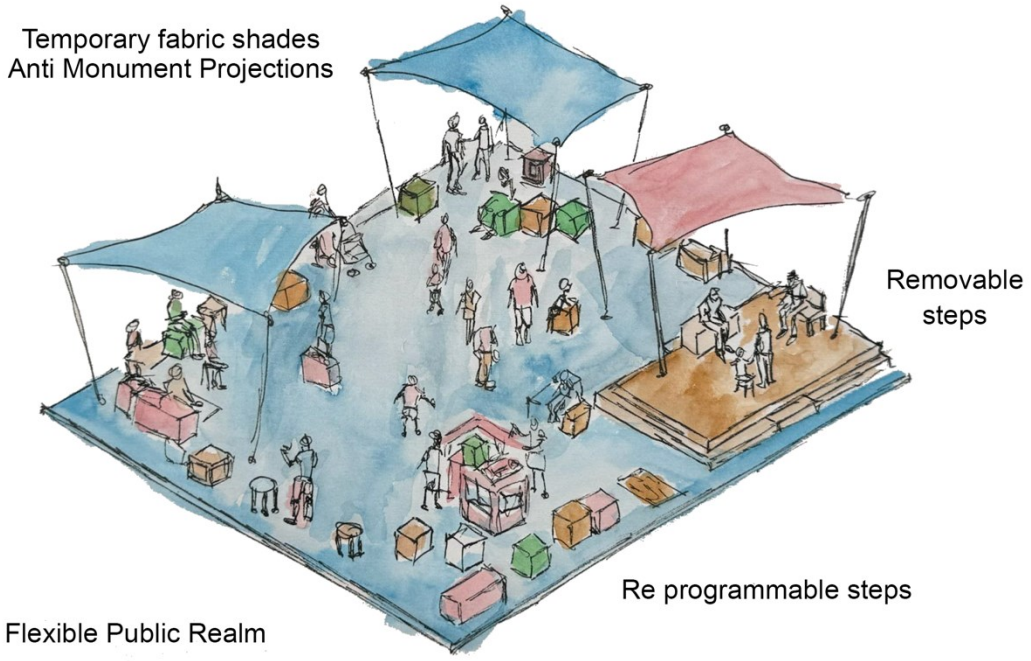


Figure 7: Urban Scaling

The example shows how the impermanent structures of children in domestic environments are reflected in temporary and modular spatial practices, e.g. tents in a bazaar consequently indicating where the concept of anti-monumental could be used in the context of public urban arena.

CONCLUSIONS AND RECOMMENDATIONS

This paper holds the argument that the Extraordinary Everyday does not represent a psychological state but a spatial strategy. When the inflexible stasis of the Monument is contrasted with the flowing, ritualized qualities of the Anti-Monument, new dimension of agency in the architecture field comes into the limelight; something that had been in the shadow before. The ability of the child to rewrite a threshold or even a corner proves that the architect never ends up space, but simply starts it.

Summary of Findings

The conceptual investigation, which is performed on the basis of the thematic coding of play-rituals, suggests that children do not simply inhabit space, they reprogram it. Micro actions like Claiming, Hiding and Transforming, allow the child to disorient singular functional narrative which previously monopolizes the cityscape of the adult. The Fixed Point analysis also indicates that a very detailed spatial perception is caused by no mobility, to obtain the space without moving. These observations imply that the contemporary life innovation must not revolve around macro scale material disturbance, but rather towards micro scale atmospheric perfection. It is the most resilient architecture that has the infinity of detail

needed to enable the inhabitant to find novelty in the familiar.

Limitations and Future Research

This research is limited by the fact that it is carried out in one domestic setting and interaction with one child. Although it is a very informative and very rich study of micro scale spatial agency, it may not be a comprehensive depiction of how children experience different homes, schools or public spaces. Future studies can also look at the way in which anti monumental strategies are formed on a larger scale, in different cultural backgrounds and in urban conditions. The comparative studies can also explain how the space creativity of the child can be addressed through architectural design on various scales.

Recommendations: The Incomplete Framework

In order to make spatial design truly inclusive and cross disciplinary, it is suggested to make the following practice changes:

From Finished Object to Open Framework

The architects can focus on the so-called Incomplete Architecture; structures that provide a solid technical base, but for which skins and interiors can be manipulated by users.

The Movement of the Ephemeral

Anti Monuments temporary building and ritualistic occupations being defined as Anti Monuments, should be taught as a valid type of architectural production in design education.

Designing for the Fixed Point

Urban policy ought to appreciate the fact that, accessibility is not just a movement (ramps and lifts) but also the quality of the stationary experience. Environments should be created to be as stimulating to the resting body as to the moving one.

Final Implications

Finally, the Extraordinary Everyday offers a different perspective. Through the identification of the child as a radical co-author where architecture comes to be a conversational and not monological entity is achieved. The blanket fort of the child or even the fixed-point observation of the researcher bear witness to one unchanging truth; the imagination does not require new buildings; it only demands that the agency shall see what buildings already exist in a new light.

Architecture based on this feature emerges as a survival strategy, but not an aesthetic option by foregrounding renewal instead of production, particularly, in case of the global instability and ecological crisis. The Anti Monument is a reminder that the greatest monuments are those that keep on offering chances of renewal.

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'Liminal Architectural Bodies' in Post-Industrial Kuçova:
From an Ecological Perspective to an Aesthetic realm

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Abstract

This paper explores post-industrial urban landscapes as aesthetic tools for understanding the complexity of sites that are still in transition, meaning they have not yet been deindustrialized, restructured, or gentrified. Starting from the idea of the "Anthropocene" understood as the hierarchical intervention of humans in nature, the research aims to disclose the paradoxes and contradictions of these "in-between nature and human" urban scenarios.

Taking Kuçova, Albania's first oil city, as a case study, we explore the various locations on site where extractive infrastructures are present. Through photographic documentation and interviews with locals, the research speculates on a "hybrid aesthetic" that emerges between human and nonhuman activities, and between past and present. Some of these oil extraction infrastructures (functioning since 1928) are still active today while others are no longer operational.

What is peculiar, however, is that they remain as "liminal architectural bodies" or relics. Although pollution and abandonment continue to shape Kuçova's built environment, this research argues for a shift from purely ecological perspective toward an aesthetic approach. Such a shift opens possibilities not only for remembering Kuçova's industrial past, but also for imagining future scenarios that incorporate, rather than dismiss, these remnants even as an object of aesthetic contemplation.

The paper argues that it is precisely today, when conditions of "transition zones" are still visible in Albania's urban landscapes and when the complexity of history and its human and nonhuman aesthetic and architectural constructions remain materially present that we have the opportunity to think critically about a more sustainable, equal and inclusive future.

This research is part of a broader ongoing project aimed at developing a hybrid design and art platform capable of generating debate and reflection among the inhabitants of Kuçova, positioning them as active agents in shaping the city's vision.

***Keywords**: Liminality; Anthropocene; Hybrid aesthetic; Transitional zones; Sustainable future*

1. INTRODUCTION: THE OIL HISTORY AND ITS POST-INDUSTRIAL REALITY

The main objective of this article is the analysis of the city of Kuçova as a post-industrial city whose landscape characteristics are unique and can open possible scenarios regarding the historical relationship between man and environment concerning the extractive dimension. Historically developed as a strategic center for the oil industry in Albania starting from 1920, and in a period of greater productivity during the socialist regime of Enver Hoxha, today Kuçova, although most of its facilities are operational, is in a state of symbolic and functional suspension. Since 1928, with the intervention of Italians from the company AIPA (Italian Oil Company Albania), Kuçova has been the center for the development of the economy in the national oil production system.

Thanks to the purchase of concessions and the agreement signed with the Albanian government, which expressed the need to attract foreign investments and technologies, a strategic opportunity for oil extraction emerged in Albania. A very important figure who contributed to the discovery of oil, especially in the city of Kuçova, was Stanislav Zuber, a European-ranking scientist in geology and the oil industry. At the request of the Italian company AIPA, the scientist arrived in Albania in 1927 and worked for 20 years tasked with conduction geological studies and analyses to identify oil deposits in Kuçova. The region was characterized by geological peculiarities and had a scarcity of local competitors.

Zuber created detailed geological maps, essential for understanding where the oil deposits, where located. He contributed to the development of the oil industry, making Kuçova one of the most important and wealth cities in Albania. Thanks to his scientific approach and positive evaluations, the prospects for an era of tar and gas discovery in southen Albania opened up. The city grew rapidly, expanding over an area of 11,000 m², and oil wells spread throughout the territory of the city, reaching a total of about 1.700 wells, of which 970 are still operational today. The mechanism and plants employed were designed and brought from Italy, with the arrival of Oreste Jacobini and other Italian engineers, who took care of the oil extraction and management of the wells. In the 1930s and 1940s, benchmarks for development began in the Devolli Valley, where the first oil well was drilled. This area is still considered the historical



Figure 1. Oil field in Kuçova. Retrieved from AIPA Collection.

area for the oil field where the first oil structures were built. The wheel-shaped mechanism, *(fig.1, fig.2, fig.3, fig.4)* allowed for the continuous and efficient extraction of oil. The wheel powered a system of levers and rods that moved the piston inside the well, pumping oil to the surface without the need for electric motors or complex modern systems. The extracted quantities of oil were stored in large tanks and transported overland; railways specifically built for the oil or tanker trucks in areas where the railway did not reach. The main destination was

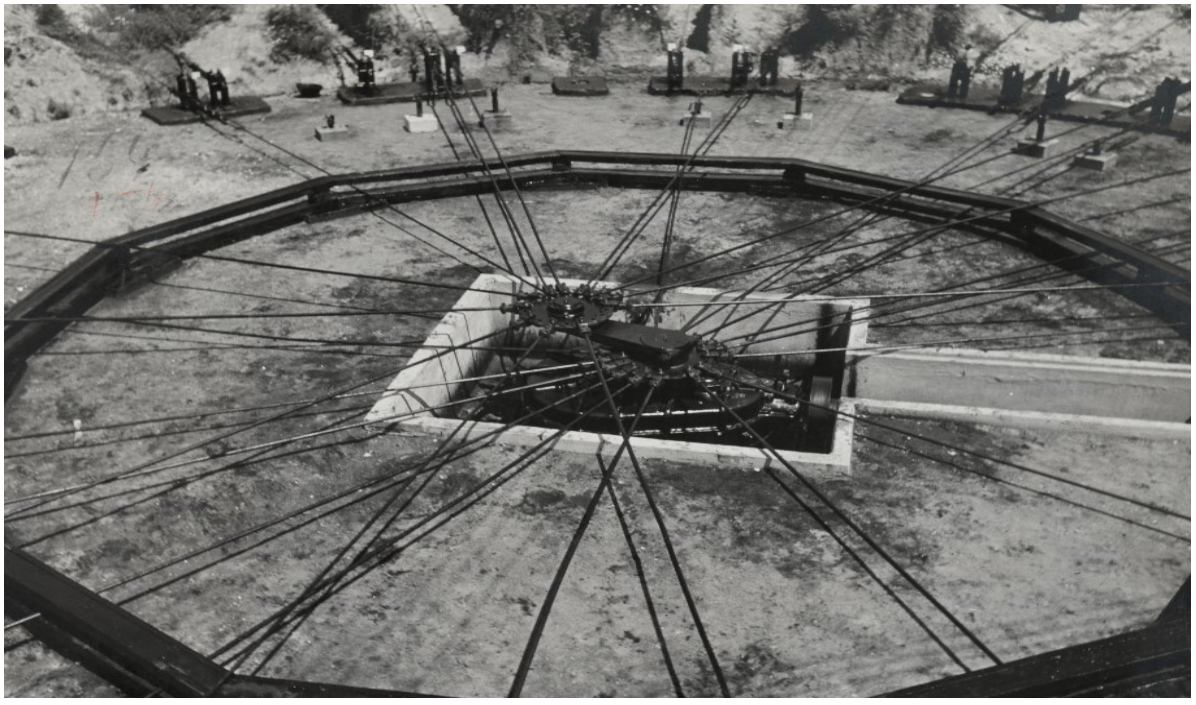


Figure 2. Wheel-shaped mechanism, “RROTA” from the Devoll Valley, Kuçova, Albania. Retrieved from Eni Archive

the port of Vlore, from where it crossed the Adriatic to reach Bari, where it was refined and sold. This system allowed for maximizing exploration of oil deposits and created economic and industrial links between Albania and Italy.

The Italian influence also contributed to the constructions of houses, roads, cinemas, ect. transforming Kuçova into a true industrial city. For this reason, the residents of Kuçova have always viewed and perceived oil only as a wealth for the city and never questioned the environmetal, ecological impact and health effects that this fuel would have caused them on the long term.

As we will see later, the fact that these extraction machines, such as the wheels and jack pumps are still present today, and some inactive, does not provoke any thoughts on the part of the citizens about a different future for Kuçova which continues to be nostalgic regarding its glorious and wealthy past. In 1943, with the conclusion of World War II and the defeat of the Italian forces, Albania began a significant transition to a communist regime under the leadership of Enver Hoxha, who nationalized the oil industry, without expansion for Kuçova, which with the end of regime from the 1990s began to experience a phase of erosion of its local wealth, thus these machines becoming merely ghostly presences or relics of industrial archaeology no longer carriers of wealth.

2. A NOT LINEAR LOGIC FOR READING KUÇOVA'S PAST FOR DEVELOPING ITS TRANSFORMATIVE FUTURE



Figure 4. Oil extraction mechanisms, period 1928 to 1944. oil field Kuçova. Retrieved from Eni Archive.



Figure 3. Oil extraction mechanisms lateral view, period 1928 to 1944. oil field Kuçova. Retrieved from Eni Archive.

Currently these oil infrastructures remain as “architectural” residues, almost industrial archaeological relics that create a landscape that tells at the same time a story of continuity with the Albanian industrialization process but also a historical narrative of unexpected interruptions. It is precisely these unexpected interruptions that, following the thought of the German philosopher Walter Benjamin in his Theses on the Concept of History (Über den Begriff der Geschichte) written in early 1940, posthumously published in 1942 in Walter Benjamin zum Gedächtnis, (Benjamin, 1942) in which he develops his idea of a discontinuous historical reconstruction compared to a linear narrative of the past, that allow us to glimpse revolutionary moments within the past itself. If for Benjamin this vision of history tied to class struggle, considering his idea of revising official history through concepts expressed by him such as “The Time of Now” (Jetztzeit) and “Critique of Progress”, the first being an interrupt time, a present laden with revolutionary tension that detaches from the chronological flow to reactivate the past, and the second as a rejection of the linear and progressive vision of history, it is possible to think about the history of Kuçova, precisely due to the presence of historical documents, as we can consider the remains of industrial archaeology, as a present that the philosopher would say has a revolutionary potential that through reactivating the past interrupts the idea that we must look to the future, annihilating the transformative potential inherent in the past itself.

Thinking about Benjamin in the context of Kuçova means using the residues of the past, the oil machines once active, many of which are now unproductive, not to place them in a linear vision leading towards progress, in this case understood as the dominant anthropocentric model, but to use their interruption and inactivity as potential for social and cultural change. Kuçova and its oil past are themselves moments on interruptions in history, frozen residues of industrial archaeology, like the abandoned and informally built peripheries of the capital. To make these structures readable, visible and unproductive, as history has wanted for the city of Kuçova, means interrupting and rendering discontinuous the linear and progressive historical process that would have the city once again be a site of oil extraction as the only possible alternative.

The residents themselves, as stated before, still dream of reactivating that past of wealth and do not foresee that the reactivation of that past would lead to a model that cancels local, social and cultural practices outside of both colonial and contemporary neoliberal extractivism.

If indeed these “infrastructures” of extraction, once the economic and pulsating heart of Kuçova, operative from the 1920s until the 1990s, are no longer commercially productive today and have not been removed, they remain, however, indelible signs on the landscape of the anthropocentric and extractivist dynamic of the city’s industrial past.

This contribution proposes interpreting these structures as “liminal architectural bodies”, spatial elements positioned between operability and abandonment, between perfection and ruin, between a productive and aesthetic dimension. The conceptual liminality to which these “bodies” make us think should be understood not just as a transitory state but as a permanent status of uncertainty; a “frozen” moment of Kuçova’s past not yet erased by the “evolutionary”

processes to come. This very uncertainty and indeterminacy, this unfished and unresolved transitoriness, initiates an open thought that freezes past and present without a univocal thrust towards a possible future. In her volume (Arendt, 1961) identifies a typical condition of advanced modernity as the crisis of tradition and authority. According to her, the waning of a shared horizon of values and references determines a rupture between past and future, placing the individual in an intermediate space, characterized by instability and loss of meaning. In this context, the past can no longer guide present actions, while the future becomes indeterminate. This suspension produces a profound transformation in the way spaces and object are perceived; they cease to be bearers of consolidated meanings and become traces of systems now devoid of symbolic authority.

On the light of the theoretical framework outlined, the case of Kuçova is configured as a particularly significant context for the analysis of the relationship between industrial space, memory and economic transformations. The city, historically linked to the oil industry, presents a landscape strongly characterized by the presence of extractive infrastructures which constitute not only functional elements but also symbolic devices. From an Arendt-ian perspective, these structures can be interpreted as material traces of a productive system that has lost its normative and identity capacity. They belong to a past that no longer exerts authority over the present, generating a condition of suspension in which the industrial space is positioned “between past and future” devoid of a univocal and stable meaning. This loss of continuity transforms the landscape into a place of crisis but also of potential socio-economic and political re-elaboration.

Due to Albania’s neoliberal capitalist development, visible, to borrow an architectural metaphor, from the constant vertical growth of the capital, resulting from the ever-increasing attraction of foreign capital, the presence of “liminal” zones in Tirana (areas not yet erased, destroyed and/or gentrified where past and future, social, economic, cultural, and architectural coexist) the country becomes almost an area of “other” thought compared vis-a-vis to the dominant and neutral narratives of global cities. Kuçova, like many peripheries of Tirana, offers this perspective not only from the viewpoint of a development process not yet undertaken, perhaps in an embryonic state, but also and especially in relation to the dynamics now taken for granted of human centrality over nature in a clear hierarchical relationship. The two dimensions of neoliberal urban realities and that of the anthropocentric worldview travel together and are part of the same logic that sees man and his built environment imposing themselves on the urban or a natural landscape. However, while these discourses are clearly visible and articulated in highly developed Western countries, where the duality of man versus nature, or urban landscape versus built surroundings, is no longer immediately recognizable in Albania the transitory, or what we have called liminal spaces, still exist. The visibility of this “liminality” opens the possibility, even now, for the imagination of something that although, has been part of a past, can be re-articulated. For example, the agricultural Albania, which still exist, can be used as a social and cultural practice that resists the unique and irrevocable model of cancellation and neutralization of identities and local socio-economic and cultural practices against primarily global ones. Indeed, it is the logic of informality that has guided

over the years the transformation of Albanian territories and consequently their urban and extra-urban landscapes. In Kuçova for example, the absence of an urban plan in the post-socialist period after the 1990s allowed many residents to build homes near the oil infrastructures to extract residual amounts of gas for domestic use.



Figure 6. Photography by Dorina Xherimeja & Aishe Bitri: Oil extraction sites embedded within residential areas in the city of Kuçova.



Figure 5. Photography by Dorina Xherimeja & Aishe Bitri: Oil extraction sites embedded within residential areas in the city of Kuçova.

This approach between the community and the oil wells has produced an unprecedented hybridization between residential space and industrial space, where the technical elements are not separated from the daily dimension but becomes an integral part of it. This physical and functional overlap around the oil wells prevents large scale reactivation or maintenance interventions on these structures, not allowing the creation of safety distances or the development of technical corridors and operational reactivation. As a consequence of these interventions, the industrial infrastructure is trapped in a state of forced suspension that confirms its transformation from a productive machine to a “relic” incorporated into urban space. From an ecological perspective, this situation raises fundamental questions regarding soil pollution, the management of energy waste and the environmental vulnerability of local communities. Beyond a critical dimension also emerges a perceptual and symbolic reconstructions of the landscape. Rusty structures and non-operational mechanical equipment integrated into the backyards of homes contribute to the constructions of a post-industrial aesthetic that does not correspond to a view in ruins but rather to a form of coexistence between nature, technology, and daily life. In this context, Kuçova presents itself as a theoretical laboratory that highlights the transition from a growing economy based on oil extraction to a post-productive state where these “architectural bodies” do not cease to exist but change their ontological and perceptual *status.*

3. PROJECT PROPOSAL FOR KUÇOVA: FROM AN ECOLOGICAL PERSPECTIVE TO AN AESTHETIC REALM

Despite my direct knowledge of the territory and its history, having been boorn and raised until the age 17 in Kuçova, I began to investigate, with the help of local inhabitants, their view regarding the contemporary state of the city (fig.7.8). As previously stated intuitively, the idea that the inhabitants have of Kuçova is still linked to its oil history and the industrial archaeological artifacts -which I have extensively discussed- is for them merely nostalgic: these extractive machines are reminders of a once opulent city that no longer exists. Rather than using these structures as a stratagem to rethink the future of the city, there is almost an uncritical resignation to a marginal and peripheral destiny for Kuçova. Instead, through the ongoing analysis, I intend to start from the idea that the historical process can only be transformative when elements of the past have not yet been completely eradicated. Only by preserving or freezing such elements (in this case, the absolute wheels and jack-pumps) it is possible to transform the irrevocable process of constructing a global dominant model that erases cultures and social practices of resistance related to a territory.

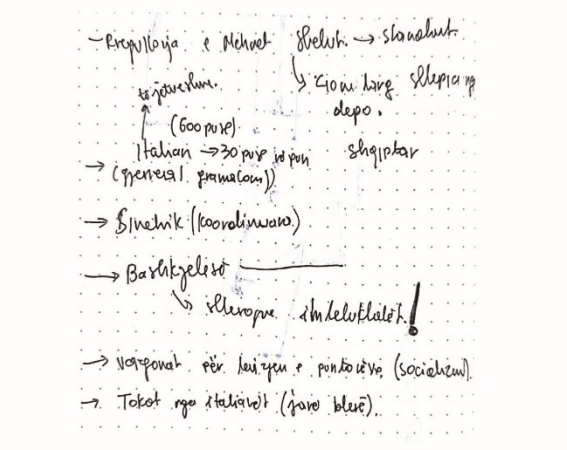


Figure 8. Fields notes based on accounts from residents of Kuçova.

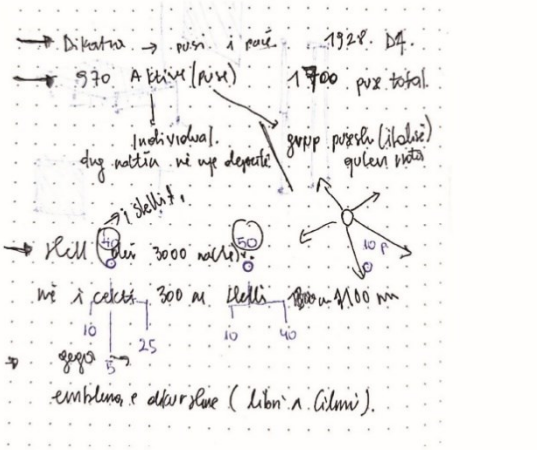


Figure 9. Fields notes based on accounts from residents of Kuçova.

Starting from Kuçova's suspended and transitional present, an unfinished process in which residual elements of the past are still alive, I intend to build and design a multidisciplinary artistic platform that includes visual arts, textile design and possibly fashion, which rather than thinking, as most of the city's inhabitants would like, of reactivating the oil extractive dynamics, would or of advocating through strictly ecological or urbanistic principles the removal of such structures, rather insists on their preservation, presenting an evident, almost "hypertrophic" aesthetic that makes these extraction structures even more recognizable and visible. In this way, the transition will be from a purely moral and/or economic dimension to an aesthetic dimension that produces and invites reflection. Indeed, the oil wheels and balance pumps will become, no longer part of the everyday life of Kuçova's inhabitants, but

rather “monsters” of aesthetic contemplation that preserve the past but in a critical key.

The aestheticization of these mechanisms will make them more inoperative, asserting their necessary suspension for the constructions of an alternative local imagination to the dominant productive model.

The idea of using the concept of “aesthetic hypertrophy” for the extractive oil structures of Kuçova draws inspiration from practices and theories developed in the 1960s and 1970s by the Italian Radical Design movement, which, in response to the transformations and social and cultural protests of that period in the country, removed design from its functionality and from every principle of industrial reproducibility. In this way, at least in the most radical examples, the expression of Italian design embodies highly aesthetic values, mostly inspired by American Pop Art. The idea of using a design vision, similar to that of the Italian Radical movement, for the oil machines of Kuçova lies in the fact that these “objects”, once endowed with functionality but lacking an intentional aesthetic dimension, will strip more evidently the function for which they were born. Balancers and wheels are therefore objects that we can assimilate to the Italian radicalism of those years. Be employing, in a manner we might call “anachronistic”, tactics of “aesthetic exaggeration” that accentuate these structures in the landscape of Kuçova, it signifies highlighting clearly and simultaneously the necessity of not eradicating the past while also underscoring the indecipherability and transitoriness of the city’s present.

The fact that these oil infrastructures can be transformed into object of aesthetic contemplation or perhaps possess the potential to become “relational structures” -potential that will be explored though the involvement of the residents of Kuçova through preliminary workshops, field visits and multidisciplinary lectures- responds in a practical way to the theorical vision on history by Benjamin and Arendt’s thought on modernity, concepts I have described earlier. If we indeed see history not as progressive and linear and modernity as possessing a transformative potential, we can assert and highlight Kuçova’s present as indecipherable. That is to say as something that does not yet have a direction, or rather something that, although directed towards a unique narrative that seems already written and dominant, still holds within it a potential for interruption which here signifies “transformation”.

Thus, suspending their functionality, remembering that some mechanisms are still operational, means negating their productive past. As relics or noncelebratory “monuments” of a past that no longer exists, these infrastructures are already symbol’s devoid of authority in themselves, to put it in Arendt’s terms. However, their presence, although significant for the inhabitants as nostalgic memory promoting a return to an opulent past, is not at all transformative, and does not open avenues for triggering reflection. Reinterpreting, re-contextualizing and aestheticizing these machines can instead serve to illuminate the contradictions of Kuçova’s past and its transitional and liminal present.



Figure 10. Ugo Rondinone, Seven Magic Mountains, Las Vegas, Nevada, 2016. Retrieved sevenmagicmontains.com



Figure 11. Ugo Rondinone, Seven Magic Mountains, Las Vegas, Nevada, 2016. Retrieved sevenmagicmontains.com

Starting from the consideration that wheels and balancers can become what I like to call "liminal architectural bodies" I do not intend to follow contemporary artistic practices that, to

perform critical and/or ecological discourses in relation to extractivist dynamics linked to oil, include this fuel as matter and color but rather to radically deny its inclusion. For instance, Mexican artist Minerva Cuevas, known for her works critiquing neo-colonialism and capitalist production, in her series of paintings, such as *Flores Sea* (2021), uses oil as sculptural critical matter to depict in her canvas's natural landscapes, in this case, marine ones. By juxtaposing bucolic and natural landscapes with dirty and anti-ecological fuel, the artist presents us with an evident face of the extractivist/anthropocentric vision where oil becomes a visible artistic element rather than a hidden deposit behind the beauty of the natural landscape we are destroying. The aesthetic strategy I intend to employ for Kuçova contrary to Cuevas, at least as an initial and not definitive proposal, completely cancels the presence of "oil" matter in every aesthetic dimension. Specifically, the intervention I propose to the inhabitants is to paint these structures with vibrant and metallic colors which in this way become simultaneously environmental sculptures from which it is impossible to "escape" at least visually and also objects for aesthetic contemplation whose operability is denied and not nostalgically remembered.

A similar operation was, for example, conducted by Swiss artist Ugo Rondinone with Seven Magic Mountains (2016) in the Nevada desert. (RONDINONE, 2026) (Fig.9-10).



Figure 12. Minerva Cuevas, Flores Sea Oil on canvas dipped in chirotope, 69.1 × 51.6 × 4.1 cm, 2021. San Francisco Museum of Modern Art (SFMOMA). Retrieved Artsy.net

Installed in the desert in 2016, the work consists of totems made of large stacked stones rising the desert. Evoking astonishment as foreign bodies in the natural landscape with surrounding neutral colours, although probably not intentionally, the fluorescent and metallic colors invite reflection on the "natural/artificial" and on "anthropocentric and non-anthropocentric". Following the model of this aesthetic strategy, different from that employed by Cuevas, the intervention for Kuçova and its extractive infrastructures aims to abruptly interrupt the harmonity of the city's landscape through exaggerating their presence.

However, unlike Rondinone, whose expedient seems to be playful aesthetic and attractiveness for tourism -a risk that the Albanian city

also faces- the environmental sculptures for Kuçova aims to be a first action, perhaps a temporary one, to interrupt a linear past, unveils its contradictions and insist that it is possible, in geopolitical contexts, like Albania, which are in transition to practice a present, outside the unidirectionality of an already established future

4. CONCLUSIONS

Places and landscapes like that of Kuçova in Albania are spaces where informality and formality, past and "avant-gardist" futures coexist in a visible and uncontested ways. These liminal spaces should be articulated and render more visible rather than eradicated in order to practice their transformative potential. Kuçova and the process I intend to undertake regarding its history, its landscape and its possible future can be a laboratory in which to experiment with aesthetic and social practices that become models for constructing a present and a future outside of the ever-increasing dynamics of real estate speculation, gentrification, art as a propaganda, extractives and anthropocentricism.

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IN Illyria, Episode I: Apollonia

A Pixel-Art Game Framework for Archaeological Interpretation and Cultural Heritage Learning

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Abstract

This paper presents the conceptualisation and prototype development of "Interactive Illyria, Episode I: Apollonia", a pixel-art-based mobile application designed for archaeological interpretation and informal heritage learning. The study positions itself within the intersection of digital heritage studies, game design, and media theory, addressing the lack of accessible interpretative tools for non-expert audiences in Albanian archaeological contexts.

Rather than proposing a full reconstruction, the project adopts a selective interpretative methodology, where architectural elements of the archaeological site are translated into an interactive system based on click-based exploration. Users engage with spatial fragments of

the site through three narrative agents, each offering differentiated interpretative perspectives. In this sense, archaeological knowledge is not presented as fixed "facts", but as layered interpretations derived from artefacts, spatial relationships, and historical reconstruction.

The use of pixel art is framed not merely as a stylistic choice, but as a representational strategy that enables abstraction, readability, and computational efficiency within mobile environments. The system is structured around micro-interactions that function as units of informal learning, supporting gradual knowledge acquisition.

The paper discusses the design logic of the environment, the reconstruction strategy of the Temple of Apollo, and the integration of narrative-driven interaction. It argues that lightweight game systems can operate as mediating interfaces between academic knowledge and public understanding, particularly in contexts where digital heritage dissemination remains underdeveloped. Finally, the study outlines the limitations of the prototype nature of the project and identifies the need for future empirical validation through user-based testing.

Keywords: *build heritage, pixel art technique, interactive gaming, archaeology, educational issues*

1. INTRODUCTION

Digital built heritage is increasingly shifting from static visualizations toward interactive systems based on user engagement and experiential interpretation. These systems attract diverse audiences by enabling active interaction with archaeological environments and architectural data. Currently, mobile platforms and digital games are considered effective tools for supporting e-learning and experiential engagement with historical content. However, within the Albanian context, despite the existence of well-documented archaeological sites, there remains a significant gap in the translation of this knowledge into accessible, user-oriented formats, particularly for younger generations and non-expert audiences.

Through interactive systems, it becomes possible to engage with complex historical datasets through exploration and interaction, rather than passive reading or observation. In this sense, the study is positioned as an attempt to bridge physical exploration, historical learning, and visual engagement within a unified interactive framework. Although this approach has advanced internationally, Albania remains at an early stage in the implementation of digital tools applied to cultural heritage. Archaeological sites such as Apollonia, Bylis and Amantia present significant historical and architectural value, including multi-layered developments from Illyrian, Greek, and Roman periods [1]. However, their representation in interactive formats remains limited, particularly in educational environments where traditional methods continue to dominate. Apollonia, including its temple, agora, and urban morphology, represents a complex archaeological landscape situated within a Mediterranean environment

near the Vjosa River [2,3]. It combines architecture, urban planning, and mythology into a unified spatial system. Despite this complexity, its interpretation for non-specialist audiences remains largely descriptive rather than interactive.

From a theoretical perspective, this research is informed by media and cultural studies. Stuart Hall's encoding/decoding model suggests that meaning is actively constructed by users rather than passively received [12]. In parallel, the concept of interpassivity, as discussed by Žižek [13], highlights how digital systems may simulate engagement without necessarily producing active interpretation. The proposed framework responds to this tension by structuring interaction as a mechanism for incremental knowledge construction.

Within this framework, IN Illyria Ep.1 (Apollonia) proposes a mobile game designed for Android and iOS platforms, focusing on the interpretation of the archaeological landscape. The game is conceived as a hybrid system combining educational and interactive functions. Archaeological content is not presented as static information, but is progressively revealed through user-driven exploration. The system is based on a click-based interaction logic, where each interaction reveals layers of information combining historical references, mythological narratives, and architectural interpretation. This approach transforms interaction into a micro-learning process, where knowledge is acquired incrementally rather than delivered in fixed sequences.



Figure 1. Graphical representation of the game's basic scene and main character

Pixel art is used as the primary visual language. Its role is not only aesthetic but functional, enabling the abstraction of complex spatial and architectural data into readable visual systems adapted to mobile environments. This allows users to understand morphological characteristics of built heritage through simplified representations [6]. The primary target audience of this study is defined as secondary school and early university students, while maintaining accessibility for a broader non-expert public interested in cultural heritage.

The research is positioned at the intersection of architecture, archaeology and game design. It investigates: (i) the role of pixel art as a strategy for heritage communication; (ii) the effectiveness of click-based interaction models for learning; (iii) the impact of character-driven narratives on user engagement.

Through this framework, the study aims to contribute to the development of alternative pedagogical models based on informal learning, where knowledge is constructed through interaction rather than passive transmission.

2. PIXEL-ART AND DIGITAL HERITAGE (STATE-OF-THE-ART)

2.1 Art, Technology and Contemporary Digital Heritage Discourse

In modern cultural production, digital media has evolved into a hybrid field where technology and artistic expression operate within the same conceptual space. The development of computer systems, game engines and interactive platforms has transformed the communication of built heritage from static representation to dynamic, user-oriented systems. Within this framework, digital heritage should not be understood solely as documentation, but as a mediating system that structures how cultural meaning is accessed, interpreted and reconstructed by users.

In contemporary communication, digital media has become a cultural object developed through technological systems such as computers and networks. According to Aleksić and Simeunović (2024), pixel art today is no longer defined by technical limitation, but by its capacity to connect early digital aesthetics with contemporary representational strategies [6]. This position aligns with broader media theory, where visual systems are understood as active agents in the production of meaning rather than neutral carriers of information [12].

The aesthetic and conceptual roots of digital art can be traced to artistic movements such as Dadaism, pop art, conceptual art and video art, which introduced experimentation and abstraction into visual culture [6]. Within this context, pixel art can be interpreted as a continuation of reduction-based visual strategies, where simplification functions as a method of conceptual clarification rather than loss of information. Advances in software and hardware during the 1990s enabled wider access to digital tools, transforming them into platforms for both artistic and technical production. In built heritage applications, this evolution allows the translation of complex architectural systems into simplified, interactive visual models adapted to contemporary media environments [12].

2.2 Educational games as actual tools

Educational games have evolved from basic entertainment systems into structured digital environments that facilitate knowledge acquisition through interaction. Their significance within heritage studies lies in their ability to transform static and complex information into dynamic and exploratory experiences. Rather than presenting heritage as a fixed narrative, these systems distribute knowledge spatially and temporally through user interaction. This

approach is particularly relevant in archaeology, where datasets are inherently fragmented, multi-layered and interpretative. Digital game systems enable the organisation of such complexity into accessible interaction-based structures, functioning as mediators between academic research and public understanding.

For example, Arias et al. (2020) highlight that virtual technologies enhance the preservation and accessibility of cultural heritage by enabling broader engagement with archaeological sites [10]. Similarly, Ferreira-Santos and Pombo (2025) emphasize the role of mobile AR-based systems in promoting architectural awareness and informal learning [7]. Their findings reinforce the idea that interactive environments are particularly effective when learning emerges through exploration rather than instruction. In this context, educational games operate within the framework of informal learning, where knowledge is constructed outside traditional institutional settings through user-driven engagement and interaction.

2.3 Game Aesthetics. Pixel-art model as graphic language

Game aesthetics should be understood as an experiential system rather than purely a visual attribute. It emerges from the interaction between the user, the system and the environment. In heritage-based applications, aesthetics plays a functional role in shaping how information is perceived and interpreted. Pixel art, in this context, operates as a visual language rather than a stylistic preference, enabling the translation of complex architectural and archaeological systems into simplified and readable forms [6]. This approach is particularly relevant for mobile platforms, where screen size, processing capacity and user attention are limited.

From a design perspective, pixel-based systems support cognitive accessibility. Early applications of pixel art were linked to interface design in operating systems such as Xerox and Apple [6]. In contemporary applications, its relevance extends to the representation of incomplete, fragmented or hypothetical archaeological structures, where abstraction avoids the illusion of total reconstruction.

The player experience in these systems is defined by layered interaction. Visual exploration is combined with micro-narratives generated through click-based mechanisms. Each interaction functions as a discrete cognitive unit, linking discovery with interpretation and reinforcing incremental knowledge acquisition.

2.4 Latest development and simple theoretical framework

In built heritage contexts, game development increasingly priorities conceptual clarity, modular design and resource efficiency over computational complexity. This approach reflects a methodological shift, where technical limitations are reframed as design parameters guiding the structure of the system.

Lightweight game systems are particularly effective in mobile environments. Pixel-based rendering, simplified animation and modular interaction logic enable the clear representation of spatial and narrative relationships [10, 11]. Within this framework, the system is not designed to simulate reality in full detail, but to construct an interpretative model that supports user understanding.

3. CASE STUDY: APOLLONIA AND THE GAME PHILOSOPHY

3.1 The Site of Apollonia

Apollonia represents one of the most significant archaeological parks in Albania, characterized by a complex system of historical, cultural and architectural layers. Founded in the 6th century BC by Corinthian colonists [2], the city developed as a strategic node between the Adriatic coast and inland Balkan regions. Its topography, located within the hills of the Myzeqe plain, established a spatial hierarchy between sacred areas, civic spaces and defensive structures. The site includes key architectural elements such as the temenos, agora, stoa, bouleuterion and theatre [3, 4, 5].

Within this study, Apollonia is approached not only as an archaeological site but as an interpretative and pedagogical context, particularly relevant for younger audiences with limited access to interactive heritage tools.

The Temple of Apollo represents the central symbolic element of the site. Although currently in a fragmented state, archaeological studies have proposed partial reconstructions based on available evidence. These reconstructions remain interpretative hypotheses rather than definitive representations, reinforcing the need for flexible and non-final visualization systems. In this research, Apollonia is therefore conceptualized as a dynamic interpretative environment, where absence, reconstruction and fragmentation coexist as core design principles.

3.2 Narrative Framework, Characters and Game Environment

The game structure is based on a character-driven interpretative system, where three narrative agents: Sihana, Artas and Robin mediate the interaction between the user and the environment. These characters function as interpretative interfaces rather than decorative elements, each representing a distinct mode of engagement with archaeological content.

Sihana provides structured historical and cultural explanations. Artas encourages exploratory interaction and discovery, while Robin simplifies complex information through accessible narrative forms. This multi-perspective system allows the same architectural element to be interpreted through different narrative logics, transforming the site into a layered knowledge environment.

The game environment is represented through a pixel-based 2D system derived from archaeological documentation and simplified spatial modelling [11]. The Temple of Apollo is reconstructed through a hybrid approach, combining documented elements with abstracted representations, while maintaining visible traces of its current fragmented condition.

This duality between reconstruction and ruin reinforces the interpretative nature of heritage knowledge. It avoids presenting the site as a fixed historical reality and instead frames it as an open system subject to continuous interpretation.

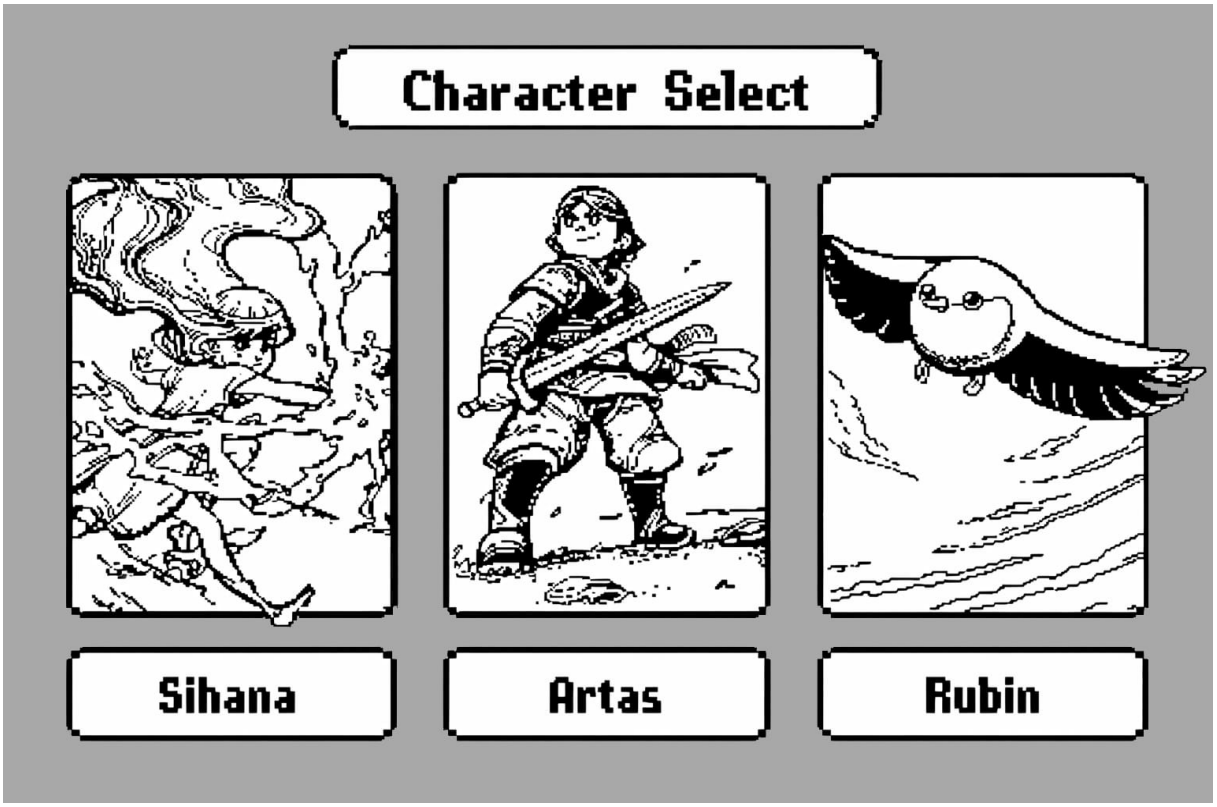


Figure 2. Sihana, Artas and Rubin, main characters at the main menu toolbar of the game

Gameplay is based on simple navigation and click-based interaction. Each interaction activates a micro-narrative combining text, visual representation and character input. This structure supports incremental learning through repeated engagement rather than linear information delivery.

From a methodological perspective, the game operates as an interpretative model rather than a simulation. It reorganizes selected elements of the archaeological site into a structured interactive system, balancing scientific accuracy with design clarity.

4. GAME PHILOSOPHY AND EXPERIMENTAL PROPOSED METHODOLOGY

4.1 Interaction Model (Click-Based System)

The interaction model of IN Illyria, Episode 1: Apollonia is structured around a minimal click-based logic designed specifically for mobile platforms (Android and iOS). The system prioritises clarity, immediacy and reduced cognitive load, allowing users to navigate and interact without prior gaming experience. This design approach follows user-centred interaction principles, where accessibility and usability are considered essential parameters for educational digital systems.

A simplified top-down map of the archaeological site is used as the primary navigation interface. Users move through the environment using touch-based input, ensuring intuitive spatial exploration without additional interface complexity [7]. The spatial configuration is

intentionally reduced to its essential elements, preserving readability while maintaining key morphological relationships of the site.

The system is organized through discrete interaction points distributed across the map. Each point corresponds to a specific architectural element, artefact or spatial fragment. This replaces continuous gameplay with episodic interaction, reinforcing the interpretative logic of the system. As shown in (Figure 3) the interaction sequence is structured around a clear visual and narrative cycle.

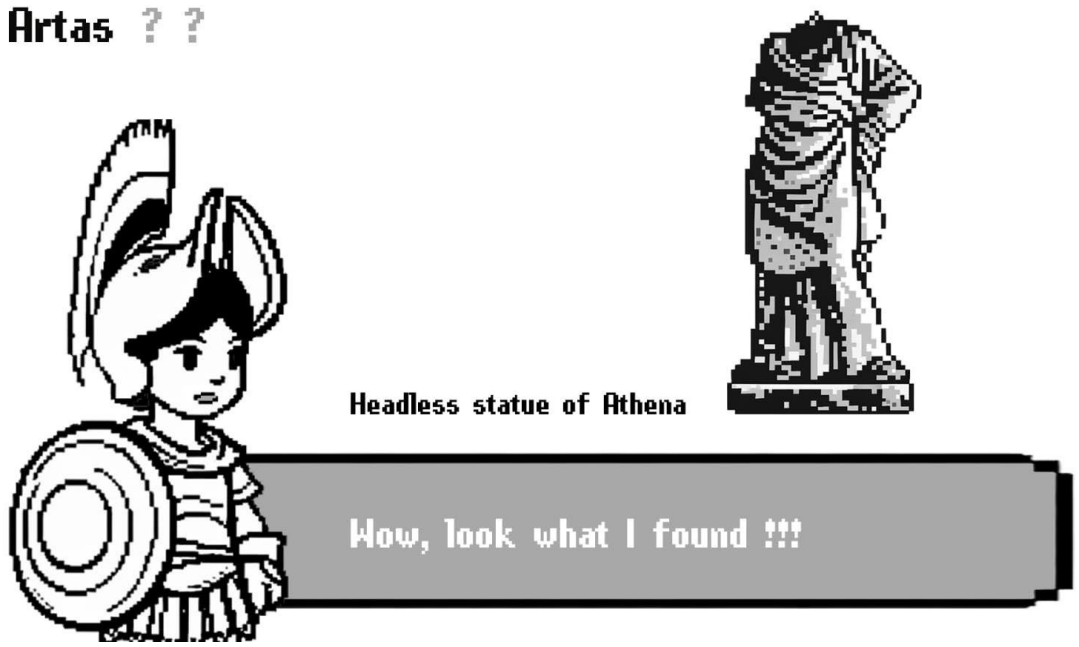


Figure 3. Interactive sequence of the game, main character discovering architectural artifact.

The core mechanism is based on click interaction. When the user selects an element, the system activates an information layer composed of three interconnected components: (i) a pixel-based visual representation, (ii) a short textual explanation and (iii) a character-based narrative. This triadic structure establishes a consistent interaction cycle linking perception, interpretation and feedback.

Within this framework, each interaction operates as a micro-learning unit, supporting incremental knowledge acquisition through repetition and exploration rather than linear instruction. The simplicity of the system does not reduce its depth. Instead, depth emerges through the accumulation of interactions, variation in narrative perspectives across characters, and progressive spatial discovery.

Micro-events are integrated as short narrative interruptions that maintain engagement without disrupting continuity. These elements strengthen the connection between gameplay and interpretative content.

From a design perspective, the absence of complex controls and layered menus ensures that user attention remains focused on spatial exploration and architectural interpretation. This reinforces the role of the system as an interpretative interface rather than a purely entertainment-oriented game.

4.2 Information Architecture and Pixel Art Workflow

The game system is structured through layered content organization, consisting of three main categories: historical, archaeological and mythological. These categories are not presented separately but are interconnected through curated narrative fragments activated during interaction. This approach avoids fragmented information delivery and instead constructs a coherent interpretative framework distributed across the game environment.

Each interaction generates a micro-narrative designed to communicate a specific concept through concise text and visual representation. The objective is not exhaustive explanation, but contextual clarity that stimulates curiosity and supports further exploration. The presence of multiple characters allows variation in tone, depth and perspective, enabling different interpretative approaches to the same content [6]. This reinforces the plural and interpretative nature of archaeological knowledge.

Isometric pixel art is used to simulate spatial depth within a 2D environment. The technique relies on color variation, tonal hierarchy and contrast to represent distance and form [6]. This allows spatial readability without requiring complex rendering systems. Each architectural component is first analyzed in terms of proportion, geometry and typology before being translated into simplified pixel-based representations. This process is illustrated in Figure 4.

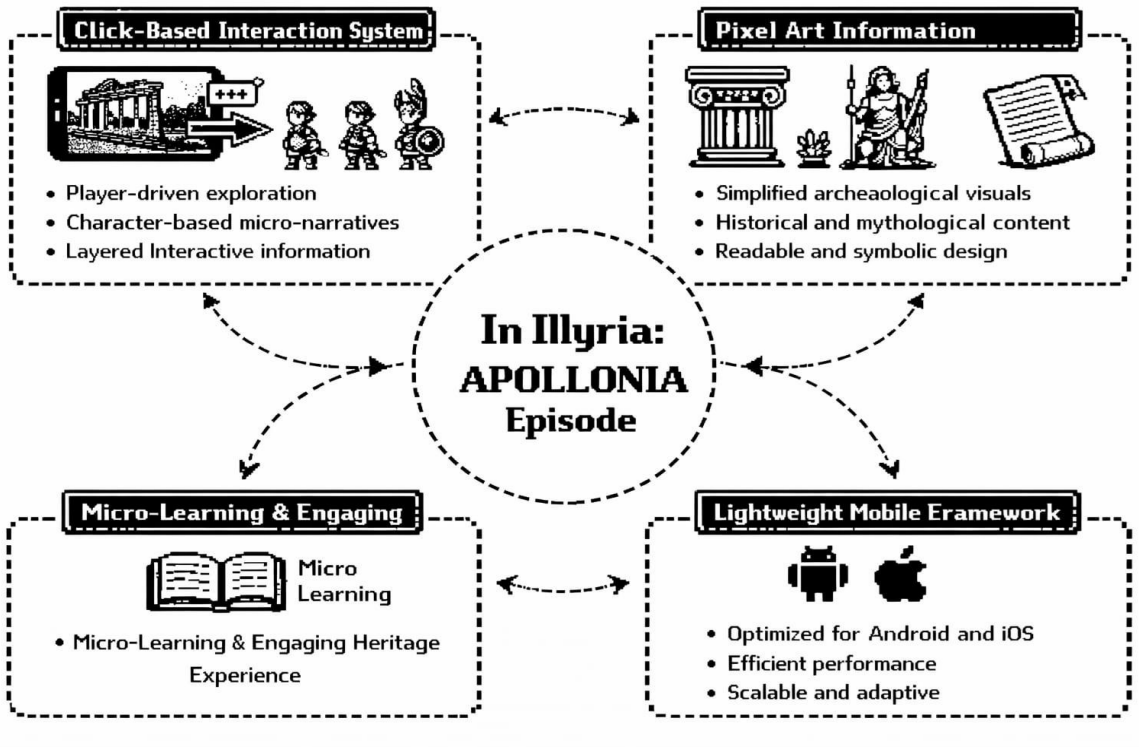


Figure 4. Diagram showing our proposed method for building the game IN Illyria

This process of controlled abstraction ensures that essential morphological characteristics are preserved while reducing visual complexity. The workflow is based on subtraction and simplification, transforming complex forms into recognizable pixel patterns. The objective is not visual realism, but structural clarity and coherence within the system.

The visual language is based on a limited color palette dominated by grey tones, enhancing coherence and reducing visual distraction. Contrast is selectively applied to highlight interactive elements and guide user attention. Animation is minimal and functional, consisting of subtle transitions such as fade-ins or slight movements. This restrained approach ensures visual stability and supports interpretative clarity.

Overall, the integration of information architecture and pixel art workflow results in a system where content, form and interaction are closely interconnected. Each component supports the others, producing a coherent and readable user experience.

4.3 Technical Framework

The technical framework of the project is defined by the need to ensure stable performance across a wide range of mobile devices. The application is designed for both Android and iOS platforms, requiring a flexible, efficient and scalable development approach. Game engines such as Unity, Unreal Engine and Godot are suitable for this type of application due to their cross-platform capabilities and support for 2D environments.

The creation of pixel art follows a structured process based on morphological analysis, abstraction and formal reduction. This process enables the translation of architectural elements into simplified visual systems while preserving their identity and recognizability. Once multiple design proposals are developed, they are evaluated based on expressive clarity, representational accuracy and technical feasibility [6]. This selection process ensures coherence between visual representation and system performance.

The user interface is intentionally minimal, with menus, icons and navigation tools limited to essential functions. This reduces interface complexity and reinforces direct engagement with the content. The system is designed to be accessible across different age groups and levels of digital literacy. Accessibility is achieved through simplified controls, clear visual language and concise textual information.

From a development perspective, the project follows an iterative workflow. Prototypes are continuously tested and refined, allowing adjustments in both interaction design and content structure. This approach is particularly relevant in heritage applications, where interpretative accuracy and user engagement must be balanced. Within this framework, technical constraints are not treated as limitations, but as parameters that actively shape the design logic of the system.

The resulting system integrates usability, performance and interpretative clarity, supporting the transformation of archaeological information into an accessible interactive experience.

5. DISCUSSION

The proposed methodology for IN Illyria, Episode 1: Apollonia positions the project as an experimental interpretative system within the broader field of digital heritage and interactive media. The study does not aim to present a complete technological solution, but rather to

explore how simplified interactive environments can mediate complex archaeological knowledge in an accessible and structured manner. At a conceptual level, the project contributes to the transition from representational models of heritage, based on static visualization and reconstruction, toward interpretative models where meaning is progressively constructed through user interaction and spatial engagement. This shift reflects broader developments in digital heritage studies, where emphasis is placed not only on visual accuracy but also on the conditions under which knowledge is accessed, experienced and understood [10].

The interaction model plays a central role in this framework. Each click-based action generates a discrete unit of knowledge composed of visual, textual and narrative elements. This structure aligns with micro-learning principles, where knowledge is acquired incrementally through short, repeated interactions rather than extended linear content. Such an approach is particularly relevant for mobile platforms, where user engagement is often fragmented and time-limited [7]. The visual and narrative synthesis of the system is illustrated in Figure 5, which presents the main graphical context of the game, integrating dramatic atmosphere, historical references and artistic abstraction.



Figure 5. Game context main graphics, showing drama, history and art together

As shown in Figure 5, the combination of spatial representation, pixel-art abstraction and narrative elements creates a unified interpretative environment, where visual and informational layers operate simultaneously. The use of multiple characters further enhances the interpretative dimension of the system. Each character introduces a distinct narrative

perspective, enabling the same architectural or historical element to be understood through different interpretative lenses. This multi-perspective approach reflects the epistemological nature of archaeology, where knowledge is constructed through interpretation rather than presented as a fixed and singular narrative. From a spatial perspective, the system adopts a simplified top-down structure that allows users to navigate the environment freely. This open-ended spatial configuration supports exploratory learning processes, where users construct their own paths and interpretations rather than following predefined sequences. This aligns with constructivist approaches to learning, where knowledge emerges through active engagement with the environment.

The adoption of pixel art as the primary visual language represents both a technical and conceptual strategy. Technically, it enables efficient performance across mobile devices, reducing computational requirements while maintaining visual clarity. Conceptually, it introduces a level of abstraction that avoids the illusion of complete reconstruction. As illustrated in Figure 5, the visual system does not attempt to reproduce reality in detail, but instead presents it as a structured abstraction, allowing users to interpret rather than passively consume visual information.

However, despite these contributions, the study acknowledges several limitations that require critical consideration. First, the system remains at a prototype stage, and its effectiveness as an educational tool has not yet been validated through empirical user testing. While the conceptual framework suggests potential for informal learning, there is currently no experimental data to support claims regarding user engagement, learning outcomes or knowledge retention. This limitation highlights the need for future studies based on user evaluation and quantitative analysis. Second, the process of abstraction inherent in the pixel-art approach introduces the risk of oversimplification. While simplification is necessary for clarity and usability, it may result in the reduction of architectural detail and historical complexity. This tension between readability and accuracy represents a fundamental challenge in digital heritage representation. Third, the reconstruction of architectural elements, particularly the Temple of Apollo, remains interpretative. Archaeological data is inherently incomplete, and any reconstruction involves assumptions based on available evidence. The system addresses this condition not by concealing uncertainty, but by integrating it into the visual and narrative logic, as seen in Figure 5 where reconstructed elements coexist with fragmented forms.

Another important aspect concerns the relationship between the digital and physical experience of heritage. The application is not intended to replace a visit to the archaeological site, but to complement it. It can function as a preparatory tool that introduces spatial and historical context before the visit, or as a reflective tool that reinforces understanding after the experience. This complementary relationship ensures that the authenticity of the physical site remains central.

From a technical perspective, the lightweight structure of the system represents a significant advantage. Optimized performance allows the application to operate across a wide range of

devices, increasing accessibility, particularly in contexts with limited technological resources. This is especially relevant within the Albanian context, where access to high-end digital infrastructure may be uneven. At a broader level, the study suggests implications for cultural dissemination and public engagement. By translating complex archaeological data into accessible interactive formats, the system contributes to bridging the gap between academic knowledge and public understanding. This has potential implications for heritage awareness and education, particularly among younger audiences.

The study also demonstrates scalability potential. The methodological framework developed for Apollonia can be adapted to other archaeological sites, each with its own spatial and historical characteristics. Future applications could extend to sites such as Butrint, Gjirokastra or Berat, forming a distributed digital network of heritage interpretation.

Finally, from a theoretical perspective, the study contributes to the understanding of interactive systems as mediating interfaces in cultural heritage. Interaction is not treated merely as a technical feature, but as a cognitive mechanism through which users engage with, interpret and reconstruct knowledge. In this sense, the project demonstrates that even simplified and resource-efficient systems can produce meaningful engagement when structured around clarity, narrative coherence and spatial logic.

6. CONCLUSIONS

This research presents Interactive Illyria – Episode I: Apollonia as a focused experimental framework positioned at the intersection of digital heritage, architectural interpretation and interactive media design. Rather than proposing a fully resolved technological product, the study explores how a lightweight, narrative-driven game system can operate as an interpretative interface through which complex archaeological knowledge becomes accessible to a broader audience. The central argument of the study is that the effectiveness of such systems depends less on visual realism or technical complexity, and more on how interaction, narrative and spatial structure are organized to mediate knowledge. Within this perspective, the project shifts attention from reconstruction as a final output toward interpretation as a continuous and open-ended process.

The application of pixel art is approached not as a stylistic preference, but as a methodological strategy. Through controlled abstraction, pixel-based representation translates architectural and archaeological elements into simplified yet legible forms, preserving essential spatial relationships while reducing visual overload. This balance becomes particularly relevant in mobile environments, where constraints of scale, performance and attention shape the user experience. At the same time, simplification does not imply a reduction of meaning. When supported by a coherent interaction logic, reduced visual systems can enhance interpretative clarity by directing attention toward key spatial and historical relationships. In this sense, the study contributes to current discussions on abstraction as a valid representational approach within digital heritage.

The click-based interaction model further supports this framework by structuring engagement into discrete and repeatable units. Each interaction operates as a compact interpretative event, combining visual cues, concise text and narrative input. This aligns with micro-learning dynamics, where knowledge is progressively constructed through short, focused engagements rather than extended linear sequences. The inclusion of multiple narrative characters introduces an additional interpretative layer. By distributing perspectives across different voices, the system reflects the non-linear and interpretative nature of archaeological knowledge, avoiding a single authoritative narrative. This approach supports varied modes of engagement and accommodates different levels of user familiarity. Despite these contributions, the study remains aware of its limitations. The project is currently positioned as a prototype framework, and its educational impact has not yet been validated through empirical testing. As such, claims regarding user engagement and learning effectiveness remain provisional and require further investigation through structured evaluation methods. A second limitation concerns the nature of representation. All archaeological reconstruction is inherently interpretative, and the process of abstraction introduced by pixel art may further reduce detail. Rather than attempting to conceal this condition, the project integrates it into its logic by maintaining the coexistence of reconstructed elements and visible fragments, reinforcing the provisional nature of heritage knowledge. From a broader perspective, the study suggests that lightweight interactive systems can play a significant role in expanding access to cultural heritage. In contexts such as Albania, where digital heritage practices are still developing, accessible and resource-efficient approaches offer a realistic pathway for connecting academic research with wider audiences. The methodology also demonstrates potential for scalability. While developed for Apollonia, its structure can be adapted to other archaeological sites with comparable adjustments in content and spatial logic. This opens the possibility of extending the project into a series of interconnected applications, contributing to a broader digital framework for heritage interpretation.

Finally, the study advances an understanding of interaction not merely as a technical feature, but as a cognitive process. Interaction is positioned here as the mechanism through which users engage with, interpret and reconstruct knowledge, rather than passively receive it. In conclusion, Interactive Illyria – Apollonia shows that carefully structured, small-scale interactive systems can generate meaningful engagement with cultural heritage when grounded in clarity, narrative coherence and spatial logic. While further development and validation are required, the framework offers a viable direction for future research and application.

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In the Age of Material Transformation: Textile Design and Upcycling

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Abstract

Is textile recycling a trend or has it become a necessity?

This study explores the relationship between textile design and upcycling. As an urgent need to transform the way of creation and production as a result of accelerating climate change. The material itself has now become a design project. From the invention of the first synthetic fibers, which were initially conceived as a strategy to preserve as many natural resources as possible. To the proliferation of synthetic materials that revolutionized industry, construction and design.

While these innovations previously brought important technical and aesthetic possibilities, they created other complex consequences on the environment. The production of materials continues to affect natural systems, even in cases where the use of natural fibers is not directly involved. In this study, design is not simply a discipline but a critical mediator, between material innovation and environmental responsibility. The role of this research is closely linked to pedagogy and the way in which the concept of upcycling should be presented in design education.

The aim is not to present sustainability as a limitation, but as a creative opportunity and as a necessary cultural attitude. Not seeing nature as an inexhaustible source of materials, but maintaining a reflective attitude towards the products they bring to the market.

Through the analysis and presentation of student projects developed in courses on form and material, the study compares two approaches: designing a project and then selecting the material, versus starting the creative process through the upcycling of the material itself. In this way, a pedagogical model is proposed where material awareness becomes an integral part of thinking and creating.

Keywords: *material, pedagogy, methodology, nature, synthetic*

1. TREND OR NECESSITY

In recent decades, the textile and design industries have undergone a profound transformation, driven by the acceleration of climate change and the growing pressure to adopt more sustainable practices. The linear production model - produce, use, discard -has proven unsustainable both environmentally and culturally.

In this context, upcycling emerges not only as a technical solution for waste reduction but as a conceptual framework that reconsiders how materials are perceived and used. The central question this study raises is: is upcycling a temporary trend or a fundamental shift in the way design is thought?

This article argues that upcycling should be understood as part of a broader transformation in which material is no longer a passive element but an active starting point in the creative process. In this way, the role of the designer shifts from an author who imposes form to a mediator who interacts with the material.

2. FROM MATERIAL TO CONCEPT

In the early stages of human history, the creation of clothing and textile objects was closely tied to the materials available in nature. Plant fibers, leather, and animal-based materials not only formed the material basis of production but also constrained and guided the creative process. In this context, material was not one choice among many but a fundamental condition that determined the form, function, and aesthetics of the product. As Tim Ingold argues, the process of making under these conditions should be understood as a continuous interaction between humans and materials, where form emerges from the act of working with matter rather than from a preconceived idea (Ingold, 2013). Material limitation in this sense, was not a constraint but a source of creativity.

With the development of industrial technology – especially the invention of synthetic fibers in the 20th century-this relationship began to change fundamentally. Artificial materials such as nylon and polyester were initially promoted as innovative alternatives that reduced dependence on natural resources and significantly expanded design possibilities. These materials introduced new flexibility in terms of performance, durability, and aesthetics, allowing designers to explore previously unimaginable forms and structures. However, this technological shift affected not only design outcomes but also how the creative process itself was conceived.

Gradually, a reversal occurred in the relationship between material and concept. Whereas previously material was the starting point, modern design became driven by abstract ideas that later sought appropriate materials for realization. In this way, neutral and interchangeable tool, subordinate to the designer’s vision. Bruno Latour challenges this separation by arguing that materials and objects are not passive but active participants in a network of production and meaning (Latour, 2005).

This disconnection between design and material has created a significant distance from

natural systems, contributing to the current environmental crisis and unsustainable production methods. As Kate Fletcher emphasizes, the fashion industry has developed a culture in which materials are often perceived as infinite and readily available, losing connection with their origins and environmental impacts (Fletcher, 2014). From this perspective, rethinking the relationship between material and concept becomes essential for understanding and transforming contemporary design practices.

3. CONTEMPORARY DESIGN THEORIES AND MATERIAL STUDIES

Contemporary theories of design and material studies have significantly challenged the traditional perception of material as a passive element subject to the designer's will. Instead, they propose a more complex understanding in which material is considered an active agent in the creative process, capable of influencing decision-making, form, and outcome.

One of the most important approaches in the direction is Actor-Network Theory (ANT), developed by Bruno Latour, which argues that object, materials, and technologies and not merely tools but active partecipants in networks of relationships that shape reality (Latour, 2005). In this sense, material is not a neutral medium but a co-creator of the design process.

This perspective shifts the focus a hierarchical model-where the designer is. The sole author to a relational model in which the creative process result s from interactions among various actors, both human and non human.

Through its physical properties, constraints, and potentials, material guides the designer's decisions and influences the development of the project. Thus, design can no longer be understood as a linear process of imposing form but as an ongoing dialogue with matter.

Similarly, Tim Ingolt conceptualizes material as a process in continuous development rather than a finish enty. According to him, creation is not the application n of form onto matter but a process of "following the material", where form emerges through interaction with its properties and behavior (Ingold, 2013). In this sense, textiles are not simply stable surfaces or structures but dynamic systems that interact with the environment, the user, and time.

These theoretical approaches contribute to a profound reconceptualization of design. Material is placed at the center of the creative process, requiring designers to adapt a more sensitive and collaborative approach. This is particularly relevant in practices such as. Upcucling, where existing material-with its history and limitations-besomes the starting point of the project. In this light, design is no longer an act of control but a process of negation and co-creation with matter.

4. UPCYCLING AS A CULTURAL AND CRITICAL PRACTICE

Recycling, and more specifically upcycling, should not be understood merely as a technical process of waste management, but as a complex practice that intertwines cultural, ethical, and aesthetic dimensions. In the field of fashion and textile design, it represents a direct challenge to the linear model of consumption – "produce, use, discard" by proposing an

alternative cyclical approach in wich materials do not and their life cycle but are continuously transformed and reintegrated into new creative processes.

In this context, upcycling contributes to redefining how material value is understood. According to Kate Fletcher, sustainability in fashion is not only about selecting ecological materials but also about how we interact with them, how we use, maintain, and value them over time (Fletcher, Sustainable fashion and textiles: Design journeys, 2014)

This This perspective shifts attention from materials as a consumable resource to material as an entity with longevity and ongoing transformative potential.

Upcycling, in this sense, is not a compromise. Due to lack of resources but a conceptual choice that restores dignity and history to materials within the design process.

Beyond its functional aspect, upcycling can also be interpreted as a form of critical design. Dunne and Raby argue that critical. Design does not aim solely to create objects but to generate questions and reflections about existing system (Dunne, 2013)

In this sense, upcycling becomes a tool to challenge norms of consumerism and to question the idea of “newness” as an absolute value. By using discarded or used materials, upcycled design creates a tension between past and present, giving objects a narrative and critical dimension.

Another important dimension of upcycling is its connection to the circular economy, which promotes keeping materials in use for as long as possible while minimizing waste. According to the Ellen Mac Arthur Fondation, this approach requires not only technological change but also a cultural shift in how society perceives ownership, use, and the life cycle of products (Foundation, 2017). In this framework, upcycling becomes a practice that combines innovation with responsibility.

In conclusion, upcycling should be understood as a practice that goes beyond technical recycling, positioning itself as a cultural and critical act. It redefines the relationship between material, time, and value, transforming design into a reflective process that integrates aesthetics with ethics and creativity with responsibility.

5. UPCYCLING BETWEEN ART AND DESIGN

One of the most significant aspects of this study is the analysis of upcycling as a hybrid practice operating simultaneously within the fields of art and design, challenging traditional boundaries between these disciplines. In the artistic context, upcycling is often used as an expressive and conceptual tool, where material is not merely a medium but a carrier of meaning, history, and symbolism. The created object does not necessarily serve a practical function but aim to provoke critical reflection on consumption, waste, and the value of materials in contemporary society (Dunne, 2013).

In contrast, within design upcycling must balance conceptual dimensions with functional requirements and practical use. Here, material becomes a structural and performative

element, requiring solutions that are both aesthetic and usable. As Fletcher notes, sustainable design demands not only innovation in materials but also their integration in ways that support long-term and responsible use (Fletcher, Sustainable fashion and textiles: Design journeys, (2014)).

In this light, upcycling creates an intermediate space where art and design intersect. It can function both as a form of critical artistic expression and as a concrete design strategy. This duality makes upcycling a powerful tool for rethinking the relationship between material, function, and meaning.

6. AS AN ART FORM

In art, upcycling becomes a powerful means of creative expression and conceptual reflection. Artist use recycle materials not only for their physical values but also for the history and symbolism they carry. Each reused object can tell a new narrative, linking the past with the present and challenging traditional perceptions of value and beauty. The artistic process is often experimental and open-ended, prioritizing ideas, messages, and emotional impact over functionality.

7. AS A DESIGN PRACTICE

In design, upcycling adopts a more functional and user-oriented approach. Recycled materials are treated as resources that must meet practical and aesthetic requirements. Designers aim to create durable, usable products that integrate into everyday life while balancing creativity and functionality. Here, structure, durability, and performance are as important as the conceptual idea.

While art and design pursue different goals in their use of upcycling, they share a common core: the. Creative transformation of material. Art focuses an meaning, symbolism, and communication, while design emphasizes usability and practical application. Despite these differences, both approaches are united by a shared philosophy-the restoration of value to discarded. Or forgotten materials.

8. ANALYSIS OF STUDENT WORK: MATERIAL–PRODUCT AND CONCEPT–PRODUCT CYCLES

Within the framework of this study, the students practical work was developed through two distinct methodological approaches, reflecting different ways of thinking and acting in design: the **material–product cycle** and the **concept–product cycle**. Both approaches were employed as pedagogical tools to explore not only the final outcome, but also the creative process as a form of knowledge production and critical reflection.

In the **material–product cycle**, students initiated the design process directly from the material itself, specifically by working with textile remnants sourced from the university's tent structures. These materials, marked by prior use, exposure, and environmental conditions, were not treated merely as passive resources but as active agents in the design process.

Through upcycling practices, students explored the transformative potential of the material by cutting, weaving, layering, and reconfiguring it in various ways.

Within this process, form was not predefined but emerged through direct engagement with the material. This generated a continuous interaction between artistic practice and design thinking, where decision-making was iterative rather than linear. Students developed textile surfaces characterized by different rhythms, textures, and structural variations, leading to outcomes that embody not only function but also material narrative and ecological awareness. In this case, the project does not conclude with a single fixed product; rather, it remains open-ended, allowing for further development and reinterpretation, particularly in relation to sustainability, craft, and cultural identity.

In contrast, the **concept–product cycle** was developed by starting from a clearly defined conceptual framework, inspired by the theme *"Biologic and Cybernetic World."* In this approach, the student first constructed a theoretical and visual narrative, exploring the relationship between biological systems and technological structures. This conceptual investigation was then translated into form through drawing, modeling, and systematic development of the product.

Material selection occurred at a later stage and was guided by the need to accurately express the initial concept. Form and function were developed in a more controlled and linear manner, following a structured design logic. The final product represents a synthesis of the original idea, where biological and cybernetic elements are integrated into a coherent and articulated formal language.

The comparison between these two approaches highlights important pedagogical differences. While the concept–product cycle strengthens the ability to structure and articulate ideas with clarity, the material–product cycle fosters material sensitivity and encourages an exploratory and experimental mode of thinking. In the first case, the design cycle is relatively closed and outcome-oriented; in the second, it remains open, enabling continuous expansion and reinterpretation.

These two experiences demonstrate that integrating both approaches in design education is essential for developing a balanced practice, where conceptual thinking and material intelligence coexist and inform one another.



Figure 1. Work by student Klea Tahiri created in the Fashion Design studio in Polis during the 2024-2025 academic year.



Figure 2. Work of first-year students at Polis, in the subject Study of Form and Material.

9. PEDAGOCICAL APPROACH

In contemporary design education, the learning process is often dominated by conceptual approaches, where students are encouraged to develop abstract ideas and then materialize them. While useful for structuring thought, this. Model often places material in a secondary role-as merely a means of realization rather than a source of knowledge and inspiration.

This study proposes a shift in this paradigm by placing material at the center of the pedagogical process. Instead of ideas always preceding form, material itself becomes the starting point of creation. This approach encourages students to directly engage. With textures, structures, durability, and the behavior of materials during transformation. Through this process, concepts are no longer fixed starting point but emerge from interaction with material.

Analysis of student projects reveal two main creative models: “Concept – Product” and “Materail-Product” . The latter proves more effective in developing deeper material awareness, as it fosters experimentation and discovery.

In this context, upcycling emerges as a particular valuable pedagogical tool. It compels students to work with existing, often imperfect materials, pushing them to find creative and innovative solutions. This process develops not only technical and aesthetic skills but also critical thinking about consumption, waste, and material life cycles.

Reconceptualize designer’s role.

The findings of this study suggest a profound reconceptualization of the designer’s role. Traditionally seen as a central author, the designer is now repositioned as. A mediator who. Collaborates with material. The creative process becomes a partnership, where material properties. Influence the evolution of ideas. This shift rapresents atransformation from “design as form” to” design as material process”. The focus moves from the final object to dynamic interaction and transformation of material.

Such a reconceptualization also. Demands a new. Ethical and ecological awareness. By viewing material as a partner rather than an infinite recourse, designers become more conscious of their environmental impact, fostering more responsible and sustainable practices.

10. CONCLUSION

Upcycling should not be understood merely as a temporary trend but as a deep structural transformation in how design is conceived, thought, and practiced. It redefines the relationship between materials, form and creative responsibility, shifting focus from the final product to the process of interaction with material.

Material is no longer passive but an active agent in decision-making. Design becomes a reflective and exploratory dialogue between ideas and matter.

From a pedagogical perspective, starting from material leads to deeper engagement and more grounded outcomes, while concept-driven approaches often remain more abstract. Upcycling acts as a bridge these approaches, encouraging a balance between creativity and material reality.

Ultimately, upcycling represents a new way of thinking about design- one that integrates aesthetics, ethics, and critical reflection into a more conscious and responsible creative practice.

11. SWOT ANALYSIS

Strengths

Repositions material as an active, supporting the shift from “design as form” to “design as material process”. Aligns with sustainability goals by reducing waste and extending material life cycles.

Encourage a reflective, experimental, and process-based approach to design. Bridges theory and practice by integrating material engagement into design thinking. Integrates aesthetics, ethics, and critical reflection into one design framework. Supports interdisciplinary connections between art and design.

Weaknesses

Dependence on existing materials limits predictability and full control over outcomes. Time-intensive and less efficient compared to industrial mass production Challenges in standardization, scalability, and repeatability. Requires adaptive material knowledge and adaptive technical skills.

May be perceived as niche, experimental, or non-mainstream. Inconsistent material quality can affect performance and durability.

Opportunities

Redefines design education through the “material-concept approach. Enables development of circular economy models in design practice. Opens new creative territories through hybrid practices (art + design). Increases ecological and social awareness among designer and users.

Supports innovation driven by constraints and material exploration. Encourages more responsible and ethical design methodologies.

Threats

Dominance of linear production systems and fast fashion industries. Risk of superficial adoption as a trend without conceptual depth. Greenwashing and commercialization of sustainability narratives. Limited industrial infrastructure for large-scale application. Cultural resistance to redefining value and aesthetics of reused materials. Economic pressures favoring speed, uniformity, and low cost over sustainability.

This SWOT analysis reinforces the central argument of the study: upcycling is not merely a technical strategy for waste reduction, but a paradigm shift in design thinking. Its strengths and opportunities highlight its role in redefining design as a material – driven, ethical, and reflective process. At the same time, its weaknesses and threats reveal the structural and cultural barriers that must be addressed for this transformation to move beyond experimental on niche practices into broader systemic change.

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AI as a Designer:
The Future of Taste and Creativity in Automotive Design

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Abstract

Artificial Intelligence (AI) is rapidly transforming design disciplines, introducing new possibilities for creativity, efficiency, and innovation. Within the automotive industry, AI-driven design tools are increasingly being employed to generate concepts, optimize performance, predict consumer preferences, and support decision-making processes. These developments raise fundamental questions regarding the future of creativity, aesthetic judgment, and the role of human designers in shaping automotive form and identity. This paper explores the emergence of AI as an active participant in automotive design and examines its implications for taste, authorship, and creative production. Through a review of current technological developments and theoretical perspectives on creativity, the study analyzes the opportunities and challenges associated with AI-generated design. The paper argues that AI should not be understood as a replacement for human creativity but rather as a collaborative design partner capable of expanding creative possibilities and transforming traditional design methodologies. The concept of machine-assisted creativity suggests a future in which human intuition and computational intelligence coexist, reshaping the design process and redefining the meaning of authorship in automotive design.

***Keywords**: Artificial Intelligence, Automotive Design, Creativity, Machine Learning, Design Innovation, Generative Design, Human-AI Collaboration, Aesthetic Judgment.*

1. INTRODUCTION

The automotive industry has long been recognized as one of the most influential fields of industrial design, combining engineering performance, technological innovation, and aesthetic expression. Throughout the twentieth century, automotive design evolved through the creative vision of designers who translated cultural values, technological aspirations, and consumer desires into physical products. From the streamlined forms of early modern automobiles to contemporary electric vehicles, design has played a critical role in shaping the identity and market success of automotive brands.

In recent years, however, the emergence of Artificial Intelligence (AI) has begun to challenge traditional understandings of design practice. AI systems are now capable of generating visual concepts, analyzing consumer behavior, predicting market trends, and proposing design solutions based on large datasets. These capabilities have introduced a new paradigm in which computational systems are not merely tools used by designers but active participants in the creative process.

The integration of AI into automotive design raises significant questions. Can machines truly be creative? How does AI influence aesthetic decision-making? What happens to human authorship when algorithms generate design proposals? More importantly, how will AI reshape future notions of taste and creativity within the automotive industry?

This paper investigates these questions by examining the relationship between AI, creativity, and automotive design. It explores how AI technologies are influencing contemporary design practices and considers the broader implications for the future of the discipline.

2. AI AND THE EVOLUTION OF DESIGN PRACTICE

The history of design has always been closely connected to technological innovation. The introduction of computer-aided design (CAD) systems in the late twentieth century revolutionized industrial design by improving precision, visualization, and efficiency. Today, AI represents the next stage in this technological evolution.

Unlike traditional digital tools, AI systems can learn from data, recognize patterns, and generate original outputs. Machine learning algorithms can analyze thousands of design examples and identify relationships that may not be immediately visible to human designers. Generative AI systems can produce hundreds of design alternatives within seconds, allowing designers to explore a wider range of possibilities than ever before.

In automotive design, AI is being used for concept generation, aerodynamic optimization, material selection, and user experience design. Advanced algorithms can evaluate multiple performance criteria simultaneously, balancing aesthetic considerations with engineering requirements. As a result, the design process becomes increasingly data-driven and computationally enhanced.

This shift does not simply improve efficiency; it fundamentally changes how design problems are approached. Rather than manually developing individual concepts, designers can collaborate with AI systems to generate and evaluate numerous design solutions. Consequently, the role of the designer evolves from creator to curator, strategist, and decision-maker.

3. CREATIVITY AND ARTIFICIAL INTELLIGENCE

Creativity has traditionally been regarded as a uniquely human capacity involving imagination, intuition, emotion, and cultural understanding. Philosophers and psychologists have long associated creative thinking with originality and the ability to produce meaningful innovations.

The emergence of AI-generated art and design challenges these assumptions. Contemporary AI systems can create visual compositions, music, architecture, and product designs that appear highly innovative and aesthetically sophisticated. Generative Adversarial Networks (GANs), diffusion models, and large-scale machine learning systems can produce outputs that are often indistinguishable from human-created works.

However, whether these outputs constitute genuine creativity remains a subject of debate. Critics argue that AI does not truly understand meaning or intention. Instead, it recombines patterns extracted from existing datasets. According to this perspective, AI lacks consciousness, subjective experience, and cultural awareness, all of which are essential components of human creativity.

Supporters of AI creativity suggest that creativity itself may be understood as a process of recombination and innovation. If originality emerges through the creation of new relationships between existing elements, AI systems may indeed possess a form of computational creativity.

In automotive design, this debate becomes particularly relevant because vehicle aesthetics involve both functional requirements and emotional responses. While AI can generate innovative forms, human designers remain essential for interpreting cultural meanings, consumer aspirations, and brand identities.

4. AI AND AESTHETIC TASTE IN AUTOMOTIVE DESIGN

Taste plays a central role in automotive design. The success of a vehicle often depends not only on technical performance but also on its visual appeal and emotional resonance with consumers.

Traditionally, aesthetic taste has been shaped by designers, cultural trends, and market preferences. Designers rely on experience, intuition, and cultural awareness to create forms that reflect contemporary values and future aspirations. AI introduces a new dimension to this process by enabling the analysis of vast amounts of consumer data.

Machine learning algorithms can identify aesthetic preferences across different demographics, regions, and markets. By analyzing social media interactions, purchasing behavior, and consumer feedback, AI systems can predict emerging trends and suggest design features likely to appeal to specific audiences.

This capability has significant implications for the future of taste. On one hand, AI can help manufacturers better understand consumer desires and create products that align with market expectations. On the other hand, excessive reliance on data-driven design may lead to homogenization, reducing diversity and experimentation in automotive aesthetics.

A key challenge therefore lies in balancing predictive analytics with creative risk-taking. While AI can reveal what consumers currently prefer, transformative design often emerges from unexpected innovations that challenge existing tastes rather than simply reflecting them.

5. GENERATIVE DESIGN AND AUTOMOTIVE INNOVATION

One of the most promising applications of AI in automotive design is generative design. Generative design systems use algorithms to automatically create multiple design solutions based on predefined objectives and constraints.

In automotive development, designers can specify parameters such as weight, strength, aerodynamics, sustainability, and manufacturing requirements. The AI system then generates numerous design alternatives optimized according to these criteria.

This approach significantly expands the design space available to designers. Solutions that might never have been considered through conventional methods can emerge through computational exploration. Complex structural geometries inspired by biological systems often result in lighter and more efficient components.

Generative design also supports sustainability objectives. By optimizing material usage and reducing waste, AI contributes to more environmentally responsible manufacturing practices. As electric vehicles become increasingly important, lightweight and efficient design solutions will play a critical role in improving vehicle performance and energy efficiency.

The integration of generative design demonstrates how AI can function not merely as an analytical tool but as a creative partner capable of proposing innovative solutions.

6. HUMAN-AI COLLABORATION IN AUTOMOTIVE DESIGN

Despite concerns regarding automation, most experts agree that the future of automotive design will involve collaboration rather than replacement. Human designers and AI systems possess different strengths that can complement one another.

AI excels at processing large datasets, identifying patterns, and generating alternatives at unprecedented speed. Human designers contribute emotional intelligence, ethical judgment, cultural sensitivity, and strategic vision. Together, these capabilities create opportunities for

enhanced creativity and innovation.

In collaborative design environments, AI can automate repetitive tasks, allowing designers to focus on conceptual development and creative decision-making. Designers become curators who evaluate, refine, and contextualize AI-generated proposals.

This collaborative model reflects broader shifts within contemporary design practice. Rather than viewing technology as a threat to creativity, designers increasingly recognize AI as a tool that expands creative possibilities and facilitates experimentation.

The success of this partnership depends on maintaining human oversight and ensuring that technological innovation remains aligned with social, cultural, and ethical values.

7. ETHICAL AND CULTURAL CHALLENGES

The growing influence of AI in design also raises important ethical concerns. Questions of authorship, intellectual property, transparency, and accountability become increasingly complex when design outputs are generated through machine learning systems.

Who owns an AI-generated design? Is the author the designer, the programmer, the company that developed the algorithm, or the AI system itself? Existing legal frameworks struggle to address these questions.

Bias represents another significant challenge. AI systems learn from historical datasets that may contain cultural, social, or aesthetic biases. Consequently, AI-generated designs may reproduce existing patterns rather than encouraging diversity and innovation.

Furthermore, excessive dependence on algorithmic decision-making risks diminishing the cultural richness that characterizes human creativity. Automotive design has historically served as a reflection of societal values and aspirations. Preserving this cultural dimension remains essential as AI becomes more deeply integrated into design processes.

Ethical governance and responsible implementation will therefore play a crucial role in ensuring that AI contributes positively to the future of automotive design.

8. TOWARDS A NEW DEFINITION OF CREATIVITY

The integration of AI into automotive design challenges traditional distinctions between human and machine creativity. Rather than replacing designers, AI encourages a broader understanding of creativity as a collaborative process involving multiple forms of intelligence.

Future creativity may emerge from interactions between human imagination and computational capabilities. Designers will increasingly work alongside intelligent systems that enhance exploration, support decision-making, and facilitate innovation.

This transformation requires a shift in educational and professional practices. Future designers will need not only artistic and technical skills but also an understanding of data science,

machine learning, and human-computer interaction. The designer of the future may function as both creator and orchestrator, guiding complex networks of human and artificial intelligence.

Such developments suggest that creativity itself is evolving. Instead of being defined solely by individual genius, creativity may increasingly be understood as a distributed and collaborative phenomenon.

9. CONCLUSION

Artificial Intelligence is transforming automotive design by introducing new forms of creativity, innovation, and decision-making. Through machine learning, generative design, and predictive analytics, AI enables designers to explore broader design possibilities and develop more efficient and responsive solutions.

This paper has examined the implications of AI for creativity, aesthetic taste, and design authorship within the automotive industry. It has demonstrated that AI challenges traditional understandings of design while simultaneously creating opportunities for new forms of collaboration between humans and machines.

The future of automotive design is unlikely to be defined by the replacement of human designers. Instead, it will be characterized by hybrid forms of creativity in which human intuition, cultural understanding, and ethical judgment are complemented by computational intelligence. In this emerging landscape, AI becomes not merely a tool but a creative partner.

Ultimately, the question is not whether AI can replace designers, but how designers and AI can work together to create meaningful, sustainable, and innovative automotive experiences. The future of taste and creativity in automotive design will depend on maintaining this balance between technological capability and human imagination.

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The Secondary Archive:
Collective Memory, Mental Images and AI-Assisted Representations in a Transforming Tirana

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Abstract

Tirana, the capital of Albania, has experienced an intense phase of urban transformation over the last two decades. Large-scale redevelopment, densification and the redesign of public spaces have significantly altered the physical configuration of the city and, consequently, the ways in which its inhabitants perceive and remember urban places. This paper investigates how collective memory can function as a secondary archive for understanding rapidly transformed urban environments. Focusing on selected central areas of Tirana that have undergone significant physical reconfiguration, the research examines the relationship between contemporary architectural interventions and residents' memories of the same urban fragments. Grounded in theories of mental mapping, mental representation and collective memory, the study considers individual recollections not as subjective accounts external to architectural knowledge, but as spatial evidence capable of revealing forms of continuity, disappearance and transformation that are not necessarily contained within official archives. Memory-based narratives, drawings and mental maps are therefore proposed as primary research material and are compared with historical archival sources and the contemporary urban condition. The paper further proposes an AI-assisted methodology for processing and relating these heterogeneous sources. Rather than replacing historical documentation, artificial intelligence is understood as an analytical and generative instrument capable of identifying recurring spatial references and visualizing relationships between documented and remembered environments. The resulting framework contributes to a broader understanding of urban resilience by positioning memory, identity and belonging as dimensions of the built environment that should be considered alongside physical transformation.

Keywords: *Memory, Image, AI, Heritage*

1. INTRODUCTION

This research emerged from an international open call launched by the Albanian Ministry of Culture in 2024 to select the curatorial team for the Albanian Pavilion at the 19th International Architecture Exhibition of La Biennale di Venezia.

The *Impossible Archive* catalogue, on which this paper is based, is a collective work developed through a collaboration between two academic teams: POLIS University in Albania and Clemson University in the United States. The team members who collaborated in the generation and conceptualisation of the proposal were: Ledian Bregasi, Sonia Jojiç, Dejvi Dauti, Keti Hoxha, Francesco Scasciamacchia, James Stivens, Andreea Vasile-Hoxha, Ergys Hoxha, Montserrat Palomino, and England Likoni.

The diversity of perspectives and the convergence of multiple voices contributed to the proposal being shortlisted for the final selection. This process provided an important foundation for the present research and contributed to a broader architectural reflection on questions of memory, heritage, and development in Albania and the Western Balkans more generally.

Over the past two decades, Tirana has undergone one of the most intense phases of urban transformation in its contemporary history. As the capital of Albania and one of the principal urban centres of the region, the city has been shaped by rapid economic growth, demographic change, and different forms of investment. Large-scale architectural interventions, processes of densification, and the redesign of public spaces have progressively transformed the spatial structure through which the city is experienced, as well as the image of the city preserved in the collective imaginary of its inhabitants.

This condition, combined with the general theme of the 19th International Architecture Exhibition, curated by Carlo Ratti under the title *Intelligens. Natural. Artificial. Collective.*, was understood as an invitation to consider intelligence as a combination of different forms of knowledge and abilities capable of generating innovation in response to contemporary challenges. Within this framework, the research assumes that every place, city, and space possesses specific needs shaped by cultural and social factors, which cannot necessarily be addressed through homogeneous solutions or standardised architectural strategies.

In this sense, intelligence can be understood as a form of human ingenuity capable of deciphering the needs of a particular culture and translating them into inclusive and contextually appropriate design positions.

Urban transformation, however, does not take place exclusively at the level of physical form. Every modification of the built environment also affects the ways in which places are recognised, remembered, and socially understood. When a building is demolished, a street is reconfigured, or a public space is redesigned, the physical reference through which inhabitants previously oriented themselves may disappear. Yet the mental image and memory associated with these places may persist, remaining strongly embedded within collective memory and

processes of reminiscence. The disappearance of a place from the material city does not, therefore, necessarily imply its disappearance from individual or collective memory.

This tension between physical transformation and mnemonic persistence constitutes the starting point of this research. The paper asks: **How can collective memory function as a secondary archive for understanding the transformation of urban fragments in contemporary Tirana?** More specifically, it investigates how inhabitants remember places that have undergone significant transformation and how their mental representations can provide additional forms of knowledge for understanding future urban developments. It proposes that memories and mental images can contribute to the construction of the city's contemporary identity by revealing dimensions of the *genius loci* that may not be accessible through conventional archival sources alone.

The research is grounded in the assumption that individuals construct internal images of the city through their experiences and interactions with their surroundings. These images can be recalled, narrated, and, importantly for architectural research, represented graphically. Memory drawings and mental maps can therefore be understood not merely as illustrations of personal experience, but as forms of spatial documentation capable of recording relationships between people and places.

The proposed methodology combines three forms of knowledge: historical and official archival sources, the contemporary material condition of the city, and memory-based primary sources collected from residents. Artificial intelligence is subsequently introduced as an assisting instrument for comparing, interpreting, and processing these heterogeneous forms of material.

The objective is not to reconstruct an objectively “lost” Tirana, nor to suggest that memory is more accurate than archival documentation. Rather, the research proposes that memory may reveal another layer of the city: a layer composed of spatial associations, landmarks, routes, social practices, and meanings that may persist even after their physical references have been transformed or disappeared. In this sense, collective memory can be approached as a secondary archive—one that does not replace the material or historical archive, but complements it by making visible the intangible and mnemonic dimensions through which urban space continues to exist in the minds of its inhabitants.

The transformation of Tirana needs to be understood within the broader evolution of the city. The transition from a socialist urban system towards a market-oriented and increasingly globally connected capital has produced significant changes in its physical and social structure. As described by Dhamo, Thomai and Aliaj in *Tirana – Qyteti i munguar*, the city has developed through processes of rapid and, at times, discontinuous urbanisation. More recently, Dhamo's discussion of emergent urbanism identifies Tirana as a case in which urban development cannot be understood exclusively through conventional models of planned growth.

These processes have produced a city in which different historical periods coexist, overlap, and compete for spatial visibility. Existing buildings and urban fragments are frequently

incorporated into new development processes, while other elements disappear completely. Consequently, the contemporary city contains multiple temporal conditions simultaneously.

This condition can be read through the concept of the urban image developed by Kevin Lynch. In *The Image of the City*, Lynch argues that inhabitants construct mental images of urban environments through recognisable spatial elements, including paths, edges, districts, nodes, and landmarks. The city becomes legible not only through its physical organisation, but also through the internal representations constructed by its users.

This proposition becomes particularly relevant in a city experiencing rapid transformation. If the physical elements supporting an individual's mental image are altered, the relationship between material environment and mental representation becomes unstable. A place can therefore change physically while continuing to exist in memory.

The research consequently focuses on selected central urban fragments of Tirana that have experienced significant reconfiguration, including the former train station, Skanderbeg Square, the New Bazaar, Rinia Park, the Pyramid, Mother Teresa Square, the National Stadium, and the Artificial Lake. Rather than treating the city as a homogeneous object, these fragments are considered specific sites where transformations can be observed and compared with residents' recollections.

Their value as research sites derives precisely from the coexistence of different temporal layers: the city that existed, the city that is remembered, and the city that exists today.

2. METHODOLOGY

The concept of memory has a long history within studies of architecture and the city. Lynch's understanding of the mental image provides a starting point for considering how individuals organise urban experience internally. However, individual memory cannot be understood independently from the social contexts in which it is produced and reconstructed.

Maurice Halbwachs' theory of collective memory is particularly relevant here. Memory is not simply an individual storage mechanism for past experiences; it is continuously reconstructed through social frameworks. Places contribute to this process because they provide physical references through which shared experiences can be organised.

Urban space therefore participates in the construction of collective memory. A square, building, street, or neighbourhood can become a reference point for multiple generations and communities. Even when the physical environment changes, the memory associated with a place may continue to circulate through stories, images, and personal recollections.

Aldo Rossi's understanding of the city further reinforces the relationship between architecture and memory. In *The Architecture of the City*, urban artefacts are considered in relation to permanence, collective memory, and the historical continuity of the city. Architecture is therefore not only a physical object occupying space; it also participates in the persistence of urban meanings.

This paper extends these ideas by considering collective memory as a secondary archive. The term “secondary” is important. Memory is not proposed as a replacement for official archives, maps, photographs, or planning documents. Instead, it is understood as an additional archive generated through lived experience.

The conventional archive records what was documented. The mnemonic archive records what was experienced and retained.

The distinction is significant because these two forms of knowledge do not necessarily coincide. An official plan may identify a building without recording its emotional or social significance. A photograph may document the appearance of a square without revealing which element residents used as their principal spatial reference. Conversely, a remembered element may have disappeared from the material city while continuing to structure inhabitants' understanding of the place.

The mnemonic archive is therefore neither objective nor stable. It is selective, subjective, and continuously reconstructed. Precisely because of these characteristics, however, it can provide access to forms of urban knowledge that conventional archives tend to exclude.

The proposed methodology combines three complementary domains of evidence: material, archival, and mnemonic.

The first domain concerns the contemporary physical environment. Existing buildings, streets, public spaces, and other urban elements are documented in order to establish the current spatial condition of each selected site.

The second domain consists of conventional archival sources, including historical photographs, maps, drawings, and other available urban documentation. These sources establish the documented history and physical transformation of the selected sites.

The third domain is the mnemonic archive. This is generated through memory-based primary research with residents who have experienced the selected urban environments. Participants are invited to describe places they remember and to represent these memories through interviews and visual material.

The use of oral accounts is particularly relevant to architectural research. When a memory is described, it generates a spatial image in both the speaker and the listener. This process introduces another layer of knowledge that can contribute to the interpretation and conceptualisation of urban transformation. The scale of an element, its position, its recurrence, or even its omission can provide information about its mnemonic significance.

For this reason, the research does not treat inaccuracies as failures. A distorted street, an oversized building, the displacement of a landmark, or the absence of an apparently important urban element may reveal how a place was mentally organised by its inhabitants.

The collected narratives and drawings can subsequently be compared with archival and contemporary evidence. Each site can therefore be examined through a sequence:

documented past → physical transformation → contemporary condition → remembered environment.

This comparison allows the research to identify three principal conditions. First, elements that have remained physically present and continue to be remembered. Second, elements that have disappeared physically but remain present within memory. Third, elements that remain materially present but have lost their mnemonic relevance.

This approach transforms memory from anecdotal material into a structured research source. Rather than asking whether a memory is factually accurate, the research asks what the memory reveals about the relationship between inhabitants and the urban environment.

The methodological framework introduces artificial intelligence as a tool for connecting and processing different forms of urban knowledge. The archives produced through this research are inherently heterogeneous: narratives are textual, drawings are visual, maps are cartographic, photographs are documentary, while the contemporary city provides material evidence. Rather than treating these sources as equivalent, the methodology uses artificial intelligence to identify relationships and recurring references across these different forms of evidence.

AI-assisted tools can support the analysis of these materials by identifying recurring spatial references within residents' narratives and drawings and by establishing relationships between these references and documented urban conditions. In this process, artificial intelligence functions primarily as a mediating and interpretative instrument rather than as an autonomous source of knowledge.

The first stage involves the processing of interview narratives. An AI text-to-text model (Fig.1) analyses the interview material and assists in identifying and connecting individual memories, experiences, associations, and ideas related to specific urban spaces. These narratives provide unique perspectives and emotional depth, forming the conceptual and experiential foundation for the subsequent visualisation process. Spatial references, recurring descriptions, landmarks, activities, and personal associations are extracted from the interviews and translated into structured textual descriptions.

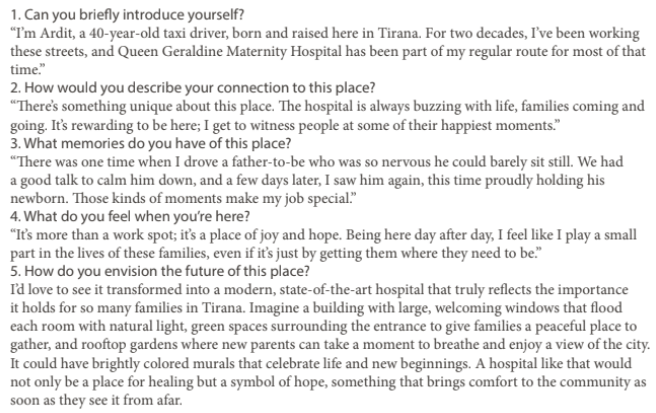

1. Can you briefly introduce yourself?
"I'm Ardit, a 40-year-old taxi driver, born and raised here in Tirana. For two decades, I've been working these streets, and Queen Geraldine Maternity Hospital has been part of my regular route for most of that time."
2. How would you describe your connection to this place?
"There's something unique about this place. The hospital is always buzzing with life, families coming and going. It's rewarding to be here; I get to witness people at some of their happiest moments."
3. What memories do you have of this place?
"There was one time when I drove a father-to-be who was so nervous he could barely sit still. We had a good talk to calm him down, and a few days later, I saw him again, this time proudly holding his newborn. Those kinds of moments make my job special."
4. What do you feel when you're here?
"It's more than a work spot; it's a place of joy and hope. Being here day after day, I feel like I play a small part in the lives of these families, even if it's just by getting them where they need to be."
5. How do you envision the future of this place?
I'd love to see it transformed into a modern, state-of-the-art hospital that truly reflects the importance it holds for so many families in Tirana. Imagine a building with large, welcoming windows that flood each room with natural light, green spaces surrounding the entrance to give families a peaceful place to gather, and rooftop gardens where new parents can take a moment to breathe and enjoy a view of the city. It could have brightly colored murals that celebrate life and new beginnings. A hospital like that would not only be a place for healing but a symbol of hope, something that brings comfort to the community as soon as they see it from afar.

Figure 1. Interview model

The second stage involves the transformation of these narratives into descriptive prompts. The AI text-to-text model (Fig.2) combines personal stories with spatial and architectural information, incorporating both documented characteristics of the site and the imaginative scenarios expressed by participants. The resulting prompts function as an intermediary layer between human experience and image production, translating memories, perceptions, and ideas into a format capable of guiding the subsequent generation of visual material.

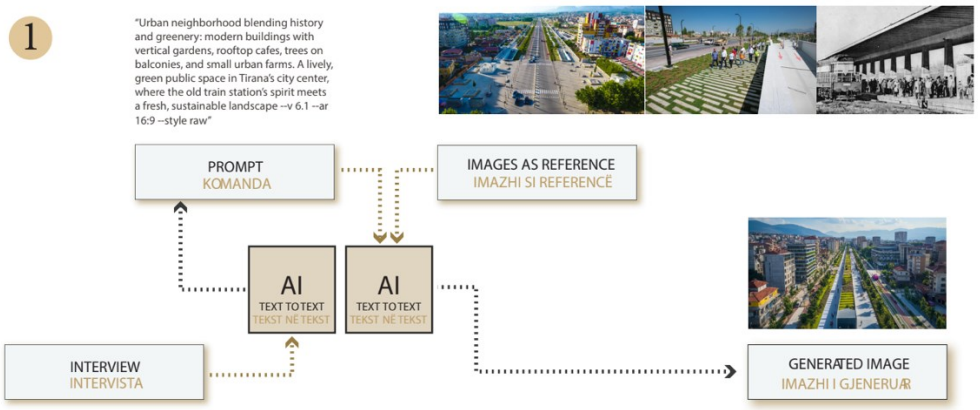


Figure 2. Intersection between interviews and archivistic source

The third stage involves the generation of visual scenarios. An AI text-to-image model uses the prompts developed from the interviews together with photographic and other visual references of the relevant locations. These inputs are synthesised to produce speculative images that combine the identifiable characteristics of the existing environment with the aspirations, memories, and possible future scenarios articulated by participants. (Fig. 3)



Figure 3. Images generated from AI text to image prompt.

The resulting images should therefore be understood as interpretative visualisations rather than direct representations of reality.

The use of photographic references is particularly important within this process. These images help anchor the generated visuals in the identifiable characteristics, spatial configuration, and atmosphere of each location, reducing the distance between the speculative image and the documented urban condition. They also provide a visual reference against which the AI-generated output can be critically evaluated.

The methodological sequence can therefore be understood as:

interview → narrative processing → spatial references → descriptive prompt → photographic references → AI-generated visualisation → critical comparison.

This sequence does not position AI as the author of the research. Instead, it establishes AI as a mediating layer through which different forms of evidence can be translated and compared.

For example, several residents may independently refer to the same building, tree, street, courtyard, landmark, or public activity. Such repetition may indicate that a particular element possesses collective mnemonic significance. Conversely, differences between individual representations may reveal that the same urban fragment is remembered through different spatial hierarchies, associations, or emotional relationships.

AI-assisted analysis can help organise these recurring and divergent references, making patterns across a large body of qualitative material more visible. However, the identification of patterns does not in itself establish their meaning. Interpretation remains dependent on the researcher and on the relationship between the AI-assisted analysis and the original source material.

AI-generated visualisations can subsequently be used as exploratory representations of these relationships. Their role, however, requires careful definition. An AI-generated image should not be presented as an objective reconstruction of historical reality. Rather, it represents a specific configuration of memories, archival references, spatial information, and speculative interpretations.

This distinction is essential because artificial intelligence may introduce information that was not present in the original source material. The resulting image may appear historically or architecturally convincing while simultaneously containing fabricated spatial configurations, architectural elements, materials, or environmental conditions. Visual plausibility should therefore not be confused with historical accuracy.

AI should consequently remain subordinate to the research archive and to the critical interpretation of the researcher. Its value lies not in producing an authoritative image of the past, but in assisting the comparison, organisation, and visualisation of relationships between documented and remembered space.

In this framework, artificial intelligence becomes a **mediating layer between memory, archive, and representation**, enabling otherwise heterogeneous forms of urban knowledge to be brought into dialogue without collapsing their differences.

3. RESULTS AND DISCUSSIONS

The relevance of this methodology extends beyond the documentation of urban history. It raises a broader question concerning resilience and the relationship between communities and their built environment.

Urban resilience is frequently discussed through physical infrastructure, environmental performance, accessibility, or the capacity of urban systems to respond to disruption. Yet communities also require forms of cultural and spatial continuity. When familiar urban references disappear, inhabitants may experience a disruption not only of physical orientation, but also of belonging.

Memory therefore represents a form of civic knowledge. Residents possess knowledge of urban environments that is generated through everyday experience and cannot always be recovered through conventional planning documentation. Their recollections may reveal social uses of spaces, informal landmarks, routes, and relationships that remain invisible in official representations.

In this sense, collecting memories can become a form of civic engagement. The resident is not simply consulted about a proposed intervention; the resident becomes a producer of knowledge about the city.

This proposition is particularly relevant to rapidly transforming urban environments. Instead of asking only what should be preserved physically, planning processes could also ask: What should remain recognisable? What should remain meaningful? Which elements constitute the mnemonic structure of a place?

Such questions do not imply that urban transformation should be avoided. Cities necessarily change. Rather, they suggest that transformation can become more socially resilient when it recognises the multiple temporal and mnemonic layers already embedded within urban environments.

The value of the mnemonic archive therefore lies not in preventing transformation, but in providing another form of knowledge through which transformation can be understood and negotiated.

4. CONCLUSIONS AND RECOMMENDATIONS

Tirana's recent transformation demonstrates that urban change is not only a process of modifying physical space. It is also a process of modifying the images through which inhabitants understand and remember the city.

This paper has proposed collective memory as a secondary archive capable of complementing conventional urban documentation. Through narratives, mental maps, and memory drawings, residents can provide evidence of spatial relationships and meanings that may not be contained within official archives. These materials make visible the gap between the city as documented, the city as materially transformed, and the city as remembered.

The methodological framework combines archival research, documentation of the contemporary city, and memory-based primary research. AI-assisted tools can further support

the analysis of these heterogeneous sources, provided that generated representations are treated critically and not as objective historical reconstructions.

The central proposition is therefore that the city possesses more than one archive. There is the archive of plans, photographs, maps, and official records, but there is also an archive carried by its inhabitants. This second archive is unstable, subjective, selective, and multiple. Precisely because of these characteristics, however, it can reveal dimensions of urban transformation that conventional documentation cannot fully capture.

For Tirana, a city undergoing continuous and accelerated transformation, recognising this mnemonic dimension may contribute to a more inclusive understanding of urban change. Resilience, in this context, is not only the capacity of buildings and infrastructures to adapt. It is also the capacity of communities to maintain relationships with place while the physical city changes.

To “resize” Tirana, therefore, may mean more than measuring its new buildings, streets, and densities. It may mean recognising the different scales through which the city exists: the material scale of architecture, the territorial scale of urban transformation, and the internal scale of memory. Between these scales lies an additional representation of the city—one carried by its inhabitants and capable of becoming an archive for its future.

The secondary archive is consequently not a fixed repository of the past, but a dynamic field in which memory, material evidence, archival documentation, and emerging technologies interact. Its purpose is not to recover a single, authentic image of the city, but to make visible the plurality of ways in which urban space is experienced, remembered, and imagined. In this sense, memory does not simply preserve the city after transformation; it becomes an active instrument through which alternative futures can be conceived.

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SESSION VI

Next-Generation Pioneers of the Built Environment

Emerging research and experimental design: Student research / Young scholars / Innovative methodologies / Experimental approaches to the built environment.

Sustainable and bioclimatic design: Bioclimatic architecture / Climate-responsive design / Environmental performance / Sustainable building concepts.

Resilience and risk management: Flood-risk management / Environmental resilience / Disaster-aware planning / Adaptive urban strategies.

Structural and technological innovation: Steel-frame technologies / Construction systems / Emerging building technologies / Engineering innovation.

Architecture, design and society: Architecture-inspired design / Fashion and spatial concepts / Objects and social space / Interdisciplinary creative practice.

Future-oriented thinking: Innovation / Critical inquiry / Interdisciplinary experimentation / New professional perspectives / Future built environments.

Performance-Based Bioclimatic Design of a Kindergarten in Tirana: Integration of Passive Systems and Dynamic Simulation

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Abstract

Contemporary buildings are increasingly energy-intensive due to rising requirements for heating, cooling, lighting, and ventilation. This article presents the bioclimatic design of a kindergarten for children aged 1–4 years in Tirana, Albania, developed in response to local climatic conditions and supported by digital simulation tools.

Tirana has a Mediterranean climate, characterized by hot summers and mild, humid winters. Climate data and solar radiation analyses were conducted for winter and summer solstices using Design Builder software, allowing evaluation of solar exposure, shading effects, and overheating risks. The site, located near Kavaja's Street, is surrounded by buildings up to 18 m high, resulting in approximately 60% shading. To optimize solar gains, the kindergarten was designed as a two-story building.

Two passive systems were integrated. The Barra–Costantini passive solar system provides winter heating through a glazed façade, metal thermal mass, and controlled air circulation, effectively serving spaces up to 12 m along the north–south axis. For summer conditions, a Canadian Well (earth–air heat exchanger) supports cooling and natural ventilation.

Design Builder simulations revealed increased solar radiation during the summer solstice,

leading to potential indoor overheating. This was mitigated through cantilevered floor slabs designed to block solar rays at a 75° angle, combined with adjustable shading devices responsive to solar angles. The study demonstrates that climate-responsive design supported by simulation-based solar analysis can significantly reduce energy demand and improve thermal comfort in early childhood educational buildings in Tirana.

Keywords: *Bioclimatic architecture, Passive solar systems, Design Builder simulation, Mediterranean climate, Energy-efficient kindergartens*

1. INTRODUCTION

In climate context of Tirana, which is characterized by hot summers, mild winters and high solar radiation the application of bioclimatic design becomes important for indoor thermal comfort and minimizing energy consumption. This study is based on the analysis of local climatic conditions and the implementation of passive design strategies such as optimal building orientation, natural ventilation, solar exposure and shading in based in different seasons to see the difference of temperature indication in building comfort, and the use of materials with high thermal mass using Design Builder V.6.1 software for analysis to see how this strategies can improve comfort inside of building.[1]

The central research explores how bioclimatic design principles can be adapted to improve building energy performance under the Mediterranean climatic conditions of Tirana.[2]

The main objective of this study is to identify the most effective bioclimatic design strategies suitable for Mediterranean climate in Tirana and to evaluate their potential in reducing energy demand while enhancing indoor environmental comfort in a kindergarten.

2. LITERATURE REVIEW

Bioclimatic design has been studied as an effective strategy for increasing environmental performance and energy efficiency off buildings. Many studies highlight the importance of climate responsive architecture, particularly in regions with mediterranean climatic conditions with high solar radiation. Research on sustainable building design emphasize the role of passive design strategies as optimal building orientation, natural ventilation and solar shading devices can reduce energy consumption for heating and cooling.[3]

Many existing studies focus on broader regional climates or on other Mediterranean cities with different urban structures and environmental conditions.[4] Therefore, more research is needed to examine how bioclimatic design strategies can be used to the specific climatic characteristics and urban environment like Tirana.

3. METHODOLOGY

This study adopts a qualitative research approach to investigate the application of bioclimatic design principles in relation to the climatic condition of Tirana.The research is based on climate analysis and using of passive strategies that work in Tirana's environmental conditions.The study aims to show how environmental design can improve energy efficiency and indoor comfort in Tirana's buildings.

Data collection for this research is based on secondary sources , including scientific articles and other architectural bioclimatic designs and weather E.[5][6]Climatic data like temperatures , solar radiation angle and wind rose are examined to identify the factors that influence building performance. In addition , other architectural projects and studies on Mediterranean climate strategies are reviewed to understand commonly applied passive design strategies.[7]

Two passive systems were integrated. The Barra–Costantini passive solar system provides winter heating through a glazed façade, metal thermal mass, and controlled air circulation, effectively serving spaces up to 12 m along the north–south axis. For summer conditions, a Canadian Well (earth–air heat exchanger) supports cooling and natural ventilation.[8]

DesignBuilder V.6.1 simulations shows increased solar radiation during the summer solstice, leading to potential indoor overheating.[Figure 1] This was mitigated through cantilevered floor slabs designed to block solar rays at a 75° angle, combined with adjustable shading devices responsive to solar angles. [Figure 2] The study demonstrates that climate-responsive design supported by simulation-based solar analysis can significantly reduce energy demand and improve thermal comfort in early childhood educational buildings in Tirana.

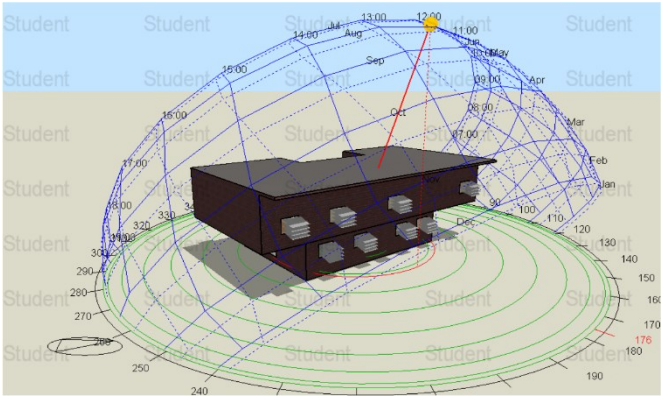


Figure 1. Solar radiation (25 July 12:00 PM) Design Builder simulation

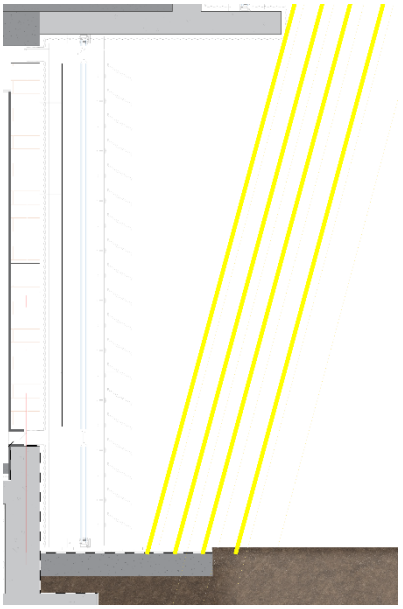


Figure 2. Solar rays (25 July 12:00 PM) 75° angle

4. PROJECT DEVELOPMENT

The project started with the analysis of the existing kindergarten no. 26 on Kavaja Street, that due to the buildings surrounding it, which reached up to 18 meters, there was not enough sunlight, especially during the winter season. [Figure 3 , 4 , 5]

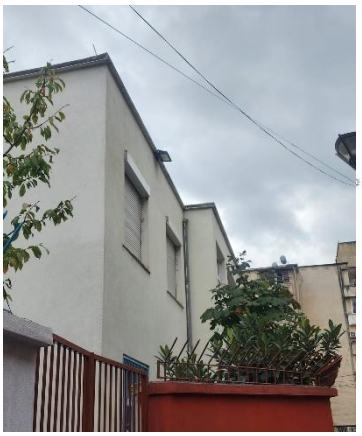


Figure 3. The existing situation

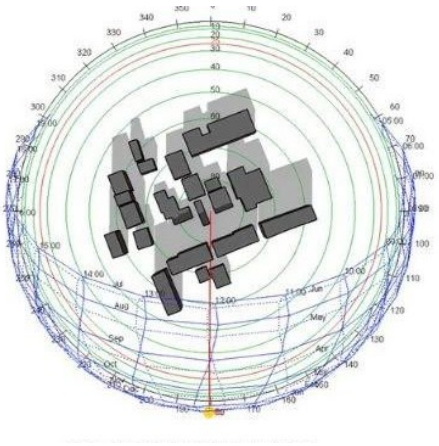


Figure 4. Sun Path (25 December 12:00 PM) Design Builder simulation



Figure 5. The existing situation

After analyzing the solar radiation of the area, despite the challenging problems, it was proposed that in order to maximize solar radiation, a new building be placed on the northern edge of the site and raised to a height that would allow for solar radiation in the winter season when the sun shines at an angle of 25 degrees.

The building frame is reinforced concrete. The external walls are 25cm-thick masonry brick, 10cm-thick thermal insulation, plaster, and wood cover. The internal walls are 10cm-thick masonry brick wall, plaster, and paint. The roof is inclined reinforced concrete, with 15cm-thick thermal insulation, water barrier, and fine gravel. The windows are aluminium profile, triple glazed, have low emissivity, and argon filled. Also, the floors are composed of ceramic tiles.



Figure 6. Proposed building

The ground floor is organized to include a nursing room, a kitchen, the main office, a reception area, a meeting room and toilets. [Figure 6]

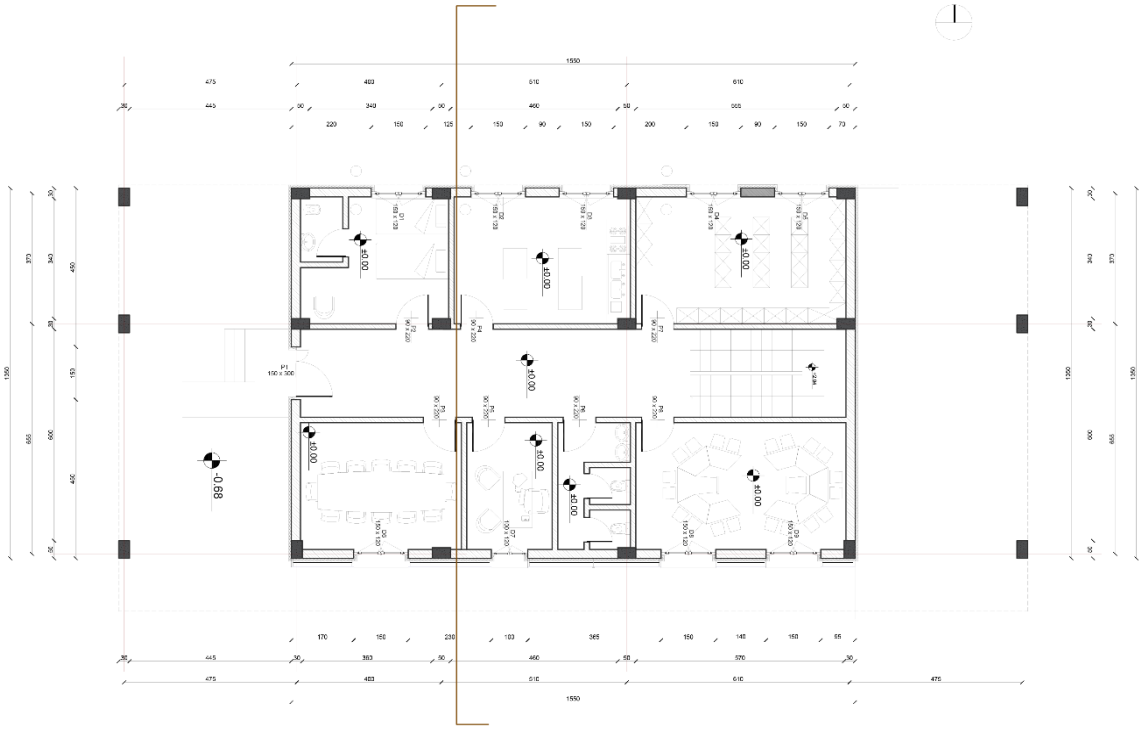


Figure 7. Ground floor plan

The second floor is organized to include classrooms for 3 groups of children, including toilets and sleeping areas within each classroom. [Figure 7]

Winter and summer scenarios were also analyzed during the day and night to show how warm and cold air circulates throughout the building.

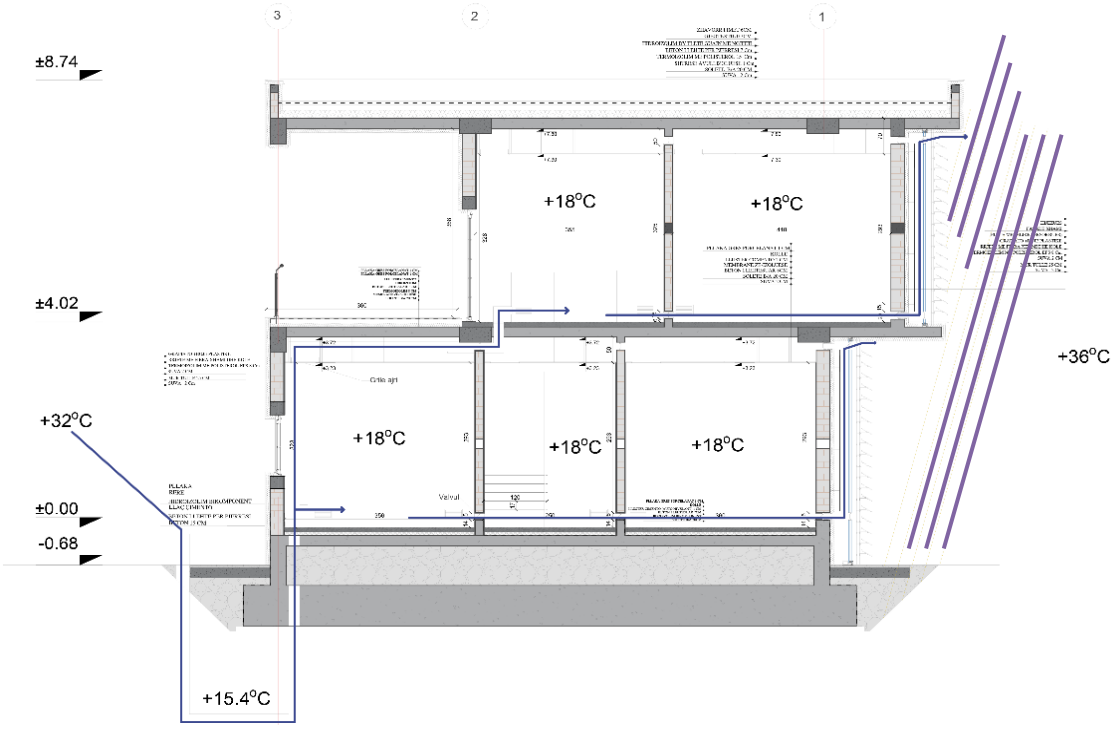


Figure 8. Scenario summer - day

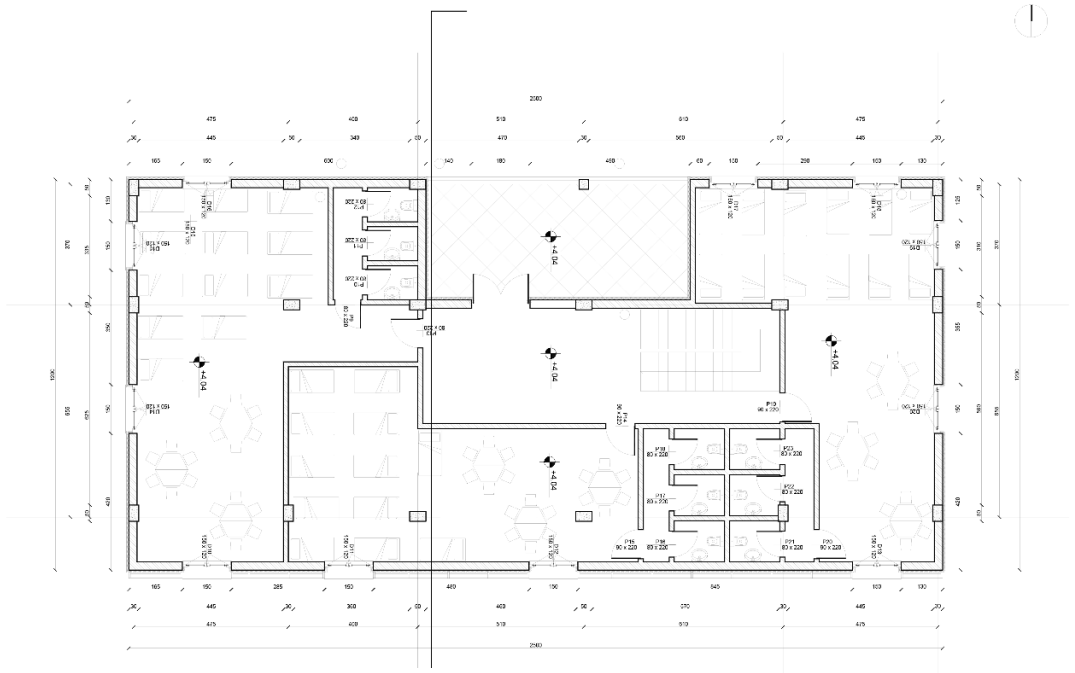


Figure 9. Second floor plan

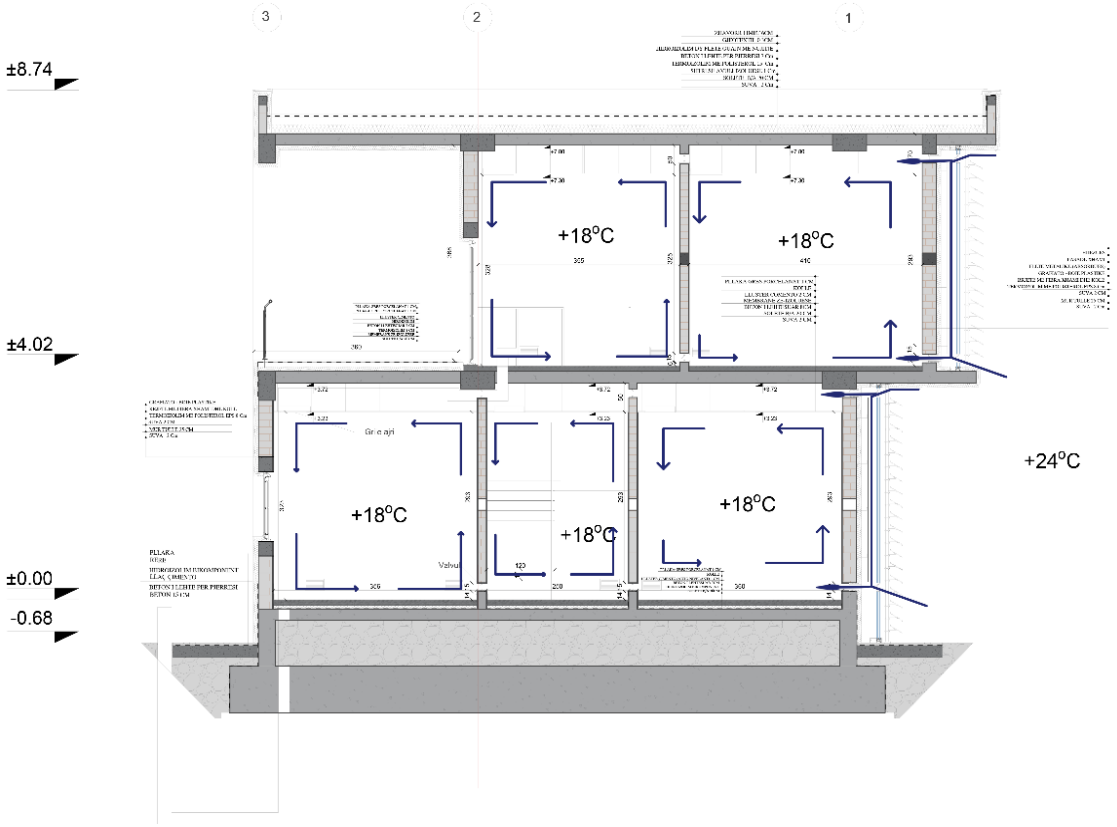


Figure 10. Scenario winter - day

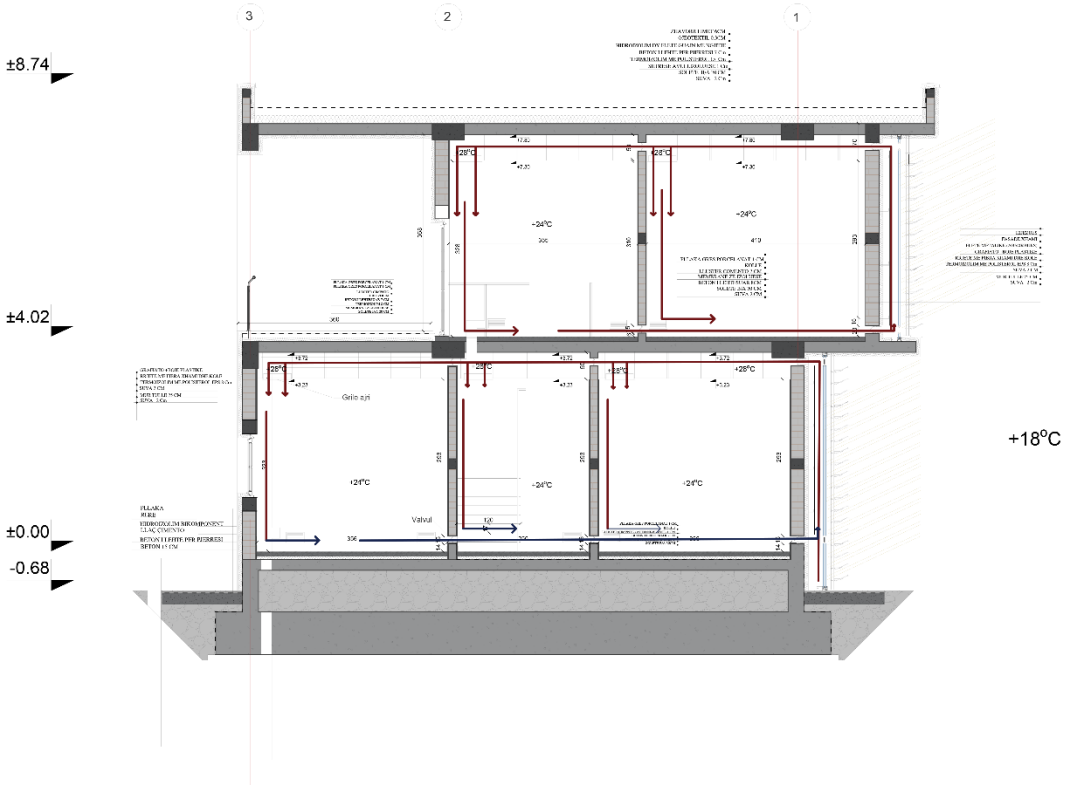


Figure 11. Scenario winter - night

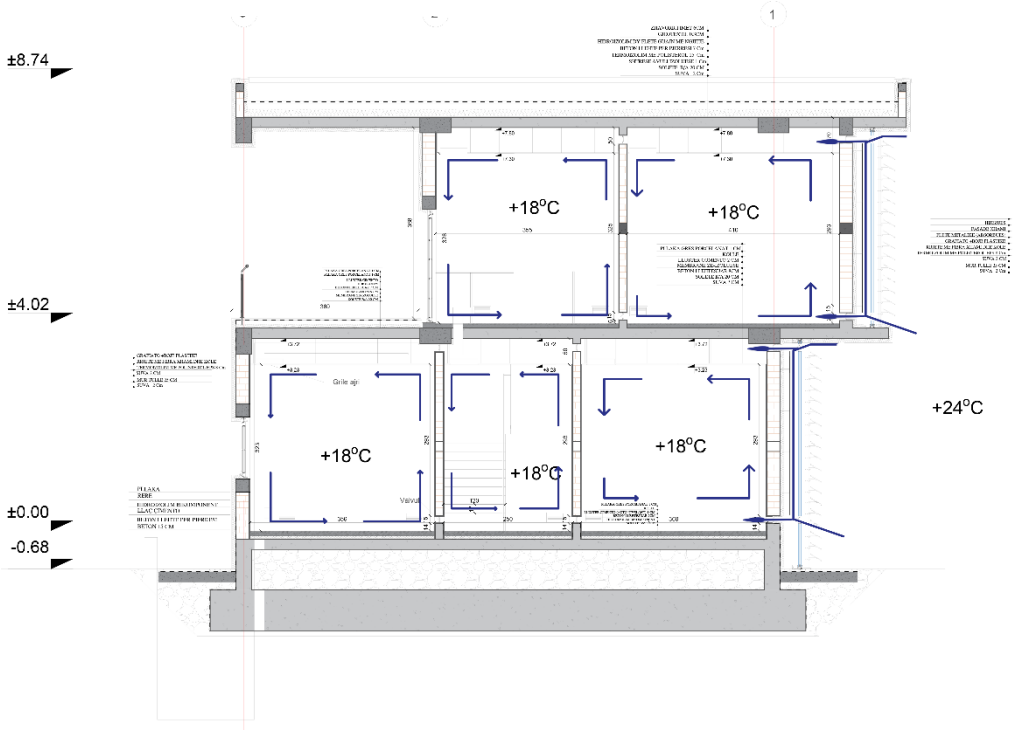


Figure 12. Scenario summer - night

Through the Canadian well, natural ventilation of the building is possible, as well as cooling of the building during the winter season using a constant ground temperature.

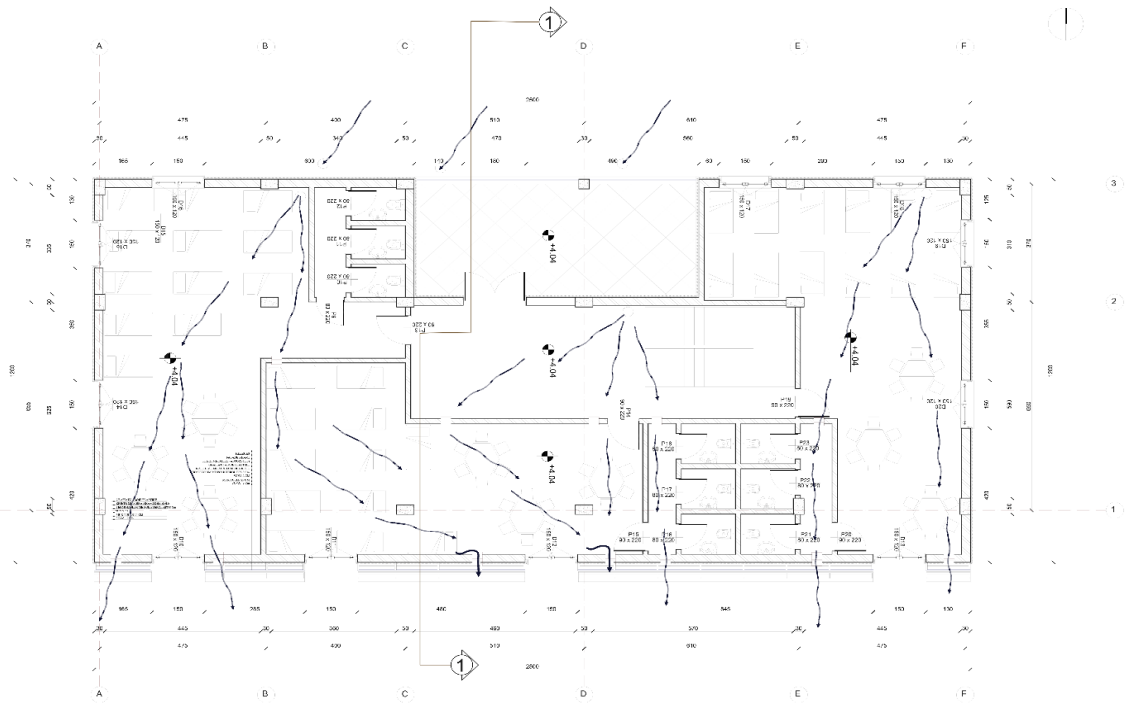
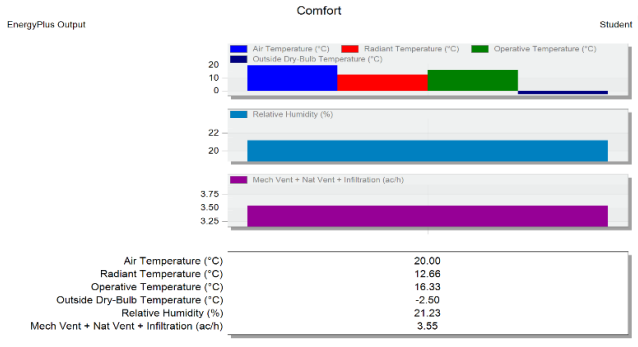


Figure 13. refresh scheme

Time											
Air Temperature (°C)	28.84	27.71	23.00	23.00	23.00	23.00	23.00	23.00	33.44	34.63	32.07
Radiant Temperature (°C)	29.31	28.23	26.80	28.44	31.49	34.01	35.62	35.51	35.69	34.47	32.26
Operative Temperature (°C)	29.07	27.97	24.90	25.72	27.24	28.51	29.31	29.25	34.57	34.55	32.17
Outside Dry-Bulb Temperature (°C)	21.50	20.68	20.68	23.99	28.96	32.41	34.20	33.37	30.89	27.30	24.82
Glazing (kW)	-0.57	-0.55	0.23	0.38	0.57	0.51	0.58	0.40	0.03	-0.59	-0.58
Walls (kW)	6.90	7.85	11.61	4.59	-2.48	-5.60	-7.26	-4.10	-12.83	-5.41	1.46
Ground Floors (kW)	0.09	0.74	2.34	0.47	-1.77	-3.03	-3.94	-3.24	-5.79	-4.21	-1.99
Roofs (kW)	-5.85	-7.50	-5.56	2.21	18.18	34.22	41.51	40.15	22.04	9.01	1.21
Floors (ext) (kW)	-0.24	-0.26	-0.19	-0.07	0.24	0.57	0.72	0.73	-0.12	0.01	-0.11
External Infiltration (kW)	-1.28	-1.23	-0.41	0.17	1.00	1.57	1.86	1.73	-0.43	-1.25	-1.25
External Vent. (kW)	0.00	0.00	0.00	0.55	13.22	10.43	24.84	11.50	0.00	0.00	0.00
General Lighting (kW)	0.00	0.00	0.00	4.91	4.91	4.91	4.91	4.91	0.00	0.00	0.00
Computer + Equip (kW)	0.08	0.08	0.08	1.54	1.54	1.54	1.54	1.54	1.54	1.54	0.08
Occupancy (kW)	0.00	0.00	0.00	3.39	13.56	6.78	13.56	6.78	0.00	0.00	0.00
Solar Gains Exterior Windows (kW)	0.00	0.00	2.37	2.56	2.13	1.73	1.69	1.34	1.27	0.00	0.00
Zone Sensible Cooling (kW)	0.00	0.00	-10.43	-19.95	-37.57	-42.95	-54.92	-50.14	0.00	0.00	0.00
Sensible Cooling (kW)	0.00	0.00	-10.43	-20.60	-51.35	-53.74	-80.55	-62.02	0.00	0.00	0.00
Total Cooling (kW)	0.00	0.00	-12.02	-37.66	-109.36	-87.53	-140.57	-95.54	0.00	0.00	0.00
Relative Humidity (%)	66.04	68.94	54.32	57.10	58.47	54.70	55.78	53.92	33.20	37.75	49.20
Mech Vent + Nat Vent + Infiltration (ac/h)	0.31	0.31	0.30	1.26	4.15	2.22	4.15	2.22	0.30	0.30	0.30

Figure 14. Internal comfort analyses Design Builder simulation

After completing the entire project on paper, the building was modeled in Design Builder and several analyses were performed regarding thermal comfort and air temperature. [9]



Air Temperature (°C)	20.00
Radiant Temperature (°C)	12.66
Operative Temperature (°C)	16.33
Outside Dry-Bulb Temperature (°C)	-2.50
Relative Humidity (%)	21.23
Mech Vent + Nat Vent + Infiltration (ac/h)	3.55

Figure 15. Thermal comfort analyses Design Builder simulation

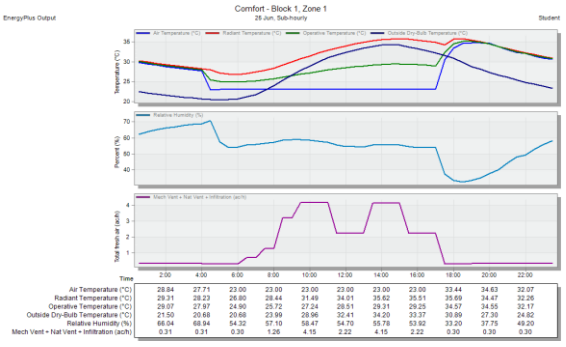


Figure 16. Cooling design Design Builder simulation

5. RESULTS AND DISCUSSIONS

From the analysis , it become clear that several factors affect building performance and indoor comfort in Tirana .The climate here has hot summers, relatively mild winters , and quite high solar radiation, which has a direct impact on how buildings behave thermally.

Because of this , passive systems such as the Barra Costandini and the Canadian Well become particularly important . They help reduce overheating during summer, especially on July in 12:00PM where from 34° C outside it becomes 24°C while still allowing useful solar gains during winter.

It can also be noticed that building orientation plays a key role . Buildings oriented along the east-west axis , with the main facade facing south , can take better advantage of winter sun where indore temperature goes aruynd 20°C. At the same time, shading devices help limit excessive solar radiation during the summer months.

The use of the Canadian Well improves indoor air circulation and contributes to cooling during warmer periods. In addiction , cross-ventilation and proper window placement further enhance natural cooling inside the building .

Another important aspect is the use of shading systems such as cantilevered floors and external louvres . These reduce direct solar gains in summer. Materials with high thermal mass also play a role , as they absorb heat during the day and release it slowly at night . Together , these strategies help reduce the need for mechanical heating and cooling systems.

6. CONCLUSIONS AND RECOMMENDATIONS

This study examined how bioclimatic design strategies can improve building performance and indoor comfort in the climate of Tirana.

The result suggest that combining different passive strategies – such as proper orientation , natural ventilation , solar shading , and the use of thermal mass- can significantly reduce energy demand for heating and cooling. These approaches help maintain more stable indoor temperatures and reduce dependence on mechanical systems.

Adapting architectural design to local climatic conditions appears to be essential for achieving better performance . In case of Tirana , this means carefully considering solar exposure , ventilation , and material selection.

In conclusion , integrating bioclimatic principles into both architectural design and urban planning can support more sustainable development . These strategies not only improve energy efficiency but also enhance indoor environmental quality.

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Integrated Flood Risk Management in Albania:
Human drivers, Basin dynamics and Policy gaps

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Abstract

Albania possesses a dense hydrographic network and significant freshwater resources, with an average annual runoff of approximately 41 billion m^3 and high hydrological module values. While this water wealth supports agriculture, hydropower and economic development, it simultaneously exposes the country to recurrent and often severe flooding. Over the past three decades, flood events have generated economic damages estimated at approximately 2.5 billion USD and have resulted in substantial social and environmental consequences.

This study examines the structural, environmental and anthropogenic factors that intensify flood risk in Albania, with particular focus on major river basins such as Drin-Buna. Through a qualitative-analytical review of documented flood events (2010-2026), institutional reports and basin characteristics, the research identifies the interaction between natural hydrological conditions and human-induced pressures. Although high annual precipitation (1400-1500mm) and geomorphological features contribute to natural vulnerability, findings indicate that unplanned urbanization, illegal construction in floodplains, deforestation, degradation of drainage systems, poor river maintenance, and inadequate management of hydraulic

infrastructure significantly amplify flood magnitude and frequency.

The Drin-Buna basin, characterized by dense population, agricultural activity and hydropower installations, represents a critical case where structural exposure intersects with management deficiencies. Inadequate maintenance of levees, pumping stations and drainage canals further reduces system resilience, leading to repeated humanitarian and economic crises, particularly in northern lowland areas.

The paper argues that flood risk in Albania is no longer solely a hydrological issue but a governance and spatial planning challenge also. Strengthening integrated river basin management, enforcing land-use regulations, investing in maintenance infrastructure, and adopting preventive rather than reactive strategies are essential to reducing long-term vulnerability. A shift toward proactive risk governance is necessary to safeguard communities, economic assets and environmental stability.

Keywords: *Hydrological vulnerability, river basin governance, civil emergency policy, drainage systems, land-use regulation*

1. INTRODUCTION

1.1 General information and main questions

Albania, due to its distinctive physic-geographical conditions, possesses substantial water resources and a dense hydrographic network. This network collects the waters of a drainage basin with a total surface area of 43,305 km², of which 28,550 km² lie within the state territory of the Republic of Albania. The mean annual runoff has a total water volume of approximately 42.25 billion m³, corresponding to a high specific discharge (runoff modulus) of about 30 L/s per km² (Geography of Albania 2022)

This considerable water wealth, in addition to its positive contributions to the economy, agriculture, energy production, and tourism, also has adverse implications during periods of intense precipitation, leading to significant flooding events. These floods can cause substantial material damage and, in some cases, loss of human life.

Hydrological risk constitutes a fundamental component in the development of Civil Emergency Plans and represents an issue of national importance. It is also among the main points of the standards required to join the European Union. The main questions that arise are:

- What are the natural and anthropogenic factors influencing these flood events?
- Are we capable of preventing such floods?
- If prevention is not feasible, how can we minimize their economic and human impacts?
- What are the fundamental problems affecting the protective infrastructure?

1.2 Damage caused by flooding over the years

According to the State Supreme Audit Institution - KLSH, the economic damage caused by floods over the past three decades has reached a substantial value of approximately 2.5 billion USD (KLSH, 2024). Furthermore, based on unofficial statistics, it is estimated that floods have caused, directly or indirectly, the loss of around 270 human lives - an alarming figure for responsible authorities, experts, and society as a whole.

In addition to economic and human losses, these recurrent flood events also produce significant social and psychological impacts on affected populations. Citizens often experience a loss of hope and trust, which in many cases compels them to migrate. This, in turn, leads to severe and often irreversible consequences for both society and the country.

2. LITERATURE REVIEW

2.1 The largest floods in Albania in recent years

Flooding in Albania occurs every year. We have selected five of the most significant flood events in recent years (Figures 1–5), and compiled a table with the corresponding statistics for each event (Table 1).



Figure 1. The 2010 Shkoder Flood. Source: Copernicus



Figure 2. The 2015 Flood in South Albania. Source: Copernicus



Figure 3. The 2017 Flood in Center and Southwestern of Albania. Source: Copernicus



Figure 4. The 2021 Shkodra flood. Source: Copernicus

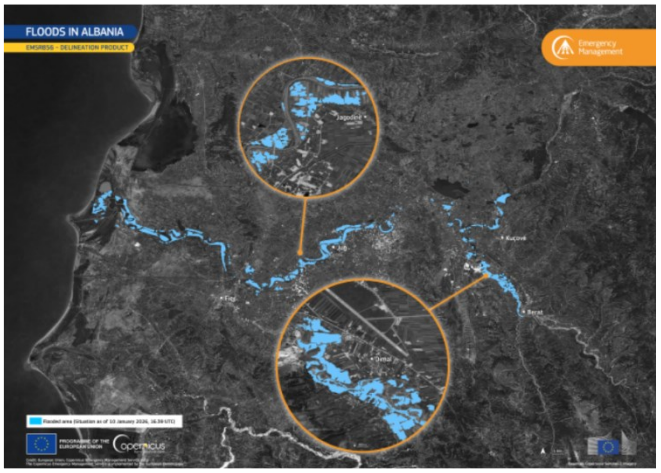


Figure 5. The 2026 Flood. Source: Copernicus

During the process of preparing the material, we also examined other countries that face flooding or heavy rainfall issues similar to Albania, in order to understand how they have addressed these problems.

Netherlands

Problem: A large part of the country lies below sea level, making it highly vulnerable to flooding from rivers and the sea.

Solutions:
Delta Works: a system of dikes and pumping stations that controls water flow.
Modern canals, reservoirs, and pumping stations to remove water during storms.
Increased afforestation and creation of water retention areas.

(Government of Netherlands 2021)

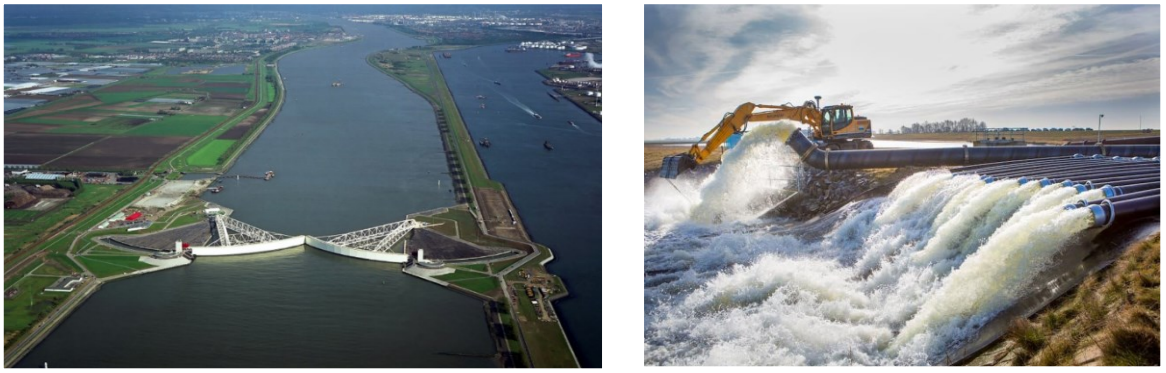


Figure 6. Delta Works in Holland (left) and modern canals (right)

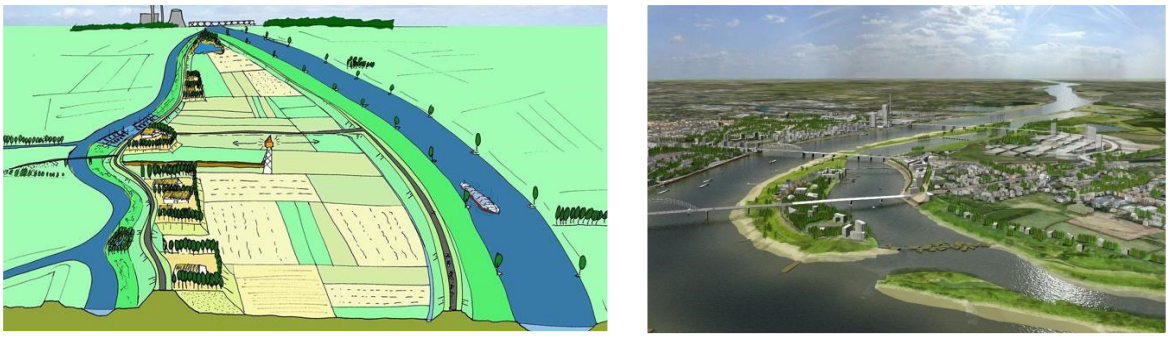


Figure 7. Project “Make Room for River”. Source: Haskoning

Flood (Year)	Main Areas	Affected Population / Evacuations	Housing & Infrastructure	Agriculture & Environment	Key Short- & Long-Term Impacts
Shkodra & Northern Albania (2010–2011)	Shkodër, Lezhë	~10,000–12,000 affected; >5,000 evacuated	~2,200–2,500 houses flooded; local roads destroyed; power outages	~10,000–14,000 ha of agricultural land flooded; livestock losses	Local humanitarian crisis; major economic losses; need for embankment reconstruction
Southern & Central Floods (2015)	Fier, Vlorë, Berat, Gjirokastër	Thousands affected; hundreds evacuated	Hundreds of houses damaged; damage to bridges and rural roads	Tens of thousands of hectares of agricultural land damaged; crop losses	Economic losses estimated at ~€100–110 million; strong impact on agriculture and rural incomes
Nationwide Floods (December 2017)	Central & Western Albania	~70,000 people indirectly affected; local	Over 4,000 structures damaged;	~15,000 ha of land flooded; soil and canal pollution	Disruption of critical services; need for improved urban

Flood (Year)	Main Areas	Affected Population / Evacuations	Housing & Infrastructure	Agriculture & Environment	Key Short- & Long-Term Impacts
		evacuations			drainage
Northern Albania (Shkodër & Lezhë – 2021)	Shkodër, Lezhë	Hundreds of families evacuated	Hundreds of houses flooded; damage to secondary roads	Thousands of hectares of agricultural land flooded	Worsening of chronic flooding situation in Shkodër;
January Floods (2026)	Fier, Berat, Durrës, Shkodër, Vlorë	Hundreds evacuated; 1 reported fatality	Homes and businesses flooded; roads blocked; damage to critical infrastructure	Large areas of agricultural land flooded; landslides	National emergency response activated; emphasis on need for better river management

Table 1. Damages caused by these floods. Source: Authors.

2.2 Human factors that cause floods

In addition to geomorphological and hydrological factors, as well as the heavy rainfall that our country experiences (annual average 1400–1500 mm), another influencing factor is human activity, which in most cases worsens the impact of floods. These factors are presented through illustrative images (Figures 8–14).



Figure 8. Unauthorized Construction. Source: ASIG GeoPortal



Figure 9. Deforestation. Source: INSTAT



Figure 10. Riverbed pollution. Source: Syri TV



Figure 11. Blockage of sewer systems. Source: Report TV



Figure 12. Unregulated releases from hydroelectric dams. Source: Shqiptarja.com



Figure 13. Lack of greenery. Source: vna.al



Figure 14. Malfunctions in pumping stations. Source: BoldNews

These human-related factors, linked to our actions or inactions, have the following impacts:

- Water has nowhere to disperse and overflows from the riverbed.
- Surface runoff and erosion increase.
- Rivers fill up and overflow more quickly.
- Flooding occurs even after relatively light rainfall.

- Water accumulates in fields and residential areas.
- Sudden rise in river levels downstream of dams.
- Water flows rapidly toward rivers and floods low-lying areas.

3. METHODOLOGY

3.1 Basin and geographic map of Albania

Based on the basin map, it can be observed that almost the entire territory of the Republic of Albania is covered by river basins (Figure 13).As indicated on the map (Figure 14), the western region of Albania is characterized by low-lying terrain, which is more susceptible to flooding and riverine overflow. The interaction of low-lying topography, significant water presence, and topographic factors renders this area highly vulnerable to flooding. For this reason, our study will concentrate and be further elaborated on the Drin–Buna basin within the jurisdiction of the Municipality of Shkodër.

3.2 Drin-Buna Basin

Near the city of Shkoder, the Drin River splits into two branches: one branch continues toward the Buna River, while the other (Drin of Lezha) flows directly into the Adriatic Sea. The Buna River itself originates from Lake Shkoder and flows into the Adriatic Sea, forming a complex and highly dynamic hydrological system.The interaction between the Drin and Buna rivers is particularly significant in terms of flood risk and water level regulation. High discharges from the Drin, directly influence the water levels of the Buna River. This interaction is further complicated by the hydraulic conditions of Lake Shkoder, which acts as a natural buffer but can also contribute to backflow effects when water levels are elevated (Figure 15). As a result, the Drin–Buna basin is considered one of the most flood-prone areas in Albania. The low-lying topography of the Shkoder region, combined with river overflow, sediment transport, and limited drainage.

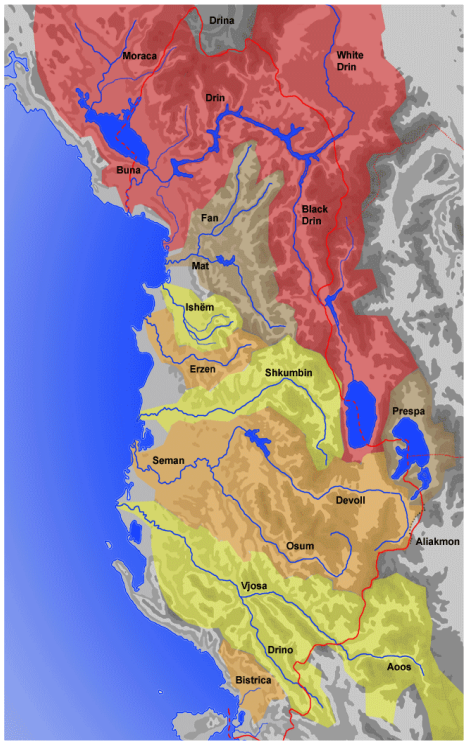


Figure 15. Basin map



Figure 16. Geografic map



Figure 17. Drin-Buna basin map. Source: Semantic Scholar

3.3 Hydrologic system within the Municipality of Shkoder

The most significant hydrological features within this territory include Lake Shkodër, the Drin River, the Buna River, the Kir River, the Shala River, the Viluni Lagoon, the Domni wetland etc (Figure 18).



Figure 18. Hydrologic system. Source: Strategic Environmental Assessment (SEA)

In 2010, due to improper management of these hydropower plants (HPPs), 12,450 hectares of farmland were inundated for a duration of 25–30 days (Figure 19).

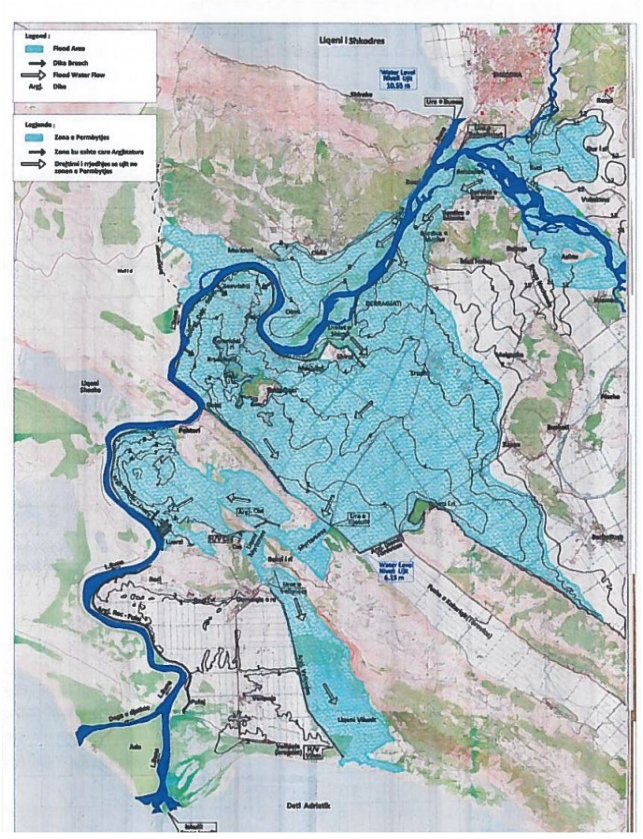


Figure 19. The major flooding of November–December 2010. Source: SEA.

3.4 Human factors contributing to the intensification of floods

Mismanagement of hydropower plants (HPPs)

On the Drin River, there are three hydropower plants of first-class importance in terms of hazard potential, where the management of dams and inflows is critical for preventing flooding in the territory of the Municipality of Shkodër (Figure 18):

- **Koman Hydropower Plant**:
  - Dam total volume: 5.7million m³
  - Reservoir: 432million m³
- **Fierza Hydropower Plant**:
  - Dam total volume: 8 million m³
  - Reservoir: 2.1 billion m³, surface area: 61.4km²
- **Vau i Dejës Hydropower Plant**:
  - Dam total volume: 3.1million m³
  - Reservoir: 499 million m³, surface area: 21km² (KKDM)

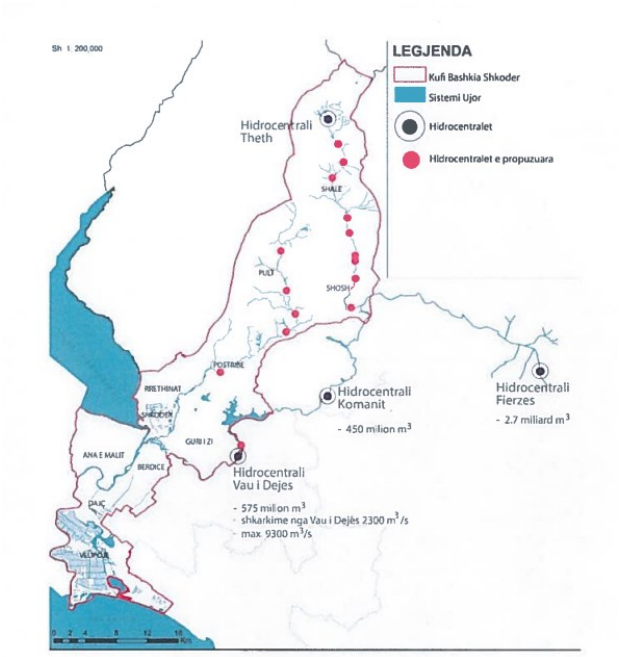


Figure 20. Map of HPPs. Source SEA

Utilization of inert materials

During the last three decades, aggregate extraction along the riverbeds of the Drin, Buna, and Kir rivers has led to substantial hydro-technical impacts, such as the deterioration of 55%–60% of riverbed protective structures, severe riverbank erosion, formation of new flood-prone zones, damage to forest cover, and a decreased sediment supply to the Buna estuary. (SEA, Municipality Shkoder).

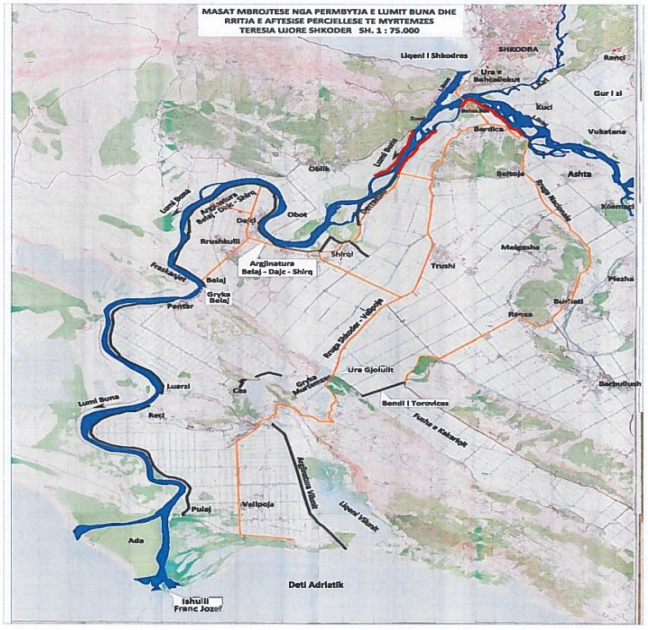


Figure 21. Map of flood protection structures along the Buna River. Source SEA

The embankments currently handle Buna River discharges of 2,200 m³/s, a flow rate that is relatively low and inadequate for effectively preventing floods in Lower Shkodër. Therefore, the embankments require modernization and repairs, especially in critical sections, including the two dikes extending from Shirq to the Gjonluli Bridge (SEA, Municipality Shkoder).

Malfunctioning or absence of an effective drainage system in the floodplain areas

In the lower Shkoder area, where the slope is mainly 0–5% and some areas are below sea level, there is a lack of functioning and maintenance of the drainage channels. Across 30,000 ha, there are 1,650 km of drainage channels (primary, secondary, and tertiary), of which only 25%–30% are operational. As a result, during floods, these channels cannot convey surface waters effectively (SEA, Municipality Shkoder).

Maps of dranaige system

The area of Mbishkodra

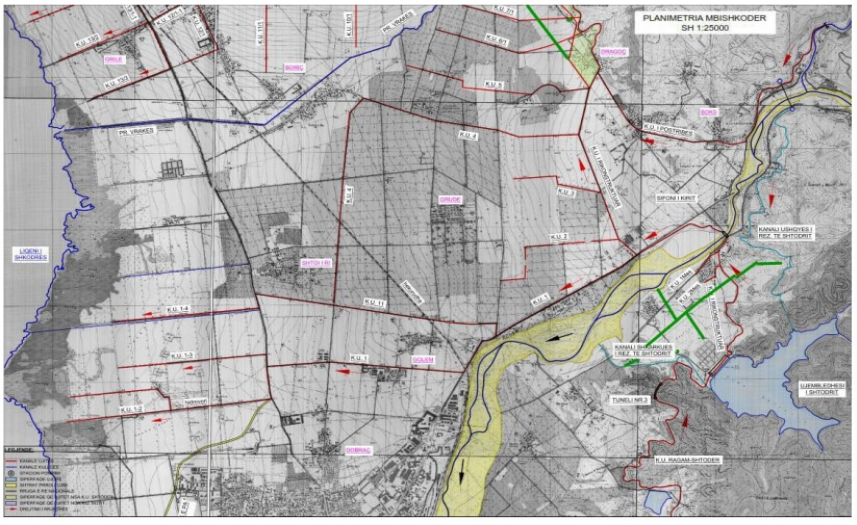


Figure 22. Dranaige system. Source: Strategic Environmental Assessment (SEA)

The area of Nenshkodra

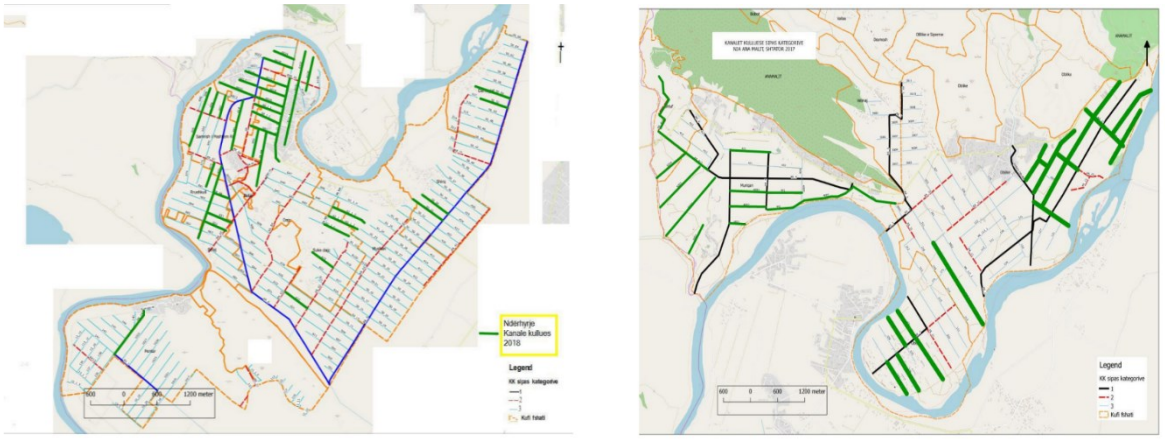
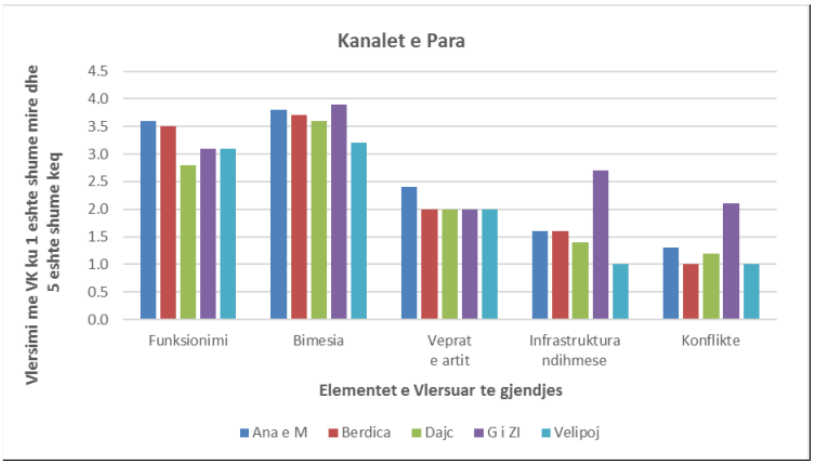


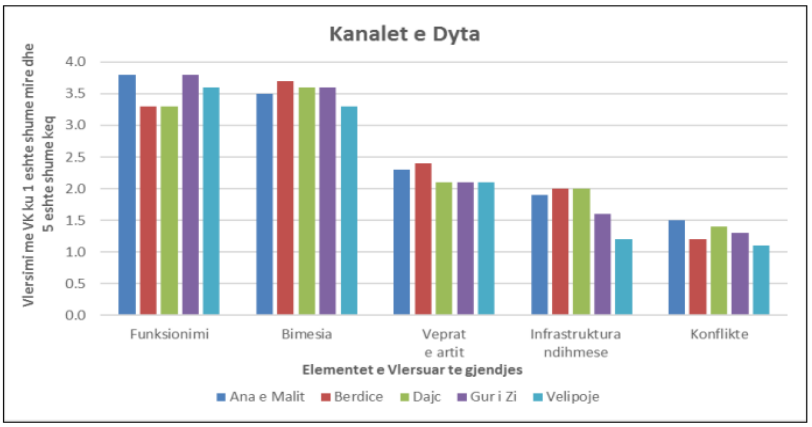
Figure 23. Drainage system. Source: Strategic Environmental Assessment (SEA)

Condition of the drainage system

The following graphs (Graphic 1–4) show a relatively poor condition and performance, which contributes to the worsening of the flood situation. There is a pressing need for the construction of new drainage channels, alongside urgent interventions in the existing drainage infrastructure.

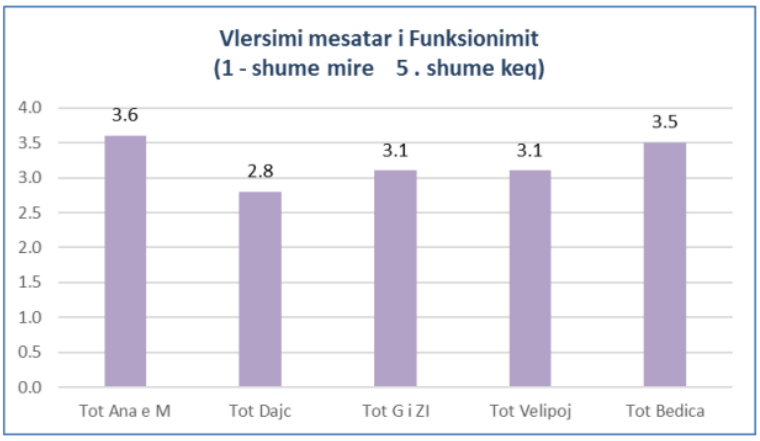


Graphic 1. Condition of the first dranaige system. Source: Porta Vendore

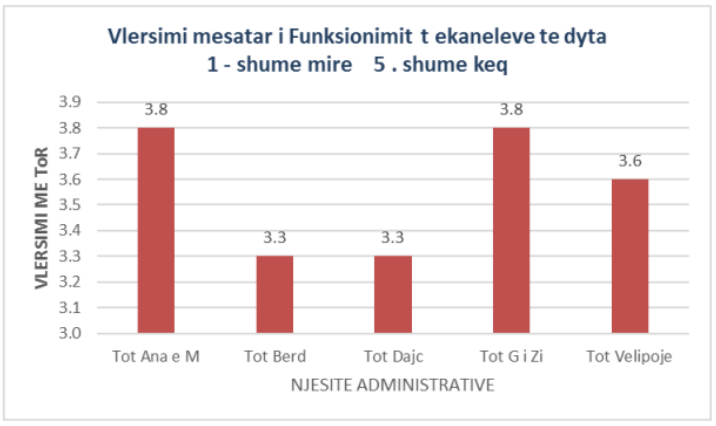


Graphic 2. Condition of the second dranaige system. Source: Porta Vendore

Functionality of the drainage system



Graphic 3. Functionality of the main dranaige system. Source: Porta Vendore



Graphic 4. Functionality of the secondary dranaige system. Source: Porta Vendore

There is a pressing need for the construction of new drainage channels, alongside urgent interventions in the existing drainage infrastructure.

Informal areas and constructions

After the 1990s, unauthorized constructions and developments without proper urban planning began to proliferate, causing pollution and blockage of sewer collectors and drainage channels. This type of urbanization, implemented without assessing its impact on drainage systems, as well as newly constructed provisional drainage channels lacking expert evaluation, contributes significantly to the flooding of many areas."

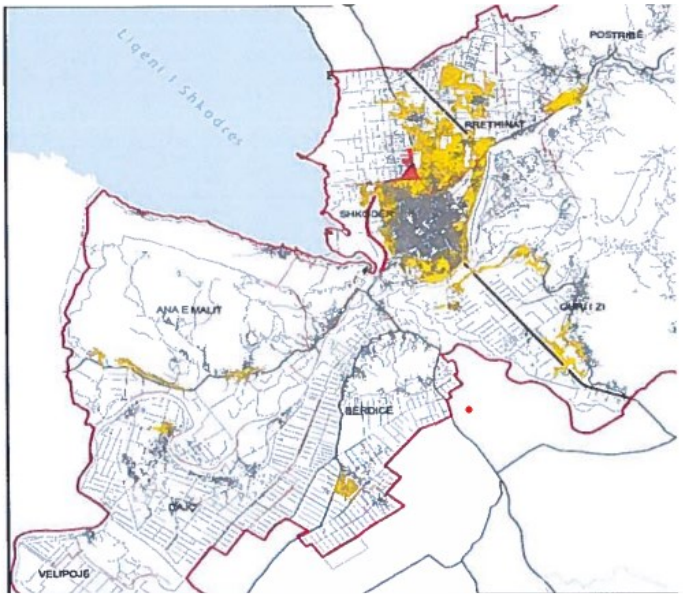


Figure 24. Map of informal constructions. Source: Strategic Environmental Assessment (SEA)

Lack of Coordination between Local and Central Authorities and Insufficient Funding

In many cases, bureaucratic obstacles and disagreements between the two levels of government, as well as a lack or mismanagement of funds for the construction, reconstruction, or cleaning of drainage channels and embankments, aggravate the flooding situation. The outdated mindset of political actors, in which political conflicts frequently deprive ordinary citizens of essential funding across all areas of life."



Western bypass

The construction of this bypass, in addition to its infrastructural importance, adversely affects water circulation. Waters coming from upstream cannot properly discharge into Lake Shkodra, causing flooding in the city and surrounding areas. It is essential to review the bypass and implement interventions to prevent obstruction of water flow into the lake."

Figure 25. Map of western bypass. Source: Strategic Environmental Assessment (SEA)

Lack of modern equipment for channel cleaning

A negative impact on flood protection is evident in Shkodra Municipality, as there is a lack of modern equipment for cleaning an extensive sewer network. Outdated tools and methods from over 30 years ago are still in use.

Massive deforestation in the Drin river basin

In the slopes of the mountainous areas, large-scale interventions have been carried out without criteria or proper studies regarding deforestation. Together with the lack of reforestation, the terrain remains exposed to the risk of erosion. Under these conditions, where forest cover in the Drin river basin does not exceed 50% of the area, water flow is unrestricted. Therefore, flood protection efforts must begin in the upper Mbishkodra area, where engineering measures are lacking, improvement of existing forests is needed, and new reforestation initiatives should be implemented.

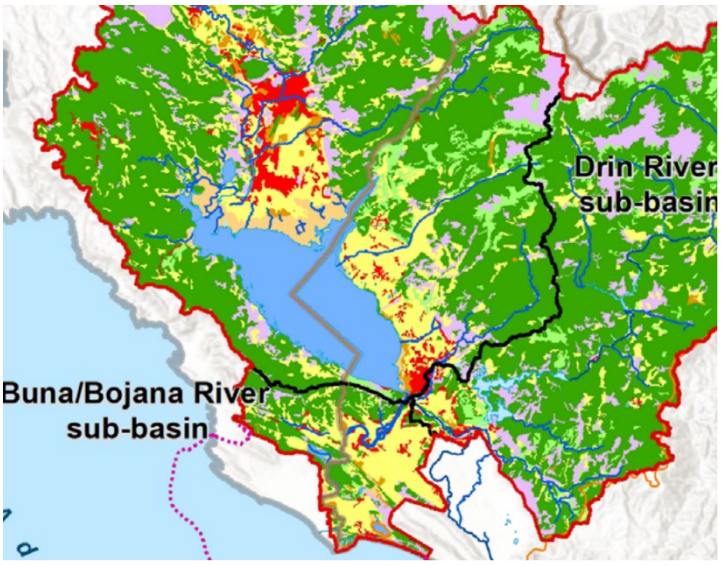


Figure 26. Map of forest zones

Pumping Stations

The main pumping stations in Shkodër Municipality, which 'drain' agricultural lands from excessive water presence are: the Velipojë pumping station, the Ças pumping station, the Vilun pumping station, and the Liria neighborhood pumping station. There are no official reports on the condition and capacity of these pumping stations, but based on the situations caused by rainfall and river inflows, which have led to massive flooding, we can conclude that they need intervention and modernization, or that investment is required in the construction of new pumping stations.

4. RESULTS AND DISCUSSIONS

Scientific documents from the Ministry of Environment indicate that from the mid-20th century to the beginning of this decade, annual precipitation has decreased by approximately 2–5%. However, since the 1990s, Albania has experienced dozens of flood events with significant impact, with at least 1–2 major floods occurring annually at the national level.This is also a result of the negative impact that human factors have had on the worsening of the flood situation over the past 30 years (Source: Ministry of Environment). Another tragic-comic situation appears in a table that clearly shows that documents, plans, and vision remain only on paper, without any real implementation. (Source: Bashkia Shkoder)

Management of irrigation and drainage infrastructure 2022

Nr	Project Name	Planned Value	Financed Value
1	Management and operation of D.SH.B.P	15,841,000 Lekë	0 Lekë
2	Cleaning of drainage canals in Dajc Area	9,916,000 Lekë	0 Lekë
3	Cleaning of drainage canals in Berdice Area	0 Lekë	0 Lekë
4	Cleaning of drainage canals in Ana e Malit Area	0 Lekë	0 Lekë
5	Cleaning of drainage canals in Guri i Zi Area	0 Lekë	0 Lekë
6	Cleaning of drainage canals in Rrethinat Area	0 Lekë	0 Lekë
7	Cleaning of drainage canals in Velipoje Area	0 Lekë	0 Lekë
8	Maintenance of Guri i Zi irrigation scheme	12,074,000 Lekë	0 Lekë
9	Maintenance of Rrethinat irrigation scheme	0 Lekë	0 Lekë
10	Maintenance of Berdice irrigation scheme	0 Lekë	0 Lekë
11	Maintenance of Postribe irrigation scheme	0 Lekë	0 Lekë
12	Maintenance of Postribe irrigation scheme	0 Lekë	0 Lekë
	Total	**37,831,000 Lekë**	**0 Lekë**

Figure 30. Drainage infrastructure management plan. Source: Bashkia Shkoder

From this study and these data, several fundamental questions arise that we must answer:

Why does Albania still face flooding problems in 2026 caused even by moderate rainfall?

Why are other countries, like the Netherlands or Singapore, not used as examples?

Why does such a critical phenomenon for national security, and beyond, continue to repeat year after year?

Where does the essence of the problem lie: in the lack of response or the "habit of citizens being accustomed to floods," in the absence of vision and investment, in political will, in the interests of narrow groups, or some other reason?

5. CONCLUSIONS AND RECOMMANDATIONS

Based on the study and the data, we have concluded that floods are a natural phenomenon whose impact is greatly exacerbated by human activity. In addition to human influence, indifference or the lack of vision and proper infrastructure increases the recurrence of this phenomenon every year. Studies show that with proper infrastructure and water management, more than 30% of the damages can be minimized. The heaviest burden falls on specialists and state authorities responsible for this phenomenon, which devastates the country's economy. We have also observed that investments often remain only on paper, with no real implementation.

Floods remain a scourge for Albanian welfare and economy, destroying agriculture, livestock, infrastructure, and more. This recurring situation every year demoralizes citizens and makes them feel abandoned in the face of this "water monster," often forcing them to leave the country. From the ordinary citizen to the highest levels of responsible authorities and state hierarchy, everyone must demonstrate responsibility and vision in addressing this highly concerning and devastating issue, which critically impacts national security and Albanian society.

Based on the above-mentioned issues, we recommend:

1. A detailed plan for surface water management and adherence to the hydrological year.

2. Unblocking of sewers and collectors, as well as their modernization and maintenance.

3. Real investments in collectors, drainage channels, and protective infrastructure.

4. Raising public awareness about avoiding pollution and construction near riverbeds.

5. Increasing forested areas.

6. Advancement and implementation of the Skavica and Bushat hydropower plant construction projects.

7. Deepening of the Buna River and the use of dredgers.

8. Implementation of innovative projects such as "Room for the River" or "Floodable Parks," avoiding unnecessary concretization.

9. An emergency plan, water stations, and evacuation equipment—all fully modernized.

10. Training of new professionals in this field.

11. Compensation for citizens affected by floods, to cover part of the damage and prevent migration.

12. Strict monitoring and control by legal authorities over fund management, investment efficiency, maintenance of existing infrastructure, as well as deforestation and damage to riverbeds.

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Steel frame technology for residential buildings:
A comparative thesis-antithesis study versus reinforced concrete systems

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Abstract

The selection of the right structural system for residential buildings is an essential engineering decision, especially in seismic regions where structural safety, construction efficiency, sustainability, and user perception are the main challenges. In many European countries, including Albania, reinforced concrete has been the main used system for residential construction due to its familiarity, availability of materials, and established design practice. However, steel frame technology has increasingly been proposed as a viable alternative, particularly for projects that require faster construction and reduced structural weight in recent years.

This paper explores whether steel frame systems can really reach a level of applicability comparable to reinforced concrete in residential buildings. The study adopts a comparative thesis-antithesis methodology, where the main advantages of steel structures are examined together with their disadvantages, such as excessive vibrations, higher initial costs, fire protection requirements, and design complexity.

To support the study, a three-storey residential building constructed in 2025 in Durrës, Albania, using a heavy steel frame system with composite steel-concrete slabs, is presented as a case study. The comparative analysis focuses on key performance indicators, such as structural self-

weight, seismic response behaviour, construction duration, serviceability performance, recyclability potential, and economic considerations.

Rather than advocating a single solution, the paper aims to demonstrate that steel frame technology can represent a competitive alternative for residential buildings whenit is well designed. The final judgment remains intentionally open, encouraging readers to form conclusions based on project-specific priorities, constraints, and long-term performance expectations.

***Keywords**: Steel frame construction, reinforced concrete structures, structural comparison, material sustainability, residential buildings*

1. INTRODUCTION

Residential buildings are the most common building typology and directly shape both the built environment and how people perceive structural safety. The selection of the structural typology for residential construction becomes particularly critical in seismic regions, as it affects not only structural performance during earthquakes but also construction efficiency, economic feasibility, and user confidence. Traditionally, reinforced concrete has been the most used structural material for residential buildings, largely due to its familiarity, fire resistance, and long construction practices.

Despite its widespread use, this type of construction presents several inherent limitations. These include high structural self-weight, extended construction durations, and is very depended on on-site workmanship quality. So, alternative systems have increasingly been considered, especially in contexts where construction efficiency, material performance, and long-term sustainability are prioritized with structural safety.

Steel frame technology has been recognized for its high strength-to-weight ratio, predictable mechanical behaviour, and suitability for prefabrication. While steel structures are most used in industrial and commercial buildings, their application in residential construction is very limited, particularly in places where reinforced concrete dominates the building culture. This lack of use is often not a consequence of insufficient structural behavior, but rather of concerns related to serviceability problems like higher initial construction costs, and the perception of reduced safety in seismic environments.

In this context, this study aims to evaluate the applicability of steel frame structures for residential buildings through an organized comparative approach. The research is primarily on the analysis of a real residential building constructed using a heavy steel frame system and compares its characteristics with those of reinforced concrete systems. Rather than promoting a single answer, the study seeks to critically assess this new technology as a competitive and reliable choice for residential construction.

Research Question: Can steel frame structural systems be successfully adopted for residential

buildings in seismic regions when compared to reinforced concrete structures?

Research Hypothesis: Steel frame structural systems, when applied to residential buildings in seismic regions and designed with current European standards, can provide a higher level of structural performance compared to reinforced concrete systems.

2. LITERATURE REVIEW

The use of steel frame structures in building construction has been mostly documented in engineering literature, especially in sectors like industrial, commercial, and high-rise buildings. In contrast, their application in residential buildings has been given less attention, particularly when heavy steel frame systems are considered.

Research on residential steel structures emphasize their potential to reduce structural mass and improve seismic response due to lower inertial forces. Studies indicate that, when properly designed, steel frame systems can achieve performance levels comparable to conventional reinforced concrete structures (Steel Construction Institute, 2017; Mazzolani, 2006). However, the literature also claims that the successful application of steel in residential buildings depends on construction detailing, and overall system stiffness, particularly for low and mid-rise buildings.

In contrast, R/C has been studied and remains the most commonly analyzed system for residential construction. Studies underline its advantages in terms of resilience, fire resistance, and acoustic performance. At the same time, many publications point out its limitations, including high self-weight, sensitivity to construction quality, and challenges related to post-earthquake reparability.

Despite the growing body of research on steel structures, a clear gap is still present in the literature concerning detailed, proper comparative studies of heavy steel frame residential buildings. This gap really tells us about the need for applied research that combines both theoretical analysis with real construction experience, providing a more comprehensive basis for evaluating the role of steel frame technology in residential construction.

3. METHODOLOGY

This study adopts a comparative research methodology aimed at assessing the applicability of steel frame systems in residential buildings through direct comparison with conventional reinforced concrete systems. The methodology is organised to ensure transparency and coherence with current European design principles, while keeping a clear differentiation between analytical framework and interpretative results.

The study is based on a thesis–counterthesis logic. Steel frame structures are considered as a proposed alternative structural system for residential buildings, while R/C structures represent the conventional benchmark. The comparison does not tend to identify a single solution, but rather to give an extra option to be considered by clients.

4. CASE STUDY DESCRIPTION

Project data were taken directly from the construction company (personal communication, 2026).



Figure 1. Building exterior". Toni Konstruksion" company

The case study used in this paper is a three story residential building constructed in 2025 in the city of Durrës, Albania. Its primary unique feature is the type of structural system: a heavy steel frame combined with composite steel-concrete slabs, an approach that remains uncommon in Albanian residential construction.

Each floor has an area about 320 m². The structure includes two stair cores and one elevator core. The first two floors are arranged into several separate apartments, while the top floor is arranged as a single residential unit.

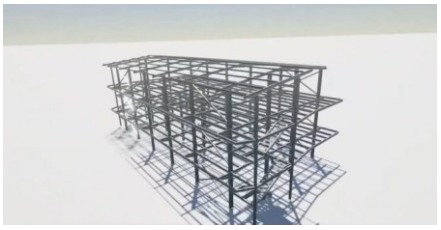


Figure 2. Building 3D project. "Toni Konstruksion" company

The external part of the structure is closed of Composite Insulated Panels (CIPs), commonly known as sandwich panels, with a thickness of 10 cm, while the internal separation is made of gypsum board walls. The use of this type of panels for external thermal insulation is proved to be an optimal solution, as it avoids problems related with masonry infill. In cases of dynamic loading, masonry may develop cracks due to its limited ductility compared to steel. In contrast, sandwich panels are better in this aspect, significantly reducing structural weight and allowing for easier repair.



Figure 3. Construction site. "Toni Konstruksion" company.

In the structural aspect, this building is structured with 24 columns with HEA 260 profiles and 8 perimeter columns on the two sides with HEA 160 profiles. The columns are connected by primary beams with IPE 240 profiles and secondary beams in one direction with IPE 200 profiles. Additionally, on the two longitudinal sides of the building, there are balcony cantilevers supported by beams with IPE 240 profiles.

The slab system used is a composite slab (reinforced concrete combined with profiled steel sheeting). The total slab thickness is 12 cm, where the maximum rib height of the steel decking is 7 cm, and the concrete topping in this section is 5 cm.

On the top floor, roof trusses with IPE 200 profiles have been used. Furthermore, in terms of lateral stability, bracing systems with SHS 100×100 profiles are incorporated. These elements play a crucial role in resisting horizontal dynamic loads and contribute to limiting window opening; however, proper design and placement significantly reduce such issues.



Figure 4. Structural elements "Toni Konstruksion" company

All connections between structural elements are executed using bolts, while plates and gussets are pre-welded in the factory. Regarding the foundation system, the building is supported on a reinforced concrete plate foundation with a thickness of 50 cm, while the columns are connected to the foundation by anchor bolts that were placed before the concrete was poured. This creates rigid performance between the foundation and the superstructure and also helps preventing corrosion.

In terms of construction process,based on company's official documents the time that was needed from the fabrication of the elements to the assembly and external cladding was about one month and a half, a significantly shorter duration compared to an equivalent R/C structure. The total weight of the steel structure and external cladding panels is about 67 tonnes, while the composite slabs contribute around 300 kg/m². These figures result in a very lighter building compared to reinforced concrete construction, with direct positive effect for seismic demand and foundation design.

5. COMPARATIVE ANALYSIS

Advantages

1. Reduced structural self-weight and seismic implications

One of the best advantages of steel frame systems in residential construction is their low structural selfweight compared to reinforced concrete structures. Due to its high strength to weight ratio, structural steel allows members to carry same loads while maintaining small cross sections. As a result, the total dead load of a steel frame building is very low compared to an equivalent reinforced concrete structure.

Research consistently verifies this difference in structural mass. Studies says that steel structural systems may reduce total building weight by around 30–50% compared to R/C systems, depending on the structural configuration and floor system adopted (Steel Construction Institute, 2017).

In seismic design, the dynamic forces acting on a building are directly proportional to its mass. Consequently, a lighter structure experiences a proportional reduction in seismic demand, which is essential for residential buildings located in high-seismicity zones such as Albania, classified under seismic zone 3 according to the Albanian seismic hazard map (KTP-N.2-89).

In simple words, a lower structural mass, makes the structural elements to deal with reduced force so as, connections, and foundations during an earthquake, allowing for more economical dimensioning of structural components and, giving simpler solutions for less favourable soil conditions, simpler and shallower foundation systems.

However, it should be noted, that lower weight alone is not the only aspect to guarantee proper seismic performance. Stiffness and lateral stability must be considered and design in appropriate structural elements, like braced frames or moment-resisting frames, which control inter drift and prevent excessive lateral displacements under seismic loading.

2. Ductility and seismic Energy dissipation

Among the structural properties that make steel frame systems suitable for seismic environments, ductility stands out as one of the most valuable. In structural engineering, ductility is the capacity of a material or system to resist large deformations beyond the elastic limit without losing its load bearing ability. For buildings in earthquake areas, this property is not a secondary consideration but it is a great factor in how a structure survives ground motion.

The material of steel exhibits this behaviour naturally. When increasing loads are applied, steel members deform progressively rather than fracturing suddenly like concrete. This controlled yielding lets the structure to absorb and dissipate seismic energy through plastic deformation. This is one of the main principles behind modern earthquake resistant design.

In practice, a proper designed steel frames are detailed so that inelastic deformation occurs in locations that we want, typically at beam ends or within bracing members. These areas,

known as plastic hinges, act as energy dissipating mechanisms during seismic events, so this way they limit the forces transmitted to other structural parts of the structure and minimizing the risk of sudden collapse.

This behaviour is studied and explained in Eurocode 8 (EN 1998-1:2004), which allocate behaviour factors (q-factors) to various structural systems according to their capacity for energy absorption. For ductile steel frames, q-values can reach 6–8, among the highest permitted for any structural system. In comparison, reinforced concrete frames typically need more complex and carefully designed detailing to get an equivalent ductility levels, and their behavior is more sensitive to construction quality.

One more advantage of steel's predictable yielding is the visible warning it provides before reaching it's limit capacity. Unlike fragile failure modes, which can occur suddenly and without prior signs in R/C, steel members show visible deformation as they approach their limits. This characteristic makes it safer after earthquake assessment and can lead to a faster structural recovery.

3. Construction speed and execution efficiency

The ability to build faster than conventional reinforced concrete construction is one of the most significant advantages of this type of structure. This is not just a matter of speed, but it follows a different logic entirely, from design and fabrication to assembly on site.

Steel structural components are produced in controlled factory environments well before they reach the construction site. Once delivered, the elements are assembled through bolted connections, a process that is fast and largely independent of weather conditions. Unlike reinforced concrete, there is no need for formwork systems to be install, no curing periods to observe, and no extended waiting times between structural phases.

The construction timeline difference is significant. Studies on medium rise residential buildings show that steel frame structures can be built 30–50% faster than equivalent R/C solutions (Steel Construction Institute, 2017). For a three-storey residential building like the case study studied in this paper, the period from factory fabrication to completed structural assembly and external cladding was about one and a half months,a duration that would never be achieved by today's technology if it would be constructed with reinforced concrete.

By building faster, we do not just save time, but a shorter construction schedule has direct financial impact. Reduced time on site means lower financing costs, less labour exposure, and the earlier use of the building all of which affect the overall cost. In markets where construction loan interest is charged daily, cutting one to two months represents an actual financial advantage (Steel Construction Institute, 2017).

4. Recyclability and environmental sustainability

Unlike most used construction materials, structural steel can be recycled repeatedly without losing the main mechanical properties, a characteristic that goes well with circular construction principles and current European carbon reduction targets.

According to the Bureau of International Recycling (BIR, 2024), around 630 million tonnes of recycled steel are consumed annually in global steel production, preventing an essential 950 million tonnes of CO_2 emissions. For structural steel specifically, the end-of-life recycling rate is considered to be about 85%, placing it among the most efficiently recovered construction materials in existence. In many cases, steel elements can be directly reused in new structures.

The energy impact of steel recycling is also significant. Secondary steel that is produced via Electric Arc Furnace which uses recycled scrap as feedstock requires approximately 50% less energy than primary production from iron ore. Each tonne of recycled steel saves about 1.4 tonnes of iron ore, 740 kg of coal, and 120 kg of limestone (Global Energy Monitor, 2023). These savings mean lower greenhouse gas emissions, contributing to the carbon reduction targets established under the European Green Deal.

On the other hand, reinforced concrete presents considerably more limited end of life recovery potential. While concrete ruins can be crushed and reused as recycled aggregate in subbase applications or low-grade fills, its structural reuse is limited by variable quality and increased porosity compared to natural aggregates. While the steel reinforcement can be recovered and recycled separately, but the cement cannot be reused as a structural material. As a result, the the mos part of demolished reinforced concrete is downcycled rather than truly recycled, with the global construction generating an estimated 3.5 billion tonnes of solid waste annually — the largest single waste stream worldwide (Eurostat, 2023).

To add more, as we said in the first part, steel structures weight less. So, less material is used, less material for foundation is needed and this all means that there is less pollution in our environment.

Disadvantages

1. Floor vibrations

Floor vibrations represent one of the most frequently raised doubts about steel frame residential buildings. This point needs clarification from the start: this is a serviceability issue and it relates to personal comfort, not to structural safety.

The physical mechanism is clear. Human walking normally generates dynamic forces at frequencies between 1.6 and 2.4 Hz. If the natural frequency of a floor falls within or near this range, resonance can increase the response to a level that usually feels as uncomfortable. For this reason, design guidance recommends that residential floor systems achieve natural frequencies above 8 Hz, so the floor frequency does not match the human activity range (Smith, Hicks & Devine, 2009).

Steel floors are are usually more targeted to this phenomenon than reinforced concrete floors for two reasons: lower mass and lower damping. Normal damping ratios for composite steel-concrete floors range from 0.5% to 1.5%, compared to 2–5% for reinforced concrete systems (Smith, Hicks & Devine, 2009). Lower damping means that when a floor begins to vibrate, the motion decays more slowly, extending the perceptible response.

But there are some parameters that directly effect this phenomenon like beam depth and

spacing, floor span length, degree of composite action, and the presence or absence of non-structural elements such as partitions and finishes. Each of these can be regulated during the design process to bring floor performance within acceptable limits.

In the case study studied in this paper, the floor system consists of composite slabs combining profiled steel decking with a 120 mm concrete topping. This type of floor makes both the mass and the stiffness of the floor greater, improving directly its dynamic performance. Also, the internal walls play a huge role in reducing these kinds of vibrations.

So, if we want to reduce vibrations in steel structure floors, we can make deeper primary beams to increase natural frequency, closer beam spacing to reduce span, additional concrete mass in sensitive zones, or in high-performance applications, tuned mass dampers (TMDs) calibrated to the floor's resonant frequency. This means floor vibration in steel buildings is a manageable design parameter, not an inherent deficiency.

2. Higher initial costs

The higher initial construction cost of steel frame systems is a real barrier, especially in markets where reinforced concrete dominates. However, this cost difference must be placed within the correct analytical context.

On average, steel frame residential buildings costs about 10–20% more than comparable R/C structures, a gap that changes with project scale, span configuration, floor system, and local market conditions (Steel Construction Institute, 2017; AISC, 2016). In European markets, raw structural steel sections are currently priced at 750–1,000 EUR per tonne, while fabricated steel elements typically cost between 1,700 and 2,500 EUR per tonne depending on section complexity and country of fabrication (Jactio, 2025).

Construction time is also a financial variable. A medium rise steel residential building completed one to two months earlier than its reinforced concrete equivalent generates great savings in financing costs, site supervision, and project overhead. (Steel Construction Institute, 2017).

Foundation costs is another big factor to be considered in the initial cost comparison. The significantly lower self-weight of a steel structure,as documented in the case study, where the total structural and cladding weight reached approximately 67 tonnes reduces a lot foundation loads, which surely translate into smaller, shallower, or less reinforced foundation elements. The initial cost premium of steel frame construction is really a great factor to put an eye on, but it must be analysed with all other external factors like time and design of the structure.

3. Fire protection and design complexity

The risk of fire is the most dangerous and problematic aspect in these types of structures. Although steel does not burn and does not produce toxic substances, it loses a significant portion of load to bearing capacity when it is exposed to fire. At approximately 500°C, the yield strength of structural steel falls to roughly 50% of its ambient value, and at 600°C this reduction reaches about 70% (EN 1993-1-2:2005, Eurocode 3 — Structural fire design). If there

are not protective measures, in a fully developed fire can reach these temperatures within minutes, potentially compromising load-bearing capacity before all evacuation is complete.

Eurocode 3, Part 1-2 (EN 1993-1-2:2005) gives a comprehensive framework for the fire design of steel structures. For residential buildings, fire resistance ratings of R60 to R90 this means that the structure must maintain load-bearing capacity for 60 to 90 minutes under standard fire conditions are typically required depending on building height and national regulations.

The principal protection methods include intumescent coatings, which expand under heat to form an insulating carbonized layer around the steel member; mineral fibre or vermiculite spray applied directly to structural surfaces. In the case study, the structural steel members are protected through the combination of intumescent coatings on exposed elements and gypsum board. This approach satisfies the R60 requirements and occupancy classification under Albanian building regulations.

The design difficulty related with fire protection in steel buildings is real, but it is a well-known and well mapped challenge. Modern intumescent coating systems can be applied in factory before delivery to site. Fire protection adds manageable cost and negligible impact on construction speed when integrated early in the design process.

6. DISCUSSION

The technical behavior of steel frames in seismic regions is well supported by both the literature and the case study examined here. Lower structural mass reduces seismic demand, high ductility enables controlled energy dissipation, and construction speed offers measurable project benefits. These are not small aspects on the contrary they sit at the core of structural design, and steel fully meets reinforced concrete across all of them when properly detailed.

However, from the analysis we learn that technical performance alone is not the only factor that indicates the choice. Som disadvantages like steel vibrations, perceived instability, higher cost are some problems that this new technology comes with. Floor vibrations are a feeling issue, not a safety one. Initial cost is higher in steel structures but can be equivalent in total cost compared to R/C systems. Fire protection is, not an unsolved problem, even though, it is a big risk.

The case study in Durrës illustrates this directly. A three-storey residential building was designed, fabricated, and assembled within one and a half months, at a structural weight really lower than a comparable reinforced concrete solution, and in full compliance with applicable seismic and fire safety standards. The outcome was the expected result of applying current engineering knowledge within a clear design framework.

The negative part in our presence is the great gap between steel's technical positive properties and its residential market presence has more to do with professional habit and market familiarity than with any genuine performance. To close this gap requires not only competent engineering, but also better-informed clients, updated regulatory familiarity, and wider exposure to completed reference projects.

7. CONCLUSIONS AND RECOMMENDATIONS

To conclude, this study aims to evaluate if steel frame structural systems can represent a good alternative to R/C in residential construction, with particular reference to seismic areas. The

answer, based on the comparative analysis and the evidence from the Durrës case study, is affirmative — provided the evaluation is conducted on the basis of total project performance rather than isolated material comparisons.

In terms of structural design and seismic context steel structures were ahead of R/C structures because of: reduced inertial mass, inherent ductility, and behaviour factors that reflect a genuine capacity for energy dissipation. Also not to forget this type of structure offers construction efficiency and end of life recyclability that reinforced concrete cannot match. The disadvantages that were discussed were: floor vibrations, fire protection requirements, and higher initial cost. They are real, but each is manageable resolved and controlled when properly studied.

In this paper I do not want to give the idea that steel should replace reinforced concrete universally, but that it should be considered on equal terms in residential project decisions. Structural system selection should be chosen by performance criteria, project context, and lifecycle cost not simply because everyone uses the same material. For designers and clients operating in seismic regions with easy access to competent steel fabrication, the case for steel frame residential construction is real and excellent decision supported by both technical evidence and built experience.

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DOUBLE SKIN:

How does the "Double Skin" concept interact with our body in the field of fashion design?

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Abstract

In conventional fashion design the body is a key object that is sometimes used as a mannequin or sample to create clothes. This approach creates a gap between real body experience and the space around it. This paper addresses the gap by developing a "double skin" as a human centered design methodology. Borrowing the notion of "double skin" from architecture, where layered facades produce an active zone, this paper reformulates the concept in fashion as two interacting layers. It argues that, if clothing is treated as an interface rather than an isolated product, the key design question shifts from what the clothes are to how it mediates relations between the body and its environment. What should be emphasized in this abstract is that this research it's necessary for fashion design, because it has to focus more on the process rather than the final product.

Roland Barthes in his book "The Fashion System" (1967*) explains that both a dressed and an undressed body communicate a message, meaning they operate as a semiotic language. Therefore clothing should not be understood merely as an object that covers the body but as a mechanism that organizes the body as a sign within a system of meaning that intervenes not only in appearance but also in how the body is interpreted and socially valued by viewers. Clothing should not be seen as only the outer surface, but rather, it serves as a symbolic skin that communicates meaning.*

This research uses a focused case study of Manuel Torres's Spray on the Body (2022)*, where material evidence and form making directly address the boundary between the body and its surrounding space. The contribution of this research is a structured conceptual tool that interprets how layered boundaries can be articulated to bridge the gap between embodied experience and the spatial contexts in which the body operates and is perceived.*

Keywords: *fashion system, undressed body, dressed body, semiotic language, spray on the body, in-between zone.*

1. INTRODUCTION

1.1 What Wears the Body?

This research puts a point on the argument that clothing, rather than being an isolated static object acts as an intermediary structure that shapes body experience and human behavior. By exploring the dynamic relationship among the body, clothing, and society, this study stands for that fashion design should focus less on the final form and more on the systems and processes that shape our interactions with clothes in a constantly evolving technological and cultural context.

The main goal of this research is to develop the concept of the term "double skin" as a new design methodology oriented towards the body and its behavior. Through analyses of the body in philosophy, architecture, and fashion design the research argues for designer's approach based on systems, processes, and human experience.

Within this system Human Centered Design, as Norman (1988) noted in “The Design of Everyday Things,” holds that ergonomics is key to understand how design can be adaptive and interactive rather than static. This research improves fashion design theory by creating space to reflect on our bodies and ways of doing design for ourselves.

1.1.1 Background

My connection to fashion design goes deeper than just an interest in clothes or trends. It comes from a long personal and empathic journey tied to how I see the body and space. Fashion for me is more than just an industry focused on looks. It acts as a language that helps to understand ourselves and our space around and it links the body, identity and society. A key concept here is the “double skin” from Le Corbusier's project “Villa Schwob” (1916), which describes facades with two layers. In this concept, an outer and an inner “skin” coexist, forming a complex relationship.

Through this concept, clothing can also be considered not simply as a cloth for covering the body, but as a dual structure that constantly interacts among our biological body, social perception and elaborating technology. In this sense, fashion design begins to appear not simply as an aesthetic discipline but rather as a complex system that forms both the space and the clothing itself.

2. LITERATURE REVIEW

2.1 The Body in Philosophy

In this context, the thoughts of Martin Heidegger and Jean Paul Sartre provide a solid theoretical framework for analyzing the body as a location of human being and its action. In the book *Being and Time (1927)*, Heidegger shifts attention from the abstract subject to the concrete being that always exists in space. With the abstract subject he refers to a more theoretical idea of the human detached from real experience, while with the concrete being, he refers to the actually existing and acting being in physical space. This parallelism points out

the body as something lived and experienced, not just imagined or defined in theory. In a way, the body becomes the link between thought and the space. Therefore, the body is not treated as an isolated object but as a condition of being in space through which the space itself becomes accessible and experienceable.

Heidegger's philosophy frames the body as a lived reality rather than a formal surface. This fact is important for fashion design because it puts the body at the center, not as a basic silhouette, but as a place of experience. Clothing in this context does not simply cover the body, but intervenes in the way the body exists, moves and acts in space by becoming a part of everyday experience.(Heidegger, 1927).

On the other hand, Jean-Paul Sartre in Being and Nothingness (1943), increases this analysis by treating the body as a field of tension between subjectivity and objectification. According to Sartre, the body is experienced simultaneously as a body for itself, that is, as a body lived from within, and as a body for others, that is, as a body seen and objectified by the gaze of the other. This dualism positions the body in a state of non-solidity, at once free and limited. We can say that clothing plays a key role, serving as a layer between the body and the gaze of the other. The clothed body is not simply a body with clothes, but a new existential configuration in which freedom and limitation coexist. (Sartre, 1943).

2.1.1 Human and Body Behaviors

The concept of human and body behavior builds a fundamental basis for understanding the relationship between the body, clothing and the environments. Human behaviors refer to the general way in which an individual acts, reacts and positions himself, influenced by and influencing the others like social, cultural, and symbolic context. Body behavior on the other hand, refers to the concrete ways the body moves, stands, and interacts with the space and objects around it.(Yang, 2016)

In this study, the body is not treated as a passive or purely biological entity but as an active actor that expresses and produces behavior. Human and body behaviors do not occur in a capsule but are formed within the formative systems and materials that surround the body itself.

Fashion design plays an important role in this process, because clothing functions as a tool that mediates human behavior. It not only reflects existing behaviors but also produces them. Clothing determines how the body can move, how much space it can occupy and how exposed or protected it can be. We say that clothing becomes an instrument of behavior, influencing the way the individual behaves in space, whether in public or private. From a systems perspective, human behavior can be understood as a network of reactions among the body, space and structures. (Sheringham, 2000)

In this analysis, the concept of “double skin” plays a crucial role because it builds an extra layer which directly affects the behavior of the body. By creating an “liminal zone” between the body and the space the concept of the “double skin” rearranges the feeling of our bodily

boundaries. The body begins to behave differently when its boundaries do not correspond to the biological skin but extends them into a second structure. This expansion of our body is important as it can take up more space and can move with greater awareness of space. Behavior is no longer simply a spontaneous reaction but becomes an understandable process of interaction with the structure that surrounds it. In this way we can say that the double skin concept transforms the behavior of the body into an element of design and not just a consequence of clothing. (Sheringham, 2000)

2.2 The Body in Fashion

In fashion design, the body is always present but not always questioned. Many traditional approaches treat the body as a physical base on which clothing is projected, reducing
it to measurements. Although this technical approach is essential to production, it often pays no attention to the body's symbolic and semiotic. Roland Barthes in his book *"The Fashion System" (1967),* expands on how fashion can be understood as not as an object or material, but as a system of signs or a language in itself. Because of this fashion is presented not simply as cloth, but as a means of communication. (Sheringham, 2000)

Clothing acts as a system of signs that gives meanings, status, identity and accepted behavior. The body in this way is not a neutral entity but a semiotic variety. It is the surface on which the signs of fashion make sense. So the dressed body is always a legible body, a body that is interpreted within a cultural code. Barthes represents the difference between real clothes, described clothes, and photographed clothes, showing that fashion exists at several levels all at once. This idea highlights that the body in fashion is not only a biological body but also a discursive one. The body that appears in magazines, advertisements, or on fashion shows is a body constructed, coded, and regulated by a system of meanings/signs.(Barthes, 1967)

This double skin concept which I borrowed from architecture and applied into fashion design, is crucial not to replace the body, but to reformulate it as an active interface. Building on Barthes' understanding of the body as a system of signs, the double skin translates this coded body into a spatial and material interaction, where clothing mediates between the body and its space around. (Barthes, 1967)

In this way, fashion is not only a representation but a process that constructs relationships among body, space, and meaning. At this point, the concept of double skin begins to take shape in fashion design. This happens through the way clothing is designed and experienced as something that responds to both the body and the space around it. Materials, movement, and shaping allow the clothes to adapt, creating a constant interaction rather than a static shape.

In a sense, clothing kind of connects or shapes how the body feels, moves and stands to its space. To recall fashion design from this perspective is to understand it as a system of signs that produces cultural meanings and unique identities. (Sheringham, 2000)

2.2.1 Is This Fashion and Does it Matter?

Before the concept of "double skin" is analyzed as a methodology or as a new approach in fashion design, I would like to address a research question that will facilitate the articulation of the argument on why the concept of the double skin might be important, namely: "Is this human center processed based and interactive fashion really fashion and does this perception matter?" This question is not simply terminological or conceptual but directly affects how fashion design is understood as a discipline and a creative field.

Fashion is often limited to clothing, trends, and aesthetic cycles. Any approach that goes outside these frameworks to some extent risks not being considered "fashion" in the conventional sense. However, in this research I intend to challenge these limits and to ask not only what fashion is but how it functions as a system. In a way, the importance of the question lies not in institutional acceptance of the concept but in its capacity to produce new methodologies.

Here, the double skin concept is not proposed as a new style or a formal innovation, but as a structure of meanings that realigns the relationship among body, clothing and space. Therefore, the question "Is this fashion?" can be reformulated as "Does this approach expand the field of fashion design?"

If fashion is understood as a system that constructs meanings through the dressed body, then any methodology that intervenes in this approach is a valuable part of the discipline. Double skin is key precisely because it shifts the focus from the finished object to the process and the system. It does not seek to replace traditional fashion but aims to articulate an additional method for reflecting on the way clothing functions as a layer.

The question asked above about the reality of the double skin concept does not aim to determine that all major brands have agreed on what is called fashion but to assess the possibility of producing a new thought or a new working methodology. So the importance of double skin lies in its ability to shift the focus from object to process and to structure positioning fashion design not only as a production practice but as a joy of labour and as a different way for seeing the fashion world.

3. METHODOLOGY

3.1 Case Studies

To understand the concept of "double skin" in fashion design concretely, it is necessary to analyze it through case studies that challenge the traditional boundaries of clothing. Two examples in this regard are the *Nike 3D printed Bra (2025)* and Manuel Torres' experiment with *Spray on Body* (*2022*) innovation. These two cases do not simply represent technological innovation, but open a deeper discussion on the relationship among the body, the material and the production system.

The Nike 3D printed bra appears as an object that reinvents the traditional way of designing

intimate clothing. Instead of starting from a standard body shape and textile cutting logic, this product is developed through a parametric and technological process. The body is scanned, analyzed, and converted into digital data, which is then used to generate a 3D-printed structure. (Cavanaugh, 2025)

In this process, the clothing is no longer a layer sewn onto the body but a structure built around it. This case study shows that clothing begins to function as an intermediary system between the body and technology. The 3D printed bra is not simply a cover or support, but a structure that regulates the body's relationship to movement, weight, and pressure. It creates a second layer that does not imitate biological skin but functionally reformulates it.

In contrast to this approach, Manuel Torres' work with the spray-on body experiment represents an unusual shift in the fashion design process. In this case, the cloth does not exist as an object before being placed on the body. It is applied directly to the biological skin in spray form. This process dissolves the boundary among the body, the material, and the production, turning the body into the place where the phenomenon occurs. *Spray on Body* (2022) challenges the traditional separation between the body and the garment in an radical way. The body is not the base on which the garment is applied but becomes an active agent in the creation process. The material is not sewn or cut but is placed directly on the body, forming a new layer that functions as an artificial skin. This process creates a behavior where the garment and the body are inseparable at the moment of creation. (Amato, 2011)

Analyzing these case studies shows two different directions in the evolution of fashion design. The Nike 3D printed bra builds an intermediate system through technology and improvement, while Manuel Torres moves the process directly onto the body transforming the body into a production site. Neither of these examples fully realizes the concept of “double skin” as proposed in this study but both introduce us to think alternatively about fashion and to challenge conventional way in which this field is perceived and analyzed and open ways for triggering thoughts for the experimentation which will come later of applying the concept of the double skin to fashion design, something I will develop concretely for my MA’s thesis, currently on-going.

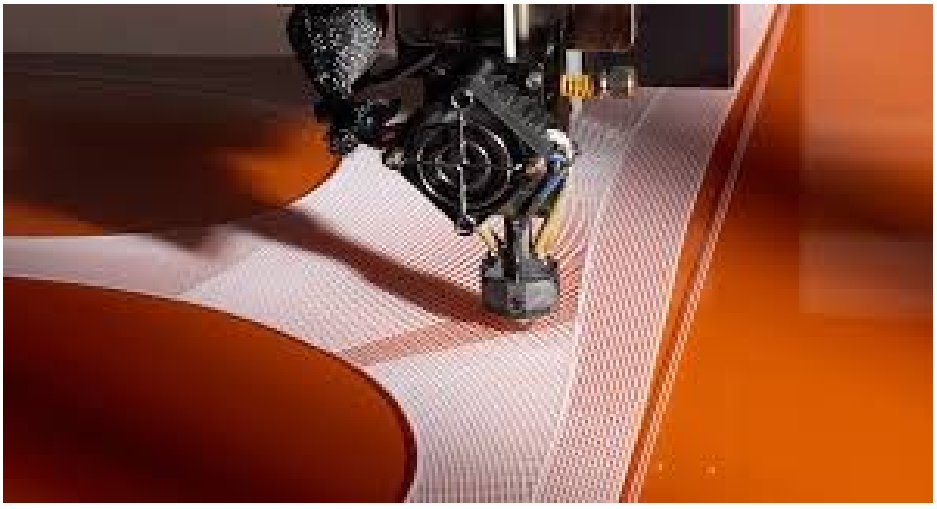


Figure 1. Nike 3D Printed Bra. Source: Nike.Inc (2025)



Figure 2. Manuel Torres at Coperni with Spray on Body. Source: Dezeen (2022)

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Chairs as instruments in the construction of social roles and human bodies

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Abstract

This study examines the chair as an everyday object that operates beyond its apparent functional neutrality. The research problem arises from the widespread assumption that furniture, particularly seating, serves purely practical purposes without social or political implications. The aim of the study is to critically analyze how chair design shapes embodied experience and reinforces or challenges gendered power structures. The objectives are: (1) to investigate the historical relationship between seating and authority; (2) to examine how scale, material, and form regulate posture and spatial occupation; and (3) to explore contemporary design interventions that question gender norms. The research addresses the following questions: How does chair design influence bodily behavior? In what ways does seating reproduce or resist social hierarchies? The hypothesis proposes that chairs function as subtle disciplinary instruments that organize posture, visibility and authority according to socially constructed gender expectations.

The study adopts a qualitative research approach based on visual, formal, and contextual analysis. The methodological framework in interpretive analysis informed by feminist theory (Butler, 1990) and theory of social performance (Goffman, 1979) through which chairs are examined as tools that regulate bodily behavior. The population consists of historically significant and contemporary chair designs, while the sample includes Laila Laurel's "A Solution For Manspeading" 2019, Anna Aagaard Jensen, 'Boss Lady Chair', 2018 from the "A Basic Instinct" series, the "Mae West Lips Sofa" by Salvador Dali and Edward James and the NAGABABA armchair by Mariusz Warsinski 2012, all representing both conservative and subversive ideological positions. Each case study is analyzed through its formal properties (scale, material and structure) and its effects on posture, performance and control.

Findings indicate that chairs distribute comfort and spatial dominance unevenly, often naturalizing gendered expectations of modesty and authority. However, contemporary critical design practices demonstrate the potential of seating to expose and challenge these norms. The study concludes that the chair should be understood not as passive furniture but as active in the construction of social meaning capable of both reinforcing and transforming embedded power structures.

Keywords: *embodiment, spatial configuration, critical design, material agency, participatory practice*

1. INTRODUCTION

Chairs, as present and immediately recognizable objects, have long occupied a central role in human life. Their presence is found in nearly every exterior and interior environment, from domestic spaces to more professional settings, and yet their significance can often go undiscussed. Something so common and familiar that we recognise immediately and that has always been present in our everyday routine. They are generally considered as one of the most ordinary objects in human life. We use chairs without hesitation: we rarely pause to consider how they shape our routines, influence our behavior and often structuring the performance of social roles. Rather than merely supporting the body, chairs actively organize it, prescribing specific posture, movement and spatial occupation. The lack of reflection becomes significantly apparent when considering how everyday actions are not purely natural but socially constructed.

Judith Butler argues that gender is not something we are but something we repeatedly perform through everyday actions and behavior (Gender trouble. Feminism and the subversion of identity 1990). Therefore, sitting and posture are a part of these everyday actions. Sitting, in this sense becomes a repeated performative act through which gender is materialized. The chair operates as a medium that stabilizes and enforces these performances through physical constraint.

Sitting objects are present in living rooms, classrooms, offices, waiting areas, hospitals and even shopping malls making it difficult to imagine a space without them, whether used purely for sitting or as decorative elements. We seek them out almost automatically and in many cases, we spend hours each day seated. Even though we are in constant and direct contact with chairs they are undoubtedly treated as neutral, aligning and designing them for the scope of accommodating a "generic" canon of the human body, exclusionary and dominant. However, chairs function as devices that discipline the body.

This paper positions the chair as a critical lens through which it is possible to explore the crossing of design, gender and social behavior. Understanding the chairs from this perspective can challenge assumptions about furniture as neutral and can highlight, instead, its agency in the construction of social and cultural norms. Chairs can open up discussion on the ways in which societal norms are constructed and performed, particularly when it comes to gender issues.

The intersection of design and cultural studies (Victor Papanek 1971; Judy Attfield 2000) has increasingly underlined that objects, such as chairs, are not to be taken as neutrals and merely functional, but are also made with an intentional purpose and are embedded within social and cultural meanings.

Seating, Power, and Gendered Space

Historically seating has been closely tied to structures of power and hierarchy. Elevated or elaborated designed seats such as thrones distinguished rulers, being typically male-centered. These forms do not merely symbolize power but materially enforce it by isolating, elevating,

and stabilizing the body in positions of authority. On the other side domestic chairs reflected ideals of comfort, modesty and presence within a private space, particularly shaping expectations of women's posture. In both cases therefore the chair does not simply accommodate the body but positions it in a physical and symbolic way. This relationship between the seating object and power continues in the contemporary context where the design and the way in which the chairs are placed within a space tend to reflect an organizational structure and an authority.

Further studies about gender highlight how bodily behavior, the way one sits is often socially constructed and regulated. (Judith Butler 1990; Erving Goffman, 1979)

The posture indicated and sometimes imposed by seating design, all contribute to the performance of gender and social status. What appears to be a simple object, reveals to be an articulated process of social and cultural conventions whether intentional or unintentional. The chair therefore can be understood as a technology of the body that takes on a role to connect and define the "feminine" and the "masculine".

While females have historically been expected to and told to sit in a more controlled and composed way reflecting ideas of modesty and good manners these expectations are not only social but spatially enforced with designs that limit expansion, restrict limb positioning and promote bodily entertainment as on the contrary men are encouraged to sit relaxed and freely.

A key distinction within this discourse is the contrast between decorative and functional chairs.

Heavy leather chairs placed in working environments such as offices or conference rooms are often associated with authority, intellectual labor, identified and designed for a more masculine background. On the contrary, smaller decorative chairs have historically been associated with home and the private sphere. This type of division highlights how design whether intentionally or not sets the tone for social roles and gender norms.

The very presence and form of chairs communicate who is expected to occupy such space. In a male-centered world, chairs are also mainly constructed for them, relegating women to perform and function as "secondary subjectivities" even within the act of seating. As we have seen up to today the female body is asked to sit in a restrained and socially controlled manner.

2. METHODOLOGY

This study adopts a qualitative interpretive methodology based on visual, formal, and contextual analysis. This paper examines how form, material and design of chairs can shape social meaning. Through the analysis of three case studies, I aim to explore how seating design can reinforce gender expectations and communicate unwritten social rules and ultimately, demonstrates that while design actively participates into performing gender-coded social rules it might be also the place to criticize them.

These gendered assumptions have become more clearer with time when we look more closely at how the so-called “masculine” and “feminine” chairs have been constructed through form, scale, material, and placement. “Masculine chairs” large, in dark leather and often heavier in material signal authority and leadership, “Feminine chairs” often suggest approachability and modesty, limiting the idea of using too much space.

If we consider chairs that we encounter every day, we can see that the act of sitting reinforces social organization through the regulation of the posture. The manner in which individuals are expected to sit, how much space they occupy, how they position their legs, how relaxed they should appear or have an uptight posture, has long been shaped into gendered behavior. These expectations are not accidental but rather historically rooted into practices that differentiate bodies depending on biological gender. For centuries women have been encouraged to or rather forced to sit upright, keep their knees together or ankles crossed, avoid spreading their arms, minimize visible movement, sitting gracefully without lounging, maintaining modest leg positioning. By contrast men were often encouraged to occupy space more expansively, meaning men seated with their legs apart, leaning their back or resting their arms broadly on armchairs.

Sitting design interacts directly with gender norms. When a woman-identified person takes on a bigger position or role in a professional environment, she is frequently subjected to evaluation and criticism, often prone to being judged or or even questioned for it, as aggressive or unlady-like, revealing the phenomenon of gendered double standards. This means that the act of sitting takes on a more political direction. The chair becomes a performative apparatus through which gendered behaviors are rehearsed, stabilized and normalized through repetition. Understanding that seating design and chair designs operate as a mechanism to reinforce these gender roles means recognizing how deeply coded in society these patterns are. The expectation that females occupy less space is simply not by choice or a matter of manners but it reflects on a systematic structuring of gender behavior by society itself. The expectation that men occupy more space or feel the need to, reinforces assumptions of entitlement and dominance. As stated, various times throughout the paper, the chair becomes more than furniture but an instrument through which, these already picked roles are rehearsed daily, often subconsciously.

3. CASE STUDIES

This analysis demonstrates that these patterns of gendered expectations of postures and roles, translated into design, often go unnoticed and are not subject to critical investigation. However, there are design examples that critically question gender roles recognizing the historical domination of the man body over the woman. Each case study is analyzed in terms of how form, material and context can regulate posture, distribute power, and construct gendered bodily behavior

For example, Laila Laurel's graduation project, *A Solution for Manspreading* (2019) consists of

two chairs designed to reverse traditional seating binary gender arrangements. A contemporary example that makes the ideology of seating explicit.

As part of her graduation project a pair of designed chairs functions as a critical design intervention addressing the expected male seating commonly referred as “man-spreading”. This practice is typically associated with men who sit with their legs far apart, daring to go outside the invisible seating lines of an individual. One of the chairs, designated for the “woman” or person identifying as such, is constructed to encourage a wide take on sitting, encouraging the person sitting to part their legs and occupy more space in contrast the other chair, designated for the “man,” that physically constrains the sitter, expecting the legs to remain together Formally, the chair redistributes spatial power by forcing expansion in one body and restriction in another.

These chairs, grounded by research and observational experience, such as everyday seating on public transport or spaces, exposes how normalized it is in public environments to position yourself into these situations. What makes *A Solution for Man-Spreading* (Figure 1) particularly significant is its use of humor as a critical tool in design, said Laurel. The designer explained that this project took on a “tongue-in- cheek” road, meaning a satiric take on a serious structural imbalance. Men have been and are allowed to demand space while women are often forced to minimize themselves. By reversing these expectations through design, the chairs make visible what is typically invisible. *A Solution for Man-Spreading (2019)* does not critique individual behavior but rather the unspoken rules that allow this behavior. In translating this behavioral sexism, Laurel's chairs deeply illustrate how rooted social hierarchies are and how design can both reveal and challenge them. By changing the intended shape, the chair exposes the everyday politics of posture and opens a space for critical reflection on how everyday life objects silently structure the coded structural unbalance between women and men.



Figure 1. *Laila Laurel's chair provides a solution to manspreading* Source:Dezeen

Another example of critical design of the same years in relation to gender norms and feminism is AnAnna Aagaard Jensen’s *Boss Lady Chairs 2018* (figure 2-3). The project made exclusively for women challenged societal expectations surrounding “appropriate” female behavior particularly in relation to body language and posture. When seated in these chairs women are encouraged to lean back confidently and spread their legs which reconfigures posture by transforming gestures traditionally coded as masculine therefore reclaiming physical and

symbolic space for the feminine body. By doing so,it challenges the restriction of the female body, and positioning it as an active rather than contained.



Figure 2-3: *Boss Lady Chairs 2018.* Source:Dezeen

Both examples demonstrate that design might also be a feminist practice and when the field of design intertwines with feminism it shifts the way designers consider bodies, objects and space. Acknowledging the relationship between the human body and the chair ultimately brings out gender into a topic of conversation. The chair does not simply support the body but it actively constructs it participating in the articulation of gender identities, something that, if we do not include practices of critical design, like the projects described above, often go unnoticed and unquestioned. Design is often presented as a fixed and universally suitable entity that excludes differences and plurality. Or better, it is often produced for a dominant Western-White- and often perceived as a male "client". Therefore, to include practices of critical design which are not directly connected to consumption, performing the tastes and needs of that dominant "client" is necessary to address societal unbalances and reclaim a space for design that can challenge the historical hegemony of man.

In the same vein of the works analyzed before in relation to the act of seating, design and feminism *Nagababa* chair (2012) firstly designed by Wamhouse studio and then later "retouched" by Polish designer Mariusz Warsinski (2020) (figure 5) transforms the chair into a sculptural representation of the cosmetic surgery culture. Such a chair is presented as an exaggeration of the female body features where details like stitches and marks resemble surgical elements.

Nagababa (2020) highlights and exaggerates dominant beauty standards that society puts pressure on women to fulfill by transforming them into an uncomfortable and excessive form. In this case the armchair becomes a site of exposing the constructed and uncomfortable body's standard imposed on women. Conceived as a big lounge chair, Warsinski wants to draw attention to the front and backside area of the armchair as a way of highlighting specific parts of the female body that contemporary society frequently seeks to change, modify and have in control. Rather than offering comfort the chair produces tension and unease, exposing how these ideals are constructed and artificial. The chair, as stated by the designer himself, encourages "...a metaphorical bow to every disadvantaged person who believes that they are in this world by accident, by mistake. Nature makes no mistake in bringing 'imperfections' into existence..." (Warsinski 2024 para.4)



Figure 4: *Nagababa* chair by Mariusz Warsinski Source: Impulse Magazine

In contrast to the more contemporary feminist projects analyzed above Salvador Dalí's *Mae West Lips Sofa* (1937) (Figure 4), is a sample in which art and design, historically has instrumentalized and depicted the female's body through the male's gaze, putting the female on a subordinated role as the one she often occupies in society. The surrealist artist transformed the actress' lips into a sensual sitting sculptural object. British feminist film theorist and filmmaker, Laura Mulvey argued that "the determining male gaze projects its fantasies onto the female figure" *Visual Pleasure and Narrative Cinema*, (1975, p.808-809). Dalí's sofa does not simply represent the female body but transforms it into a consumable object of pure desire turning the act of sitting into an interaction with a sexualized form shaped by the male gaze. This way of constructing the visual subjectivity of women treats the feminine body as a visual accessory and mobilizes its sexuality to stimulate consumption. The sofa then, far from being neutral as the society wishes us to believe, presents itself as an object that puts into stage male sexual fantasies over the woman's body.



Figure 4: *Mae West Lips Sofa* by Salvador Dalí Source:Dazeen

4. DISCUSSION

Throughout this paper I have argued until now that the chair, despite being narrated and designed as a neutral object for performing a basic human activity such as seating, actually functions as a technology of the body that not only facilitates physical comfort but most importantly disciplines and regulates it. The way individuals are taught to sit is not a fixed biological condition, but rather a socially constructed practice, shaped by historical social expectations and norms that privileges men over women.

We rarely question chairs as sites where a men-centered society is also learned, rehearsed, and maintained through repeated interaction with our surroundings. However as seen

throughout this paper, design can also possess the capacity to expose or challenge societal gender unbalance. The case studies analyzed in this paper shows how it is possible through the design of seating to encourage women to take more space, to be more present and also, even though only humorously, to reduce the social practice of "manspreading" as a symbol of a male dominated society.

5. CONCLUSION

This paper makes evident that chairs cannot be dismissed merely as neutral or naturally constructed objects but they are, as many designed objects of our daily life, embedded in a historical, socially and culturally produced narrative making no exception for the discourse on gender inequality which is part of the historical subordination assigned by our society to women. By questioning something that might look ordinary for a simple gesture such as sitting, we can reveal, through what have been called "critical design", gender norms that are embedded into our everyday life in order to challenge, reshape, critique and open conversation. If we do this, we can even consider design as a possible feminist practice of our time.

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Autonomy as a Value:
Design and Branding in the Post-Fordist Era

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Abstract

For a long time, autonomy in art and cultural production has been understood as something that stands outside the market. According to this traditional view, when art becomes a commodity to be sold, creative freedom is undermined and controlled by the logic of profit. Industrialization and capitalism have been seen as forces that limit creativity.

However, in post-Fordist capitalism, the situation seems much more complicated. The question that arises is not whether autonomy has been lost, but how its form has changed. In contemporary economies, where value is created through communication, networks, and identity, autonomy does not disappear; it becomes part of the way value is produced. It is not enough to treat autonomy solely as a resistance to the market to understand its role today.

To examine this transformation, this article presents a critical analysis, drawing on the concept of the cultural field and the theoretical framework of project-oriented capitalism. These approaches show that autonomy functions within the economic system as a form of symbolic capital. In this context, branding takes on a key role, because it structures identities, stories and meanings, turning authenticity and creativity into economic value. Ultimately, autonomy is neither a complete illusion nor a complete freedom. It can be considered as a negotiated space, where creative freedom and market logic intertwine. To understand design today, we must stop asking whether autonomy has been lost. Instead, we must examine how autonomy produces value and how it is shaped by the structures that demand it. Branding is the mechanism that connects creative freedom with economic logic. In the post-Fordist era, autonomy is not lost. It is transformed.

Keywords: *Creative freedom, project-oriented capitalism, identity production, communication networks, transformation*

1. PAPER

For decades, debates about art and design have echoed an idea: once culture becomes fully commercialized, it loses its autonomy. According to this view, when everything becomes a commodity to be sold, creativity can no longer be free; it becomes a tool for marketing, audience, and profit. In an economy where success and performance are everything, “authenticity,” “originality,” and “personal voice” are more in demand than ever. Companies are looking for new ideas, brands are looking for powerful stories, and design is not just about creating beautiful forms, but also about shaping identities and meanings. This is especially visible in the built environment, where branding increasingly shapes not only products and images, but also buildings, interiors, urban experiences, and the symbolic identity of places.

An important question arises: how has it happened that autonomy, once understood as something separate from the market, has now become something upon which the market relies? Is autonomy just an illusion that hides new forms of control, or is it really a necessary part of cultural production in post-Fordist capitalism? In this essay, I argue that design does not lose autonomy; on the contrary, autonomy becomes an integral part of the way value is created. Branding is the means by which this value is organized and turned into identity and meaning. Design should therefore not be seen as a victim of the market, but as an active part of a system where autonomy and capital are not just opposites, but work closely together.

Several strands of critical theory suggest that autonomy in cultural production has been lost or has not been fully realized from the beginning. This position comes from the Frankfurt School, which was a critical theoretical movement that highlighted the effects that capitalism and mass production had on culture. One of the main thinkers of this school was Theodor W. Adorno, whose main argument was that culture was becoming a "culture industry", where art no longer seemed free but was introduced into a standard and was driven by the need for profits for businesses and mass consumption by citizens, which could lead to a weakening of creative autonomy and its critical power (Banks, 2010). According to this view, the industrialization of culture places creators under the logic of the market: art becomes repetitive, creativity is reduced to formulas, and profit becomes the main goal. Later, other thinkers, influenced by Michel Foucault, bring a warmer perspective to the situation, suggesting that autonomy does not disappear completely, but changes form (Banks, 2010). People may seem free, but much of this freedom is affected by the demands of the market. Rather than being directly controlled, they learn to regulate themselves to be flexible, creative and productive, because that is the price the system rewards them with. Mark Banks, a scholar of culture and the creative economy, argues that autonomy in cultural work is often seen as a key principle, but it can also act as a covert form of control (Banks, 2010). Thus, freedom does not always lie outside the system; sometimes, it becomes one of the system’s main ways of maintaining itself.

However, this position is not complete. Rather than saying that autonomy has been lost, the question should be asked: what role does it play today? While Adorno sees culture as controlled by the market and Foucault focuses on hidden forms of power and self-regulation,

the French philosopher and sociologist Pierre Bourdieu offers a different approach. He doesn't see autonomy as something lost or just an illusion. Instead, he views it as a specia l place within the process of creating culture. According to Bourdieu, cultural production takes place in a “field,” where individuals compete not only for money but also for prestige and recognition (Bourdieu, 1983). Artistic autonomy does not mean standing outside the economy; it is a unique position within it. For example, when an artist puts aside immediate financial gain to focus on "art for art's sake," they can gain prestige and social acceptance. This, in turn, can lead to financial success later. Bourdieu calls this an "inverted economy," where success is measured not just by money, but also by symbolic recognition (Bourdieu, 1983). This shows that autonomy is not outside the system, but operates within it. It is how trust, authenticity and value are created in the cultural realm.

This idea becomes clearer when we see that cultural production does not function like an industrial factory. As Bill Ryan notes, the cultural sector is shaped by a contradiction: capital seeks control and standardization, but it also depends on innovation and originality. Mark Banks makes a similar point in his discussion of cultural labor, showing that while industrial production can divide, repeat, and replace labor more easily, cultural production relies on qualities such as talent, style, and personal voice (Banks, 2010). If autonomy is removed completely, the product risks losing the authenticity and distinction that make it valuable in the first place. For this reason, the market cannot fully eliminate autonomy; it must preserve a degree of it, because without distinction there is no value, and without value there is no profit. This does not mean that autonomy exists as pure freedom. Rather, it operates within limits set by the market and is continually negotiated, challenged, and redefined. It is better understood as a fluid space, where capital and creative practice remain in tension, but also depend on one another.

In his analysis of postmodern space, Fredric Jameson, a cultural theorist, uses the example of the Bonaventure Hotel in Los Angeles to illustrate how late capitalism creates a “hyperspace” that makes us lose our bearings (Jameson, 2016). Modern man, accustomed to understanding the city and the surrounding space, is confronted with an architecture that distorts him: the space seems closed, reflective, without clear points of orientation. According to Jameson, this is more than a question of architecture; it is a metaphor for our difficulty in understanding global capitalism as a whole. We live within a complex financial, technological and cultural system, but we fail to “map” it clearly. For this reason, he proposes the idea of “cognitive mapping”: we need cultural forms that help us understand our positions within this system (Jameson, 2016).

This is directly related to design and branding. Post-Fordist capitalism, which emerged in the latter part of the twentieth century, signifies a transition from the industrial mass production paradigm (Fordism) to more adaptable work structures centred on services, networks, and innovation. This evolution is linked to the concept of "late capitalism," which underscores the intricate global nature of contemporary societies and the pre-eminence of financial, technological, and cultural influences within modern economic systems. If post-Fordist

capitalism creates confusion, branding can act as a symbolic system that provides orientation. It provides identities, histories, and meanings that help individuals understand their place in a complex world. But this orientation has its drawbacks. While it helps us understand the structures around us, it can also obscure them, replacing critical thinking with a comfortable sense of belonging. In this way, design is not just about aesthetics; it influences the way we perceive and understand the world around us.

Jameson also discusses the "fashion of nostalgia." In late capitalism, the past is not presented as a real historical period, but as a style that can be reused (Jameson, 2016). Retro films, fashion, and trends don't bring us closer to real historical experiences. Instead, they create a general sense of "the past" through familiar images. As a result, the past becomes something we can choose and use, like a visual archive.

This is related to branding today. Many brands create their identity by emphasizing tradition, origin, and authenticity, even when these elements are simplified or reinterpreted. Vintage aesthetics, the use of old logos, and retro packaging are ways to turn the past into a story that can be consumed. In this context, creative autonomy does not disappear; it is used to create modern versions of the past that bring value to the present. Culture is not separate from capitalism; it is one of the ways in which capitalism reuses the past and turns it into value.

Maurizio Lazzarato, an Italian sociologist and philosopher, introduced the concept of “immaterial labor” to describe forms of work that produce non-physical outcomes, such as knowledge, communication, emotional engagement, and social relationships. This position, which originates from the post-operaismo or Italian Autonomia tradition, examines how work has changed in late capitalism, emphasizing the increasing role of subjectivity, collaboration, and communication in the creation of value. As Jason Del Gandio (2011), a scholar and activist, explains, in post-Fordist capitalism, value is increasingly created through communication, collaboration, creativity, and emotions. Work is no longer just about producing physical products; it also involves creating meanings and building relationships. Del Gandio takes this further, arguing that communication is not simply a reflection of reality, but a factor that shapes it (Del Gandio, 2011). Symbols and stories are not just add-ons; they shape the way we understand the world. Post-Fordist capitalism, then, not only uses our working time, but also our ability to create meaning through communication.

Maria Hynes (2023), a scholar of the creative economy and interdisciplinary practices, applies this idea to the creative sector, especially in collaborative work across disciplines. She states that value lies not only in the final product, but also in the process of creating the product itself, from building networks, exchanging ideas and collaborating across disciplines (Hynes, 2023). The artist or designer not only creates works; they also continually shape themselves as valuable figures within these networks, shaping their identities. The time spent communicating, nurturing relationships, applying for funding or publicly presenting themselves becomes part of the production of the value of their work. In this context, autonomy is not only the freedom to create, but a need to be active, flexible and always present. Freedom becomes the standard of work.

Luc Boltanski and Eve Chiapello, French sociologists who study changes in contemporary capitalism, argue that the transition from industrial capitalism to network capitalism is not only an organizational change, but also a moral and normative change (Boltanski & Chiapello, 2005). In Fordist-industrial capitalism, success was linked to stability, a long career, positions in the hierarchy, and loyalty to the company. The value of the individual was measured by clear criteria: degrees, experience, and predictable advancement within a stable structure. In the new capitalism, these criteria have been weakened and replaced by others. The central figure is no longer the bureaucratic administrator, but the "project actor": a person who is flexible, mobile, capable of creating networks, and coordinating temporary collaborations.

This change is what Boltanski and Chiapello call the "Project-Oriented Cité": a new way of justifying value, where the value of the individual is measured by his or her ability to enter and exit projects, create connections and always stay active (Boltanski & Chiapello, 2005). In this world, stability is no longer seen as a virtue, but mobility is more important. Security is no longer linked to a long-term contract, but to "employability" – the ability to adapt to different networks and projects. This brings a new work ethic: the individual must be open, communicative, creative and always ready for change. Autonomy is no longer a privilege, but a requirement. Being autonomous means knowing how to self-organize, manage time and energy and produce value without constant external control.

In the new capitalism, the designer is a typical figure, who works on projects, collaborates with temporary teams, helps build a portfolio and reputation through networks, and is valued for his ability to generate ideas and communicate a vision. His autonomy is not simply artistic freedom, but part of the way work is organized. Autonomy becomes a key criterion of evaluation: can you manage yourself? Are you able to move between projects? Can you create a "personal brand"?

Boltanski and Chiapello emphasize that in this new system, the standards of evaluation are vaguer and more difficult to identify (Boltanski & Chiapello, 2005). In industrial capitalism, success was measured by clear and formal criteria. In a project-based system, value is assessed by reputation, networks, and the ability to communicate. As a result, power is diffused and harder to challenge. People feel constantly under pressure to remain active, visible, and not to fall out of the network. Autonomy has two aspects: one is freedom, and the other is anxiety and uncertainty. The freedom to move comes with the constant need to maintain mobility.

However, this does not mean that autonomy is a weakness. In fact, the system requires individuals who create, connect, and innovate, and therefore must provide space for initiative and uniqueness. The "Project-Oriented Cité" cannot function without those who create new ideas. In this way, autonomy still plays an important role in value creation, but it is part of a system where flexibility, networking, and performance are the norm. Design and branding operate in this space, demanding creativity and originality, but also organizing and measuring them based on the logic of projects and the market.

According to Constantine V. Nakassis (2013), an expert in brand anthropology and culture, a brand is more than just a recognizable sign. It's a way to create value by connecting products

with symbolic meanings. Value is not only in the product itself, but also in the history, image, and identity that is built around it. In a global economy where production can move from one place to another, the brand becomes an abstract asset that adds a symbolic "premium." It links production to consumption through identity. This shows that aesthetic autonomy does not disappear; it is organized and measured as "brand equity," that is, as symbolic capital that has economic value (Nakassis, 2013).

A useful example of this logic, also grounded in personal experience, is Fondazione Prada in Milan, which we visited during a study trip. Experiencing the project in person made it easier to understand how branding operates not only through products or visual identity, but through architecture, spatial atmosphere, and the transformation of existing urban fabric. Designed by OMA, Fondazione Prada is located in a former 1910 gin distillery within the Largo Isarco industrial complex and is conceived as a coexistence of regenerated and new buildings. What makes it especially relevant here is that the project does not erase the industrial past of the site; instead, it reworks it into a new cultural environment where heritage, design, and institutional identity are held together. In this sense, the value of the project lies not only in the exhibitions it hosts, but also in the way the space itself produces distinction, experience, and meaning. The Prada name clearly frames the institution, yet the project's force comes from how architecture turns this identity into a lived spatial condition. This makes Fondazione Prada a concrete example of how autonomy in design is not simply outside the market, but becomes part of the production of symbolic and economic value through the built environment.

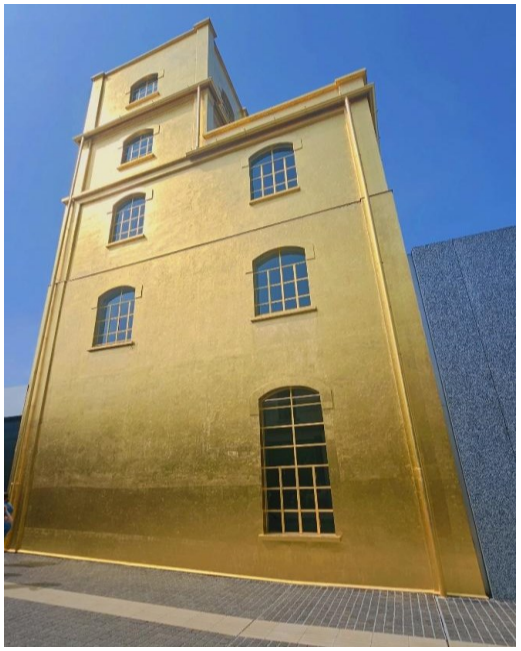


Figure 1. Fondazione Prada, Milan: exterior view of the gold-clad "Haunted House."[1]

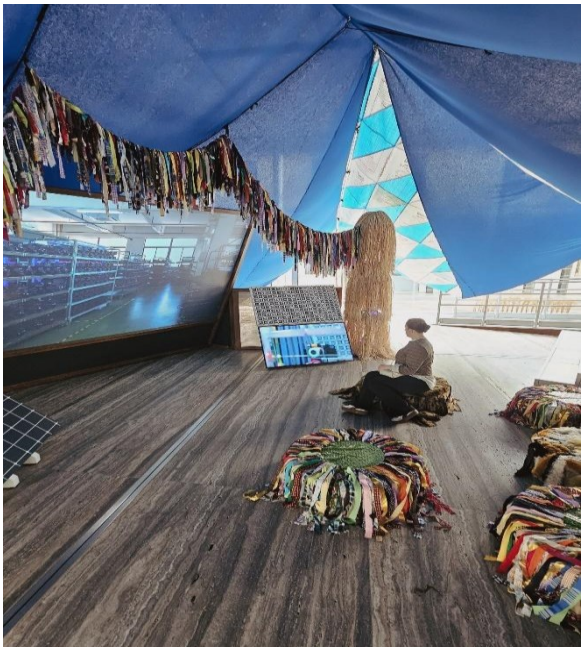


Figure 2. Cao Fei, Dash, Fondazione Prada, Milan: installation view of the rice-granary tent cinema.[2]

[1] *Haunted House* is one of the most recognizable buildings within Fondazione Prada, where an existing structure from the former industrial complex is transformed into a cultural and symbolic landmark through architectural intervention. Its gold-leaf exterior makes visible the shift from industrial utility to aesthetic and institutional value, showing how architecture can reframe the past while producing a new identity for the site. Source: Author's photograph, 2026.

[2] *Dash* is an immersive multimedia installation by Cao Fei that examines the transformation of traditional agriculture through automation, drone technology, and AI in rural China and Southeast Asia. By bringing together ritual, technological change, and spatial experience, the work reflects on how contemporary systems of production reshape both everyday life and cultural meaning. Source: Author's photograph, 2026.

Dennis K. Mumby (2016), a scholar of organizational communication and critical theory, places branding within what he calls “communicative capitalism.” Today, value is created through the circulation of signs, stories, and emotions. The brand tries to stabilize a meaning in a reality where meanings are always unstable. But this stabilization is never complete. People can renegotiate, modify or even challenge the meanings associated with brands (Mumby, 2016). Thus, branding functions as a control mechanism and a space of tension (Mumby, 2016). It offers identities that seem ready to be accepted, but cannot fully dictate how they will be lived or understood.

So, design is not just a matter of form or appearance. As Guy Julier (2006), a researcher of design culture, argues, we need to move from the idea of “Visual Culture” to that of “Design Culture”. Design is not simply something we see and interpret; it is a system that organizes the circulation of products, our experience and everyday practices (Julier, 2006). In post-Fordism, branding is the clearest example of this. It doesn't just put a logo on a product, it shapes environments, services, ways of communication and ways of identification. In Julier’s terms, design should be understood not only as a visual object, but as part of a broader design culture shaped by value, circulation, and practice (Julier, 2006). From this perspective, branding can also be read as something that exceeds visual identity alone, since it operates through objects, spaces, and everyday forms of use.

There is a debate on participatory art, as analysed by Ditte Vilstrup Holm (2019), a scholar of art history and organizational studies, also shows that autonomy does not disappear, but takes on a different form. It moves from an idea of freedom, which is based on autonomy and stable institutions, to a form of freedom understood as opportunity, where individuals are expected to exploit opportunities within flexible networks and changing structures (Holm, 2019). Autonomy is no longer a protection guaranteed from the outside, but an ability to move and position oneself within the system. This makes it clear that today autonomy is not only an aesthetic issue; it is also an organizational and economic category.

If we bring all these analyses together, we can say that in the post-Fordist era, design does not lose autonomy. Capital relies on authenticity, innovation and differentiation, all of which require creative space. In contrast, branding shapes and controls this space, creating identities and meanings on a large scale. Autonomy isn't a complete illusion or total freedom; instead, it's a negotiated space where symbolic value is created and where meaning is debated.

Branding has become the main way through which post-Fordist capitalism creates not only products, but also forms of identity and ways of life. It influences how people understand themselves, what they want, and where they feel they belong. Design is deeply connected to the systems that make this possible. To understand design today, we need to look at how identities are formed through communication, emotions, and shared meanings. This is the crux of the argument: autonomy has not disappeared. It now acts as an important source of value and as a key condition for how branding works in contemporary capitalism.

When we connect Bourdieu’s ideas with those of Boltanski and Chiapello and read them

through the lens of branding today, it becomes easier to understand how autonomy functions in post-Fordist capitalism. Bourdieu explains that artistic autonomy is not something outside the economy, but a position within a field where symbolic and economic capital are always in tension with each other (Bourdieu, 1983). Boltanski & Chiapello show that the new capitalism has absorbed the critique of hierarchy and standardization and has turned autonomy into a working norm within the "world of projects" (Boltanski & Chiapello, 2005).

Branding works precisely at this point: it needs authenticity, style and distinction to create value in the market. Creative autonomy produces symbolic capital, while the brand is the means that stabilizes and turns this capital into economic value. In post-Fordist capitalism, design is not outside the logic of projects and networks; it is one of its most visible expressions.

Taking into account analyses ranging from Adorno's critique of cultural standardization, to Foucault's analyses of power and self-regulation, to Bourdieu's understanding of autonomy as a position within the field of cultural production and Boltanski and Chiapello's explanation of flexibility and project work, we can say that a common denominator emerges: autonomy does not disappear under capitalism, but takes on a new form, to adapt to new and changing systems, to coexist with them, without losing its value. This article argues that, in post-Fordist capitalism, autonomy becomes a condition for creating value. It is no longer outside the market, but something that the market needs, through originality, authenticity and creativity. In this context, branding is the main way to structure these qualities, linking them to identity and turning them into economic and symbolic value. This means that to understand design today, we should not focus on the recovery of lost autonomy, but on the way, autonomy is supported and shaped by an economy that increasingly depends on meaning, communication and identity.

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