BOOK OF PROCEEDINGS

1st International Conference on Built Environment

ICBE 2026

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

ISBN: 9789928347282

DOI: 10.37199/c4100031

CIP Katalogimi në botim BK Tiranë

Universiteti Polis

1st international conference on built environment (icbe) :

may 08th-09th, 2026 : book of proceedings / POLIS University,

Tirane. - Tiranë : Universiteti Polis, 2026. 1 burim në linjë (... f.)

ISBN 9789928347282

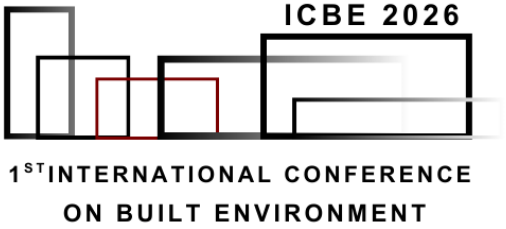
1.Arkitektura 2.Konferenca

72 (062)

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1st International Conference on Built Environment

ICBE 2026

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.

Layout & Design:

Dr. Kristiana Meço

Msc. Erjon Çobani

POLIS University Contact:

Rr. Bylis 12, Autostrada Tiranë-Durrës, Km 5, Kashar

Kodi Postar 1051, Kutia Postare 2995

Tiranë, Albania

Tel: +355.(0)4.2407420 / +355.(0)4.2407421

Fax: +355. (0)4.2407422

Mob: +355 (0) 69 40 88 111

Email: contact@universitetipolis.edu.al

Website: www.universitetipolis.edu.al

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

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

DOI: 10.37199/c4100039

Elma MAHMUTOVIĆ
ORCID 0009-0006-6768-2319
University of Novi Sad, Faculty of Technical Sciences, Serbia
elmaberovic@gmail.com

Dragana KONSTANTINOVIĆ
ORCID 0000-0003-3971-0678
University of Novi Sad, Faculty of Technical Sciences, Serbia
konstan_d@uns.ac.rs

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).

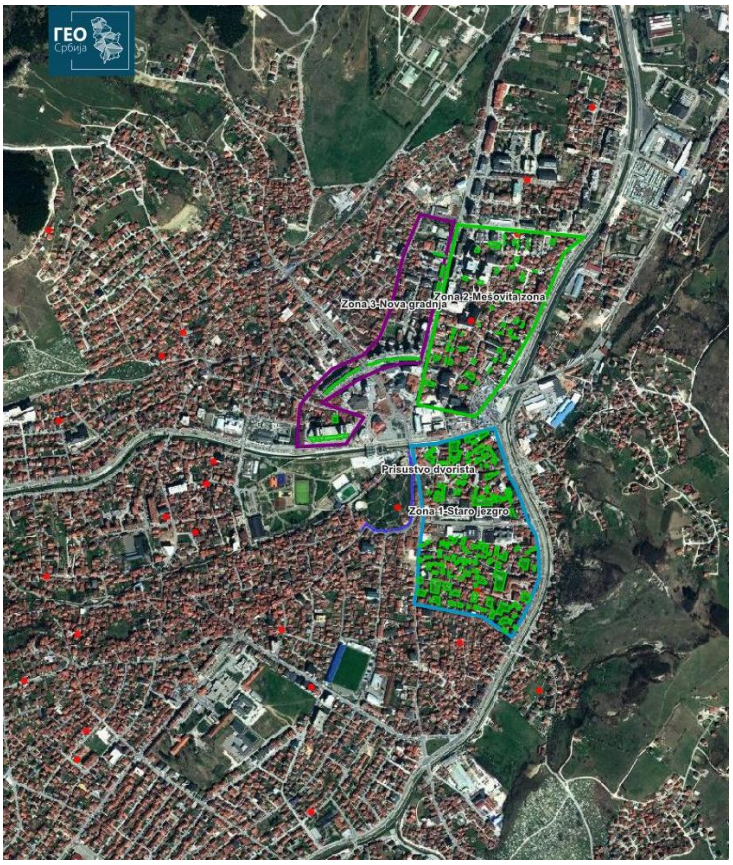


Figure 1. Orthophoto view of the analyzed urban zones in Novi Pazar. Source: GeoSrbija; processed by the author.

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.

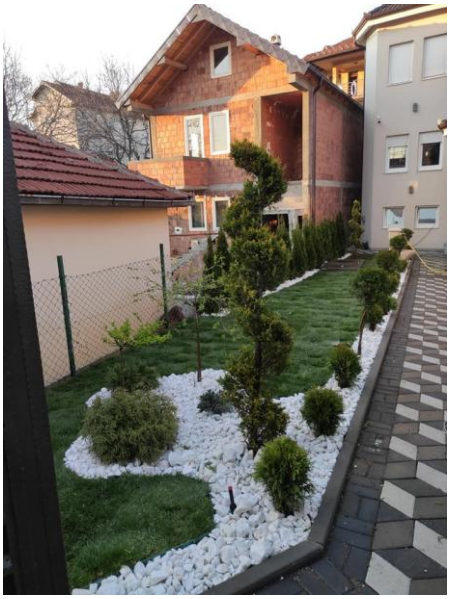


Figure 6. Contemporary courtyard design in the mixed zone. Source: Author's photographic documentation, 2026.

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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