

Techniques and Modern Interpretations for the Developments of Historical City Centers: Insights from Ukraine

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Abstract

This study scrutinizes the issues surrounding the introduction of new structures into historic city areas, particularly focusing on the preservation of urban identity. Using a case study methodology, three instances where new buildings have been integrated into historic city centers have been examined, drawing from the reconstructive transformations in Ukraine. The goal of this research is to propose guidelines for merging modern and historic architectures in a way that maintains city image and cultural integrity.

While the construction of new structures within historical areas can often lead to distortion or degradation of urban identity, this study posits that, if done correctly, these new additions can in fact enhance the historic environment. Yet, frequently, local authorities neglect community inputs, leading to developments that disrupt the historic content and unique styles of cultural heritage, altering cities negatively.

The research concludes that the success of merging old and new architectural styles relies on a broad understanding of the historically established architectural and urban planning parameters, and the requirements of current urban communities. This study delivers practical methods for the introduction of new buildings in historic cities, contributing to the discourse on how to combine diverse architectural styles in order to form a harmonious urban appearance. The findings of this paper hold significant values for urban planners and architects, and lay the foundation for future research on urban development within historic contexts.

Keywords: Architecture, Revitalization, Urbanism, Historical urban environments, New buildings, Ukraine

Introduction

Recent decades have shown an interest in the sustainable development of cities, which is inseparable from the problem of preserving the identity of urban entities in historical contexts.

Meanwhile, there is an intensive intervention of voluntary radical reconstructive changes in the structure and development of the central parts of many cities. They pose a high threat to the cultural and historical heritage, present mainly in the city centers. Numerous negative consequences of such interventions are observed in many cities of the world – from attempts to erect skyscrapers in the historical area of Paris to the brutal flooding of the central part of Kyiv with massive high-rise buildings. They destroy not only the expressiveness and integrity of historical buildings, but also the unique landscape of the areas, untouched for centuries. Often, the protests of specialists and the general public are overridden by the unstoppable interests of commercial profit of the city administrators, developers, and designers (Makulova et al., 2023).

Addressing this issue first requires an urgent and firm reinforcement of legal responsibilities. Any violations of urban planning legislation, prohibitions, and prescriptions must be met with strong consequences. Additionally, it is necessary to have clear scientific research outcomes. These should concern the harmonization of 'old and new' in the structure and growth of historical cities. Such findings need to be incorporated into architectural and urban planning practices. This is because even the concept of 'construction' and 'building' are not completely separated (Ponomarenko, 2019; Sun et al., 2020). In this area, issues of matter of harmonizing of the modern buildings are distinguished based on the main principle of synthesizing architectural art – continuity. This article examines this issue.

The design of new buildings in the midst of historical urban environments requires the harmonization of the following factors: features and opportunities of places, context; new needs of the modern communities; requirements of the users, and existing town planning regulations (Schults et al., 2016). Ideally, the introduction of a new building to supplement, update and activate an existing historical environment should not violate the traditional character and compositional integrity of an area. The improved urban environment should emphasize the most valuable characteristics of historic buildings, enrich the centers of historical cities with new images and functions, and make them more comfortable and ecological (Leshchenko & Guley, 2019).

On the contrary, nowadays, the centers of historic cities have begun to lose their value when they have succumbed to the pressure of industrial developments, which have caused many changes in their economic structures and social compositions. Unfortunately, these changes are not connected to the historical heritage either in the architectural form or substance (Mehanna & Mehanna, 2019). Ignoring the historical contents of such areas, invariably lead to changes in their appearance significantly.

In this context, this paper aims to establish effective guidelines for blending new constructions within historical city centers while preserving their unique identities and cultural integrity.

Its objectives are:

1. To examine case studies of architectural integrations within historical city centers, focusing particularly on instances from Ukraine.
2. To identify the factors that contribute to the successful integration of modern architecture within the historic environment.
3. To propose strategies for ensuring that the introduction of new structures enhances rather than degrades the historical urban identity.
4. To lay a foundation for further research into the adoption of modern technologies in preserving the unique appearance of historical buildings and the environmental conservation in historical urban areas.

Review of Literature

The body of literature concerning the development of historical city centers presents several salient themes, revealing both consensus and divergence. An important area of focus is the structural health monitoring and management of cultural heritage structures, a field well explored by Rossi and Bournas (2023). Their review underscores the critical role of vigilant monitoring and informed management in the preservation of historical structures. However, the ways to perform this monitoring and management require a deeper understanding and call for

the integration of more advanced technologies. The tourist movement in historical urban areas has been scrutinized by Baiz and Atakara (2023). They emphasize the relationship between reshaping tourist routes and the conservation of architectural heritage, arguing that appropriate tourism management can foster architectural conservation. However, these findings are contrasted by Lukomska, Chemakina, and Lukomska (2023), and Lukomska and Lukomska (2022) who underline the significant role of urban regeneration in preserving architectural heritage, notably in the context of Western Ukraine, implying that architectural conservation might not solely be influenced by tourist movement, but also by broad revitalization strategies.

Environmental sustainability is an emerging topic in the domain of architectural heritage, as examined by Corradi, Mustafaraj, and Speranzini (2023). They argue for the incorporation of sustainability considerations into the remediation and retrofitting of historic structures. However, this view is nuanced by Adami et al. (2023), who posit that a Heritage Building Information Modelling (HBIM) approach is key to heritage protection, demonstrating the diverse range of methodologies advocated for within the literature. The application of digital technologies to architectural heritage, particularly the use of Building Information Modelling (BIM), is detailed in the research by Mansuri et al. (2022). They argue that BIM and similar technologies can play an instrumental role in the conservation of architectural heritage. This is further echoed by Al-Bayari and Shatnawi (2022), who posit that geomatics techniques and building information models can significantly aid historical building conservation and restoration.

The vulnerability of built cultural heritage is another theme highlighted in the literature, examined in depth by Damas Mollá et al. (2022). Their methodology for vulnerability assessment adds another layer of complexity to the discourse on urban development within historic contexts. In terms of specific case studies, Ivashko et al. (2020) offer a close examination of historical preservation challenges in Chernihiv, highlighting particular issues with preserving art nouveau buildings. Nieto-Julián et al. (2022) provide a case study on the semantic discretization of architectural heritage, demonstrating the usefulness of a HBIM approach in restoration and conservation projects. Meanwhile, Jaman (2019) focuses on Lesya Ukrainka Street in Lutsk, detailing the historical aspects of its architectural and spatial organization, showing how specific local contexts can play a significant role in the preservation approach.

In conclusion, the literature reveals that while there are many points of agreement, such as the importance of sustainable methodologies, digital technologies, and structural health monitoring, there are also many areas where consensus is yet to be reached. For example, the role of tourism, the focus on urban regeneration, and the necessity for a HBIM approach. It appears that the discussion on these issues needs to continue, underlining the relevance of this study in contributing to that ongoing discourse.

Research Methods

This research adopts a multi-method approach to investigate the integration of new buildings into historical cityscapes while preserving their architectural uniqueness. The study focuses on the factors that influence the aesthetic success and preservation of authenticity when introducing new structures into historical environments. The adopted research methods are delineated below:

1. **Historical Analysis:** A systematic review of historical urbanism literature is conducted to understand the evolution of city planning and architecture over time. The selection of these sources is based on their relevance to the research topic and their scholarly rigor. This review provides insight into the 'flexibility' of old town planning plans and the stagnation of 'ideal' Renaissance cities. The aim is to discern patterns and principles that ensure the aesthetic integrity of architectural designs within historical contexts.
2. **Policy Review:** An in-depth analysis of existing urban architectural management policies and methodologies is performed. The policies selected for review are those specifically related to the introduction of new buildings in the historical

centers of cities. This review provides a comprehensive understanding of current architectural regulations and their impact on the continuity of urban planning in historical areas.

The data generated from these methods are then critically analyzed to draw conclusions and recommendations for future urban planning practices and architectural designs. This approach ensures a well-rounded understanding of the complexities involved in introducing new buildings into historical cities and provides practical guidelines for harmonious urban development.

Findings and the Discussion

In the historical development of architecture, the stylistic direction of each era significantly contrasted with the architectural expression of the previous period, depending on the changes in social, aesthetic, and technological criteria of the society. These were especially acute when looking at the distant past and the architectural and plasticity specifics of the past and the trends of the 20th and early 21st centuries, which illustrate a sharp historical-social, cultural and scientific-technical leap in the development of civilization (Almaganbetovna et al., 2023).

However, the history of urban planning shows that none of the subsequent eras, erecting new structures in the urban environments, remained inert to the previously created ones. Urban experiences show that the differences and contrast of architectural styles of different periods do not prevent a good relationship between historical buildings and modernity in the construction of historical cities and especially their centers (Danchuk et al., 2021). There, the most valuable architectural parts of the cities have been concentrated and the most complex reconstructive collisions have arisen. The aesthetic phenomenon of the urban complexes, which was often formed over centuries, demonstrates the historical sequence of the harmonious development of the primary idea. At the same time, it testifies to the arrival of the moment when all the elements of the architectural and urban development achieve a complete aesthetic unity and harmony. Then it is not reconstructive transformations, but highly professional conservation and restoration of the completed architectural and urban planning complex (Giedion, 2015).

In this connection, continuity takes on special importance as the core of artistic thinking. Thus, since the Middle Ages, when limited economic opportunities stretched the construction of large cathedrals, monasteries, and castles for tens and hundreds of years, several generations of architects participated in the construction of unique objects. The creative idea of the previous master became the basis for the creativity of the next one, and in this way, such a construction became a real school, which nurtured in architects, a sense of respect and the hereditary transformation of the ideas and values of the previous generations (Giedion, 2015).

Thus, the continuous improvement of cities that have led to high artistic levels possessed by historical cities in all the architectural styles that were constantly changing. Conversely, there has been a practice of reconstruction interventions in the structures of city centers. There are many situations where new buildings have been artificially given the retrospective appearances in creating urban complexes with a 'single stylistic character' with the buildings of the past, although they have led to the opposite outcomes because imitation and counterfeiting of architectural forms can only reduce the authenticity of real historical buildings (Cherkes and Idak, 2022).

A good example of such a pseudo-stylistic unity, which significantly distorted the architectural history and expression of one of the iconic and oldest streets of Kyiv Podol is the Andriivskiy Uzvoz, building which has lost its authenticity and temporal individuality. This was a result of carrying out unacceptable additions, superstructures and 'additions' with 'old-fashioned' fake. In the development of the same street, another unacceptable experiment has also taken place with an absolute disregard for the remains of the historical context. This is the intrusion into the facade of the pseudo-stylistically modernized theater of an old residential building of the so-called 'Kyiv brick style' pavilion made of black glass.

Indeed, excessive additions of such solutions in relation to the styles of new buildings in historical environments do not achieve positive results. There is no doubt that buildings

devoid of artistic individuality harm the architectural expressions of the dominant historical cities – their centers – created over the centuries. This is confirmed by the indifference of several buildings erected during the reconstruction of the central area of Vienna, which was partially destroyed during the war, near the main symbol of Vienna – the majestic Gothic cathedral of St. Stefan (Kryvoruchko et al., 2009).

Based on historical experience, it is right to single out the leading factor that is not subject to de-actualization, which determines the integrity and high aesthetics of the development of historical urban entities. It is the optimal level of interaction between the elements of regulation and creative architectural freedom, which ensures the unification of various individualized architectural-figurative manifestations in the orderliness necessary for a complex anthropogenic creation, which is a city (Müller-Menckens, 1977).

As the history of urbanism shows, the basic elements of the spatial structures of the central parts of historical cities have always been the quarter. Its structure can be defined as a secondary, sufficiently independent, elastic, and variable substance. Even a simple comparison of the old town plans, which illustrate the ‘flexibility’ of building quarters depending on the change of allotments – parcels, their consolidation, densification of the building itself, is convincing in this regard. The picturesque phenomenon of the orderly historical urban environment is based on the expedient ‘uniformity’ of the two-dimensional planning basis and the creative interpretation of the third dimension of the city – its buildings, in which the individuality of the architect and the customer could adequately manifest. Attempts to completely unify the planning structure and construction of the urban entity, proposed in the projects of ‘ideal’ Renaissance cities, did not develop in urban planning practice. Urban creation based on various ‘free’ planning solutions with the same type of development also turns out to be unpromising. This has destroyed the model of compositional-spatial integrity of cities, unifying and depriving expressiveness of that city-building substance that is most amenable to aesthetic individualization of buildings (Baudrillard, 2015).

At the same time, the expressiveness and integrity of historical buildings convince us that architectural individualization of buildings do not lead to chaos. In the development of streets and squares of the central parts of cities, there are many buildings, different in terms of architectural and stylistic characteristics, built in different periods but at the same time forming integrated integrity. The guarantee of this at all times was the high register of the intellectual and creative level of architects and the culture of builders who were aware of the need to apply the scale of unifying parameters developed by urban theory and practice tested by time (Kornilova et al., 2023). These are architectural features such as ‘red’ and ‘blue’ building lines, maximum allowable heights, features of the scale-rhythmic organization of ‘walls’ of urban interiors of public spaces of streets and squares, nature of roofs and crowns of buildings, specificity of divisions and saturation of facades, material, and prevailing colors.

In order to find optimal and rational solutions for preserving the unique appearance of the centers of historical cities, one should also turn to the experience of world architects. City administrations solve the issue of designing and organizing the design of buildings of the historical urban complexes, without losing conceptuality and cultural values, by establishing a set of rules of construction norms that will guide the development of the city. Lehnerer (2009), in his work ‘Grand urban rules’ claims that compliance with the rules is the most effective tool for managing urban architecture, whether at the level of the city administration or at the level of project planning.

Lessons from Universal Standards

By analyzing the world urban standards such as Historic Building Preservation Standards, Urban Heritage Conservation Standards, International Urban Development Standards, UNESCO World Heritage Guidelines, International Property Maintenance Code, Building Regulations on Light and Ventilation, City Planning Acts, Architectural Form and Volume Guidelines, Land Use and Planning Laws, Zoning Codes, Urban Aesthetic Guidelines, Building Design and Construction Standards, View Corridor Regulations (Lehnerer, 2009), and

their role in modern urban developments, this study identified the following types of regulations of new buildings in the areas of the historical and cultural heritage of cities:

- Contextual (related to the historical urban context, namely the protection of monuments, traditions),
- Hygienic (related to the incompatibility of functions, types of land use),
- Right to light and air,
- Management of architectural form and volume,
- Preservation of urban views and panoramas.

To determine a morphological and historical-genetic analysis of the development of the historical environments of the cities, the urban morphotypes are analyzed: streets, squares, and quarters. This research (Lehnerer, 2009) created a classification of morphotypes of historical districts: functional, morphological, historical-cultural, compositional, and morphological transformation parameters. With the help of the last parameters, the dynamism and trends of transformation of the architectural form of the city are taken into account. The set of these parameters includes the following indicators:

- The average number of floors of a building,
- The area of the territory,
- Deviations from the red line of the street,
- The configuration of the block,
- The closedness and perimeter of the boundaries of the blocks,
- Volumetric and spatial density,
- The density of the building and its elements.

The compositional parameters include the following.

- Building orientation,
- Style spectrum,
- Boundary alignment,
- Scale, and aesthetic value.

Historical and cultural parameters include the following.

- Density of monuments,
- Historical and cultural potential, and
- Potential for reconstruction.

Functional parameters include the density of public buildings, they determine the permissible types of land use within the quarter. The main object of regulation of buildings in this study is the quarter as a planning unit. The value of these parameters is the so-called "genetic code" of the historical environment, which will ensure the continuity of the urban development of the historical environment if it is followed. This method combines fundamental research of historical districts with the technology of making urban planning decisions (Osychenko, 2017).

The term "volume-plastic consistency" in architecture refers to the principle that advocates for the harmonious integration of form (plastic) and volume within a singular architectural entity or complex. It encompasses the coherence and agreement in the spatial, visual, and aesthetic aspects of a building or a structure. The principle underscores the necessity for the different elements and spaces within the structure to complement each other in terms of size, shape, proportion, and arrangement, thus creating a cohesive and harmonious overall design. When solving the issues of volume-plastic consistency of the existing and new buildings of the city centers, specific reconstructive conditions should be taken into account. With sufficient maneuverability, it is possible to distinguish three main cases of the introduction of new buildings into the built-up environment, depending on the level of preservation of their architectural and urban planning substance:

- New development in the form of separate buildings included in the maximally formed environment of a city center,
- New construction was introduced into the historical environment in the form of complexes of new buildings,
- Historical buildings in the form of local ensembles or separate buildings preserved in the environment of mainly new buildings.

The first two cases require special responsibility, when new buildings, without disturbing the established harmony, should adequately complement the historical environment not on the basis of pastiche, fakes 'in the old style' or reducing the expressiveness of the models of modern architecture. However, the creative understanding of the above-mentioned scale of parameters of the formation of the urban substance, among which the leading place belongs to the architectural structure, which encodes the principle of form formation. That is the interconnection and interaction of the building elements united by its structural system.

Discussion

Discussions about urban planning systems do not lose their relevance. Sitte (2002), noted that the practice of modern urban planning today does not satisfy either professional architects and urban planners, or a wide circle of the population. Mass construction of de-personalized large areas of new buildings and entire cities, it reflects the lack of emotional and aesthetic expressiveness. However, it is necessary to recognize the positive points of this architecture, such as the sanitary and hygienic side, providing a large part of the population with orderly housing, and solving the issue of industrialization of construction (Bieliatynskiy et al., 2022).

The first areas of mass construction were initially even satisfactory from an aesthetic point of view. However, at the present time, we are at another dialectically conditioned point of denial. Most often, new monumental buildings are in no way connected with the breakdown of the surrounding territory and the configuration of the squares. Therefore, Sitte (2002) made a study of a number of urban formations and, in particular, old squares, in order to find out the reasons for the impression they make. On this basis, it is possible to determine a set of rules, the observance of which can give favorable results even today.

The proposed work should be perceived as research with theoretical conclusions for practitioners. It forms part of the comprehensive knowledge in the field of practical aesthetics for urban planners and reinforces personal experience and rules that determine design concepts when dividing the territory into built-up plots. The work is a collection of substantiated theoretical generalizations and conclusions, which describe methods and practical recommendations that are used directly in modern urban planning practice. This is especially important since the lack of a clear theoretical framework is often the cause of negative practical results.

Today, the issue of preserving the historical heritage and cultural values of the city during the construction of new buildings is acute, as historical cities around the world are losing their distinctive identity. This is evidenced by a large number of scientific studies (Al-Bayari & Shatnawi, 2022; Damas Mollá et al., 2022; Adami et al., 2023; Corradi et al., 2023), the authors of which introduce new solutions aimed at protecting historical territories.

Urban theorists (Al-Bayari & Shatnawi, 2022; Corradi et al., 2023) argue that in the post-World War II period, cities faced the growing development of monotonous and soulless urban spaces. This has led to the formulation of theories of urban design to address issues of space and place as a means of correcting the anthropogenic environment of modern cities. Furlan et al. (2019) has investigated the importance of landscaping in Msheireb, which is a restored historic district of Doha, Qatar. The volumetric plastic solutions provided in this study contribute to the development of urban conservation projects in Qatar. They are aimed at the protection of historical heritage during the development and revitalization of decaying areas, as well as at the call for the revival of cultural values by society.

An example of a successful combination of new buildings in the existing architectural and cultural environment can be considered the revival of urban areas of Barcelona in the early 1980s in preparation for the 1992 Olympic Games (Moor & Rowland, 2006). Moor and Rowland (2006) cite the experience of Gese, who conducted research on the process of transforming dusty areas into a modern, modernized city to accommodate the influx of Olympic guests and other visitors. Squares, boulevards, parks, markets, and beaches were designed based on a heritage that combined the best features of the Catalan spirit and the international avant-garde. It should be noted that artists and architects, not civil engineers or urban planners created these designs. Barcelona created a new style for the street: stylized mosaic floors, artistically designed furniture, and sculptures, small water bodies, and green spaces.

Ukrainian researchers are also studying this issue of the preservation of historical values. Rybchinsky (2016) has raised the issue of the role and tasks of citizens in preserving the cultural heritage of market squares of Ukraine. According to him, it is necessary to create conditions for the cooperation of the heads of executive authorities and local self-government bodies, architects, investors, restorers, urban planners, and city residents for the revival of the central part of the historic city. The intervention of local authorities is necessary to establish and control programs for the preservation of the historic landscape and the regulation of buildings (Shults et al., 2022).

The scientific community and public organizations recognized by the local population should also influence the organization of the cultural policy of the historical city. Their voice should be decisive in the matter of cultural heritage preservation. Analyzing the current state of the centers of historic cities, this study offers global volume-plastic solutions for the revitalization of these areas as follows:

- Protection and restoration of cultural monuments of the city,
- Restoration of technical and social infrastructure,
- Creation of conditions for economic development
- Improvement of the quality and comfort of housing in historical centers cities,
- Revival of cultural values and traditions.

Therefore, successful revitalization and control of the development of the centers of historical cities can exist under the conditions of joint work and the active position of the local community, executive authorities, scientific societies, and public organizations (Rybchynskyi, 2022; Kerimkhulle et al., 2023). It is in this way that it is possible to preserve cultural heritage and stop the decay and destruction of historical cities.

Jaman (2019) has analyzed the architectural and spatial organization of L. Ukrainka Street as one of the most important components of the urban planning and architectural heritage of Lutsk. In recent years, there has been an increase in interest in the historical and architectural heritage of urban planning. This necessitates the search for ways of further development.

He has analyzed the artistic and architectural features of L. Ukrainka Street. The results are the basis for the development of future programs for the development of historic cities since the problem of preserving the historically formed visual and functional originality of the environment remains relevant.

Ukrainian architectural historian and art critic Vecherskyi (2011) in his work "Problems of preserving the historical image of the city" has considered the stages of development of views on the activity of preserving the image of the historical part of the city or its reconstruction. In recent years, reconstructions usually take place with the superstructure of individual objects. The author justifies why such works must be carried out according to the principles of comprehensive preservation and hereditary development of historically formed buildings.

Leshchenko (2020) analyzes and systematizes the theoretical and practical experience of restoration, reconstruction, and modern construction of historical cities. She takes into account the current Ukrainian normative documents on the protection of cultural heritage. The work separates 4 degrees of restoration-reconstructive transformation depending on the intensity of the intervention: preservation, strengthening, adjustment, and change, while

preservation and strengthening are classified as restoration, adjustment, and change – as reconstructive transformations. She introduces a direction in the study of the development of historical small towns – cumulative development and an approach to the restoration and reconstruction transformations of their historical centers in the system "place – person – tradition".

The methodology of the process of restoration and reconstruction transformation of the centers of historical cities have been developed. It includes a method of determining the 'genetic code' of cities and determining the destruction of their historical centers in order to establish a qualitative indicator of their current state (Kornilova et al., 2018). In accordance with these principles, recommendations are given for the planning, volumetric-spatial, architectural-image, and functional transformations of the centers of historical cities. The author determined in which cases and when applying which methods of restoration and reconstruction transformation for historical buildings, the original function should be strengthened, the existing one activated, or a new one provided. It was determined which new function would be possible and appropriate for a certain type of historical building in order to preserve and increase their historical, cultural, utilitarian, and socio-economic value and ensure the functional activity of the center of the historic city as a whole.

Conclusions

A city's unique appearance is formed by its historical heritage, which must not only be preserved in its original form but also emphasize its authenticity. The development of the city should not stand still: new buildings should complement the historical complexes, increasing the functionality in accordance with the needs of the modern society. Such a subject is multifaceted and variable, it opens up space for innovative solutions.

The success of harmonizing the historically formed and new architectural substances in the central parts of historical cities relies not only on the high intellectual and creative register of architects and the culture of developers, but also on the comprehension of the historically formed key architectural and urban planning parameters in accordance with the demands of the time and needs of the urban communities. In Ukraine, we can see examples of this interplay, where preservation of historic architecture and incorporation of modern structures are of significant importance, such as in the capital city of Kyiv. One notable case is the Andriivskiy Uzvoz, one of Kyiv's oldest streets, where unsuitable additions and "old-fashioned" imitations have unfortunately detracted from its authentic historical individuality. This highlights the risks of introducing new buildings without careful consideration of the existing historical and urban context.

In future studies, methods of rational implementation of the latest technologies in historical buildings while preserving their unique appearance should be studied. Research aimed at the development of ways to preserve the environment in historical areas of cities should also be developed since the issue of environmental protection is one of the most urgent today.

References:

- A Baudrillard, J. (2015) *Simulacra and Simulation*. Moscow: Publishing House "POSTUM".
- Adami, A., Scala, B., Treccani, D., Dufour, N. & Papandrea, K. (2023) 'HBIM approach for heritage protection: First experiences for a dedicated training', *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives*, 48(M-2-2023), pp. 11-18.
- Al-Bayari, O. & Shatnawi, N. (2022) 'Geomatics techniques and building information model for historical buildings conservation and restoration', *Egyptian Journal of Remote Sensing and Space Science*, 25(2), pp. 563-568.
- Almaganbetovna, T.A., Daniyarovna, T.A., Ogly, M.S.E., Papin, H.E., Nikolayevna, K.Y. & Alua, A. (2023) 'Development of the Architecture of Residential Buildings from the Beginning of XX to XXI Century (By the Example of Astana)', *Civil Engineering and Architecture*, 11(3), pp. 1220-1233. <https://doi.org/10.13189/cea.2023.110308>

- Baiz, Z.H. & Atakara, C. (2023) 'Reshaping the tourist movement in historical urban areas for enhancing architecture conservation: Historical district of Koya city as a case study', *IET Smart Cities*, 5(2), pp. 135-149.
- Bieliatynskiy, A., Yang, S., Pershakov, V., Shao, M. & Ta, M. (2022) 'The use of fiber made from fly ash from power plants in China in road and airfield construction', *Construction and Building Materials*, 323, article number 126537.
- Cherkes, B. & Idak, Yu. (2022) 'The phenomenon of the city in the contemporary discourse of urban history', *Architectural Studies*, 8(2), pp. 7-23.
<https://doi.org/10.56318/as2022.02.007>
- Corradi, M., Mustafaraj, E., & Speranzini, E. (2023) 'Sustainability considerations in remediation, retrofit, and seismic upgrading of historic masonry structures', *Environmental Science and Pollution Research*, 30(10), pp. 25274-25286.
- Damas Mollá, L., Sagarna, M., Zabaleta, A., Antigüedad, I. & Uriarte, J.A. (2022) 'Methodology for assessing the vulnerability of built cultural heritage', *Science of the Total Environment*, 845, article number 157314.
- Danchuk, V., Bakulich, O., Taraban, S. & Bieliatynskiy, A. (2021) 'Simulation of traffic flows optimization in road networks using electrical analogue model', *Advances in Intelligent Systems and Computing*, 1258 AISC, pp. 238-254.
- Furlan, R., Petruccioli, A. & Jamaledin, M. (2019) 'The authenticity of place-making: space and character of the regenerated historic district in Msheireb, Downtown Doha (State of Qatar)', *International Journal of Architectural Research*, 13(1), pp. 151-168.
- Giedion, S. (2015) *Space, Time and Architecture: The Growth of a New Tradition*. Basel: Birkhäuser.
- Ivashko, Y., Dmytrenko, A., Paprzyca, K., Krupa, M. & Kozłowski, T. (2020) 'Problems of historical cities heritage preservation: Chernihiv art nouveau buildings', *International Journal of Conservation Science*, 11(4), pp. 953-964.
- Jaman, U. (2019) 'Historical aspects of the architectural and spatial organization of Lesya Ukrainka Street in Lutsk', *Chronicle of Volyn*, 20, pp. 36-41.
- Kerimkhulle, S., Mukhanova, A., Kantureyeva, M., Koishybaeva, M. & Azieva, G. (2023) 'Applying a housing construction model to improve a small town demographic dynamics', *AIP Conference Proceedings*, 2700, article number 040047.
<https://doi.org/10.1063/5.0125066>
- Kornilova, A.A., Mamedov, S.E.O., Karabayev, G.A., Khorovetskaya, Y.M. & Shlyakhtich, Y.V. (2023) 'Organization of an Architectural Environment Based on Spatial and Constructive Modules in a Severely Continental Climate', *Civil Engineering and Architecture*, 11(2), pp. 733-740.
- Kornilova, A.A., Mamedov, S.E.O., Khorovetskaya, Y.M., Karabayev, G.A. & Kiseleva, T.A. (2018) 'Historical aspects of the formation of rural settlements in northern Kazakhstan during the pre-revolutionary period', *Terra Sebus*, 10, pp. 271-285.
- Kryvoruchko, N.I., Petrovych, I.M. & Grebennik, O.S. (2009) 'Methods of scientific research in reconstruction general urban center of large and largest cities', *Scientific and Technical Collection "Communal Economy of Cities"*, 90, pp. 71-80.
- Lehnerer, A. (2009) *Grand urban rules*. Rotterdam: NAI010 Publishers.
- Leshchenko, N. (2020) *Methodological foundations of restoration-reconstructive transformations of historical centers of small towns*. Kyiv: Kyiv National University of Construction and Architecture.
- Leshchenko, N.A. & Guley, D.V. (2019) 'Regeneration of the residential quarter of the Podil district in the context of the historical development of the city of Kyiv', *Urban Planning and Territorial Planning*, 69, pp. 225-234.
- Lukomska, Z. & Lukomska, H. (2022) 'Regeneration as a Method of Protection and Preservation of Architectural-Urban Heritage On the Example of Historical Seventeenth-and Eighteenth-Century Cities of Western Ukraine | Regeneracja jako sposób ochrony i konserwacji dziedzictwa architektonicznego i urbanistycznego na

- przykładzie miast historycznych Ukrainy Zachodniej z XVII i XVIII wieku', *Wiadomosci Konserwatorskie*, 2022(70), pp. 7-16.
- Lukomska, Z., Chemakina, O. & Lukomska, H. (2023) 'Preservation of the historical environment of the city through revitalization (on the example of Ivano-Frankivsk)', *AIP Conference Proceedings*, 2678, article number 020010.
- Makulova, A., Saparbayev, A., Zhuman, Y., Abdibekov, S., Madiyarova, K., & Bekbulatova, R. (2023) 'Application of the TRIZ Methodology in the Construction Industry', *Civil Engineering and Architecture*, 11(1), pp. 517-524.
<https://doi.org/10.13189/cea.2023.110140>
- Mansuri, L.E., Patel, D.A., Udejaja, C., Awuah, K.G.B. & Jha, K.N. (2022) 'A systematic mapping of BIM and digital technologies for architectural heritage', *Smart and Sustainable Built Environment*, 11(4), pp. 1060-1080.
- Mehanna, W.A.E.H. & Mehanna, W.A.E.H. (2019) 'Urban renewal for traditional commercial streets at the historical centers of cities', *Alexandria Engineering Journal*, 58(4), pp. 1127-1143.
- Moor, M. & Rowland, J. (2006) *Urban design futures*. London: Routledge.
- Müller-Menckens, G. (1977) *New life for old buildings: On the continuo in architecture*. Stuttgart: Koch.
- Nieto-Julián, J.E., Farratel, J., Bouzas Cavada, M. & Moyano-Campos, J. (2022) 'The Semantic Discretization of Architectural Heritage as the Basis of a HBIM Restoration and Conservation Project', *Lecture Notes in Civil Engineering*, 258, pp. 225-242.
- Osychenko, G.O. (2017) 'Peculiarities of regulating the development and construction of historical cities', in *Materials of the international scientific and practical conference sustainable development of cities (urban planning aspect)* (pp. 83-85). Kharkiv: KNUUE named after O.M. Beketova.
- Ponomarenko, K.D. (2019) 'The concept of development as a form of realization of the civil right to development', *Legal Position*, 3(24), pp. 135-139.
- Rossi, M. & Bournas, D. (2023) 'Structural Health Monitoring and Management of Cultural Heritage Structures: A State-of-the-Art Review', *Applied Sciences (Switzerland)*, 13(11), article number 6450.
- Rybchinsky, O.V. (2016) 'Local community and preservation of heritage in the context of revitalization of market squares of historical cities of Ukraine', *Modern Problems of Architecture and Urban Planning*, 42, pp. 120-126.
- Rybchynskyi, O. (2022) 'Integral development of the historical city centres of Ukraine', *Architectural Studies*, 8(1), pp. 41-50. <https://doi.org/10.56318/as2022.01.041>
- Schults, R., Annenkov, A., Bilous, M. & Kovtun, V. (2016) 'Interpretation of geodetic observations of the high-rise buildings displacements', *Geodesy and Cartography*, 42(2), pp. 39-46. <https://doi.org/10.3846/20296991.2016.1198566>
- Shults, R., Annenkov, A., Seitkazina, G., Soltabayeva, S., Kozhayev, Z., Khailak, A., Nikitenko, K., Sossa, B. & Kulichenko, N. (2022) 'Analysis of the displacements of pipeline overpasses based on geodetic monitoring results', *Geodesy and Geodynamics*, 13(1), pp. 50-71. <https://doi.org/10.1016/j.geog.2021.09.005>
- Sitte, C. (2002) *Urban planning according to its artistic principles*. Basel: Birkhäuser.
- Sun, J., Bieliatynskyi, A., Krayushkina, K. & Akmaldinova, O. (2020) 'Research of properties on graphite conductive slag in asphalt concrete', *E3S Web of Conferences*, 175, article number 11015.
- Vecherskyi, V. (2011) 'Problems of preserving the historical image of the city', *Bulletin of the National University "Lviv Polytechnic"*, 716, pp. 68-73.