

УДК 728.1(5-191.2)  
DOI: 10.36979/1694-500X-2024-24-4-153-163

## ОСОБЕННОСТИ ФОРМООБРАЗОВАНИЯ ЖИЛОГО ДОМА В ЦЕНТРАЛЬНО-АЗИАТСКИХ ПОСЕЛЕНИЯХ

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*Аннотация.* Проведен анализ архитектурных традиций и формообразования жилых домов в Центральной Азии, рассматривается взаимосвязь между историческим наследием, климатическими условиями, культурными практиками и социально-экономическими процессами региона. Использован комплексный подход, включающий анализ научной литературы, архивных материалов и современных исследований в области архитектуры и строительства. Проанализированы исторические корни формообразования, культурные и климатические особенности, оказывающие влияние на архитектурное наследие и современные тенденции в строительстве жилищ. Подчеркнута важность сохранения традиционных архитектурных форм и их адаптации к современным условиям при развитии жилищного строительства в горных и равнинных регионах Центральной Азии.

*Ключевые слова:* архитектура жилых домов Центральной Азии; традиционные строительные материалы; климатическая адаптация архитектуры; сохранение культурного наследия; multifunctionality жилых пространств.

## БОРБОРДУК АЗИЯНЫН КОНУШТАРЫНДАГЫ ТУРАК ҮЙЛӨРДҮН ФОРМАЛАРЫНЫН КАЛЫПТАНУУ ӨЗГӨЧӨЛҮКТӨРҮ

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*Аннотация.* Макалада Борбордук Азиядагы турак үйлөрдүн архитектуралык каада-салттарына жана калыптанышына талдоо жүргүзүлүп, аймактын тарыхый мурастарынын, климаттык шарттарынын, маданий тажрыйбаларынын жана социалдык-экономикалык процесстеринин өз ара байланышы каралат. Архитектура жана курулуш жаатындагы илимий адабияттарды, архивдик материалдарды жана заманбап изилдөөлөрдү талдоону камтыган комплекстүү ыкма колдонулган. Архитектуралык мураска жана турак жай курулушунун учурдагы тенденцияларына таасир этүүчү калыптануунун тарыхый тамырлары, маданий жана климаттык өзгөчөлүктөрү талданды. Борбордук Азиянын тоолуу жана түздүк аймактарында турак жай курулушун өнүктүрүүдө салттуу архитектуралык формаларды сактоонун жана аларды заманбап шарттарга адаптациялоонун маанилүүлүгү баса белгиленди.

*Түйүндүү сөздөр:* Борбордук Азиядагы турак жай имараттарынын архитектурасы; салттуу курулуш материалдары; архитектуранын климаттык ыңгайлашуусу; маданий мурастарды сактоо; жашоо мейкиндиктеринин көп функционалдуулугу.

## FEATURES OF THE FORM OF RESIDENTIAL HOUSES IN CENTRAL ASIAN SETTLEMENTS

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*Abstract.* This article is dedicated to the analysis of architectural traditions and the formation of residential houses in Central Asia, highlighting the interconnection between historical heritage, climatic conditions, cultural practices, and socio-economic processes of the region. The study is based on a comprehensive approach, incorporating the analysis of scientific literature, archival materials, and modern research in the field of architecture and construction. It examines the historical roots of form-creation, cultural and climatic features that influence architectural heritage and contemporary trends in housing construction. The article emphasizes the importance of preserving traditional architectural forms and

their adaptation to modern conditions, identifying key challenges and opportunities for the development of housing construction in the mountainous and plain regions of Central Asia.

*Keywords:* Central Asian architecture; traditional building materials; climatic adaptation of architecture; preservation of cultural heritage; multifunctionality of living spaces.

Construction technologies and the peculiarities of project solutions in traditional housing constitute a pivotal aspect in the study of residential environment evolution in Central Asia from the 17th to the 20th centuries.

In this sphere of construction, there is a direct and integral reflection of the peculiarities of the surrounding landscape, as well as the preferences and needs of extensive layers of the population. The experience accumulated over centuries in the realm of traditional construction has contributed to the development of methodologies for protecting residences from negative climatic impacts, as well as enhancing their functionality and comfort. The architecture of a dwelling reflects the social conditions, ethnic identity, and cultural traditions of its inhabitants, as well as their everyday habits and aesthetic preferences. There are numerous examples of the construction of traditional homes among the ethnic groups living in mountainous regions.

Currently, the relevance of studying architectural traditions and the peculiarities of residential house form development in various cultural and climatic conditions has significantly increased. Central Asian settlements, with their rich historical heritage reflected in unique architectural forms and planning solutions, are of particular interest. These features are shaped by a multitude of factors, among which climatic conditions, historical-cultural traditions, and the socio-economic context are key.

The objective of this study is to analyze the peculiarities of residential house form development in Central Asian settlements with the aim of identifying characteristic features that define the uniqueness and functionality of these architectural entities. The research will examine the historical roots of form development, as well as the cultural and climatic characteristics of the region, which influence architectural heritage and contemporary trends in construction.

The research is based on a comprehensive approach that includes the analysis of scientific literature, archival materials, as well as contemporary studies in the fields of architecture and construction. The application of comparative analysis methods and typology will enable a detailed examination of the diversity of forms and construction methods used in various regions of Central Asia, and identify promising directions for the development of architectural heritage in the context of modern urbanization.

Thus, this study contributes to a profound understanding of the interrelationship between cultural traditions, climatic conditions, and architectural form development in Central Asia, as well as contributes to the development of methodological approaches to the preservation and adaptation of historical heritage in contemporary construction.

The study of architectural achievements and housing traditions in Central Asia has traversed a long path, starting from antiquity and reaching up to the present, with a focus on the most important works and discoveries. As early as 1939, N.M. Bachinsky and V.I. Pilyavsky initiated this series with a publication dedicated to the architecture of Turkmenistan, laying the groundwork for subsequent research, including the works of A.N. Bernshtam on Kyrgyzstan and G.A. Pugachenkova on Southern Turkmenistan. Additional contributions to this knowledge base were made by the research of V.L. Voronina on folk architecture, as well as the works of V.A. Nielsen, A.M. Pribytkova, and other scholars, which expanded the understanding of regional architecture. V.V. Ginzburg investigated mountain housing, while R.S. Mukimov and S. Mamadjanova focused on mountain architecture and early medieval monuments.

Significant contributions to the understanding of architectural traditions and the formation of dwellings in Central Asia have been made by scholars R.S. Mukimov, S.M. Mamadjanova, K. Usmanov, D.A. Nazilov, R.M. Muksinov, and R.D. Muksinova. Their multifaceted research spans from the historical development

to the adaptation of architecture to climatic conditions, and contributes to the understanding of the socio-economic factors shaping housing construction.

Despite the substantial contribution of these researchers, there is a perceived need for further deepening and integration of knowledge to comprehensively illuminate the historical, cultural, climatic, and technological aspects that define the form development of residential houses in the region. This underscores the necessity of continuing scientific research to create sustainable and adaptable architectural solutions in the conditions of Central Asia, ensuring the preservation of cultural heritage while simultaneously adapting to contemporary challenges.

In the southeastern territories of Central Asia, mountain ranges predominate, formed by the systems of the Tien Shan and Pamir-Alai, creating a transverse barrier about 750 km long, extending from northwest to southeast across the entire region. The mountain formations are characterized by a pronounced division into elongated ridges, forming a continuous mountain mass despite the presence of gorges and other dividing elements. These ridges are distinguished by an asymmetric structure, with one gentle and another, steeper slope leading to elevated plateaus or mountain valleys, where settlements are often located [1].

The landscape and geographical conditions of these mountains provide a broad spectrum of natural zones from the foothills to the summits, influencing the distribution and characteristics of settlements, as well as the architectural design and layout of buildings. Architectural design in these conditions takes into account not only the relief but also the climatic features, including wind conditions, which contribute to effective ventilation and thermal insulation of spaces, and considers loads on the structure, increasing its durability.

The climate of mountain regions, with its characteristic cooling in summer and harshness in winter, and the altitude dependence of air temperature, require a special approach to construction, including seismic-resistant structures due to high seismic activity. These conditions have defined the development of building traditions, taking into account the need for high strength and reliability of buildings.

In constructing in the mountainous areas of Central Asia, the local population adapted to using available resources, leading to the diversification of architectural styles based on the geological and relief features of different ridges. For instance, the Zeravshan and Nuratau ranges, rich in crystalline schists, limestone, and marble, differ from the Hissar and Baysun, where softer reliefs with developed vegetation predominate [1, 2].

Ecological zones influence architectural decisions: from stone structures in rocky regions to timber-frame constructions in wooded and fertile valleys.

Architectural choices in mountain areas are determined by the availability of natural materials, leading to the predominant use of stone in rocky conditions and clay or straw walls in valleys, while forested areas facilitated the spread of wooden construction.

The study of historical and architectural sources allows for tracing the dynamics of residential architecture development in Central Asia, starting predominantly from the 19th century. In analyzing the architectural heritage, special attention was also paid to previously constructed buildings, although their typological analysis is complicated due to numerous reconstructions. It is noted that the geographical isolation of mountain settlements contributed to the slow and uniform nature of housing type transformation up until the second half of the 19th century. Detailed investigation of the residential architecture of individual mountain areas provides the opportunity for comparison and identification of prevailing housing types, enabling the reconstruction of the typological structure of dwellings in the mountain regions of Central Asia [3, 4].

Based on the analysis, let's start with the most common compositional scheme, where the central room is located between two side rooms. This type of dwelling is widely used in the mountain regions of Nurata, Kashkadarya, Tashkent, Fergana, as well as in Samarkand and Khujand. Besides, in some areas, there are dwellings with a similar plan but with an ivan (a traditional veranda) instead of the central room [5, 6] (Figure 1).

D.A. Nazilov's analysis determined that this architectural type is also characteristic of the plain territories of Central Asia, where houses with an ivan located between living spaces are also found in Kashkadarya and Surkhandarya. However, here the ivan is sometimes replaced by a narrow passage, similar to an entrance

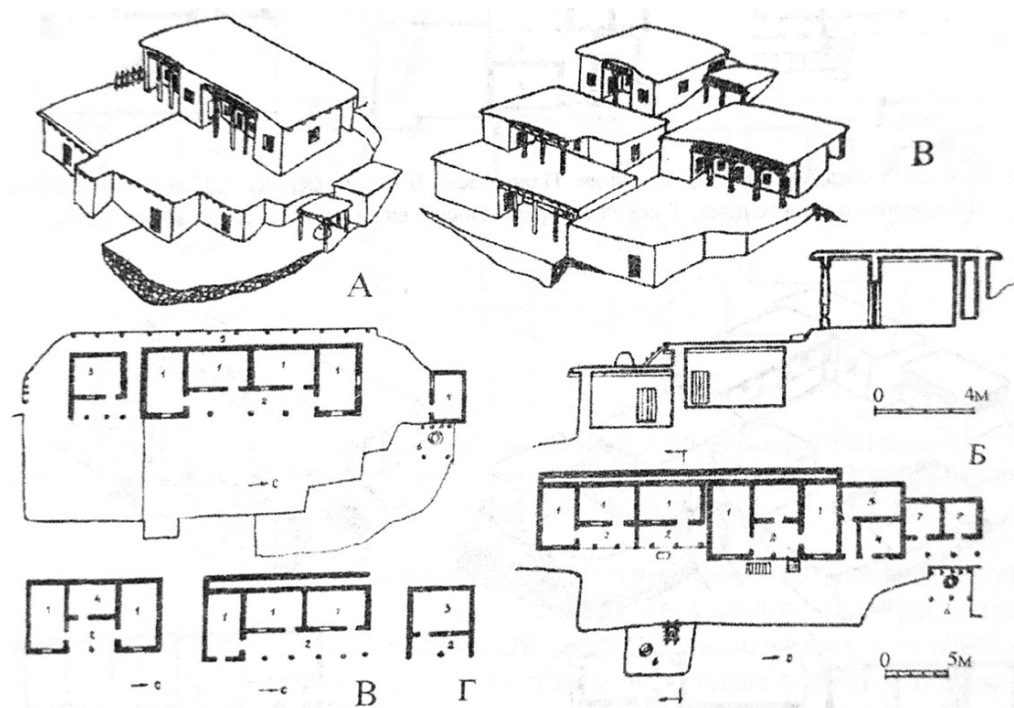


Figure 1. Village of Karch. A – Shukurov’s house. General view, plan; B – the house of master Dzhabbor. Plan, section; C – general view of the residential complex, plans of the upper living blocks; D – living room, plan. 1 – living room, 2 – ivan, 3 – guest room, 4 – kitchen, 5 – treasury, 6 – tandoor, 7 – storage (Nazilov D.A. Architecture of the Mountain Regions of Central Asia. Tashkent: TashGTU Publishing, 1999)

hall. In more recent constructions, this element, called “dolon,” acquires the status of an independent room, indicating a gradual development of architectural forms [4] (Figure 2).

Considering the climatic conditions of mountain regions, it can be assumed that constructions with a dolon emerged earlier than dwellings with an ivan, the latter of which likely evolved from the former. In the context of cold winters, the dolon remains an important part of the dwelling to this day, although in some places there is a trend towards replacing it with an ivan with minimal openings.

Interestingly, the layout with an ivan extending along the entire facade became widespread in the early 20th century, marking the evolution of residential architecture in mountain areas. The development of residential forms, including one-, two-, and three-room houses with ivans, demonstrates the adaptation of architectural solutions to local conditions [7].

The analysis of residential architecture in the mountain regions of Central Asia allows for the identification of prevailing house types and tracing their development, which facilitates a deep understanding of the typological features of mountain dwellings and their adaptation to complex natural and climatic conditions.

The study of traditional Kyrgyz housing from the 17th to the early 20th century allows for a vivid tracing of the diversity and uniqueness of local architectural traditions, which have their roots in the Middle Ages. The supremacy of local schools in stone processing, creating ornamental wood carvings, and working with ganch stimulated a deep and comprehensive study of these phenomena, including meticulous graphic documentation of the objects studied. This research, based on specific examples from various settlements, purposefully reveals the specific features of traditional Kyrgyz dwellings. According to scientific works in architecture and ethnography, depending on the ecological conditions of the territory, the architectural and planning solution of dwellings and settlements is classified into three main types: mountain, foothill, and plain [8].

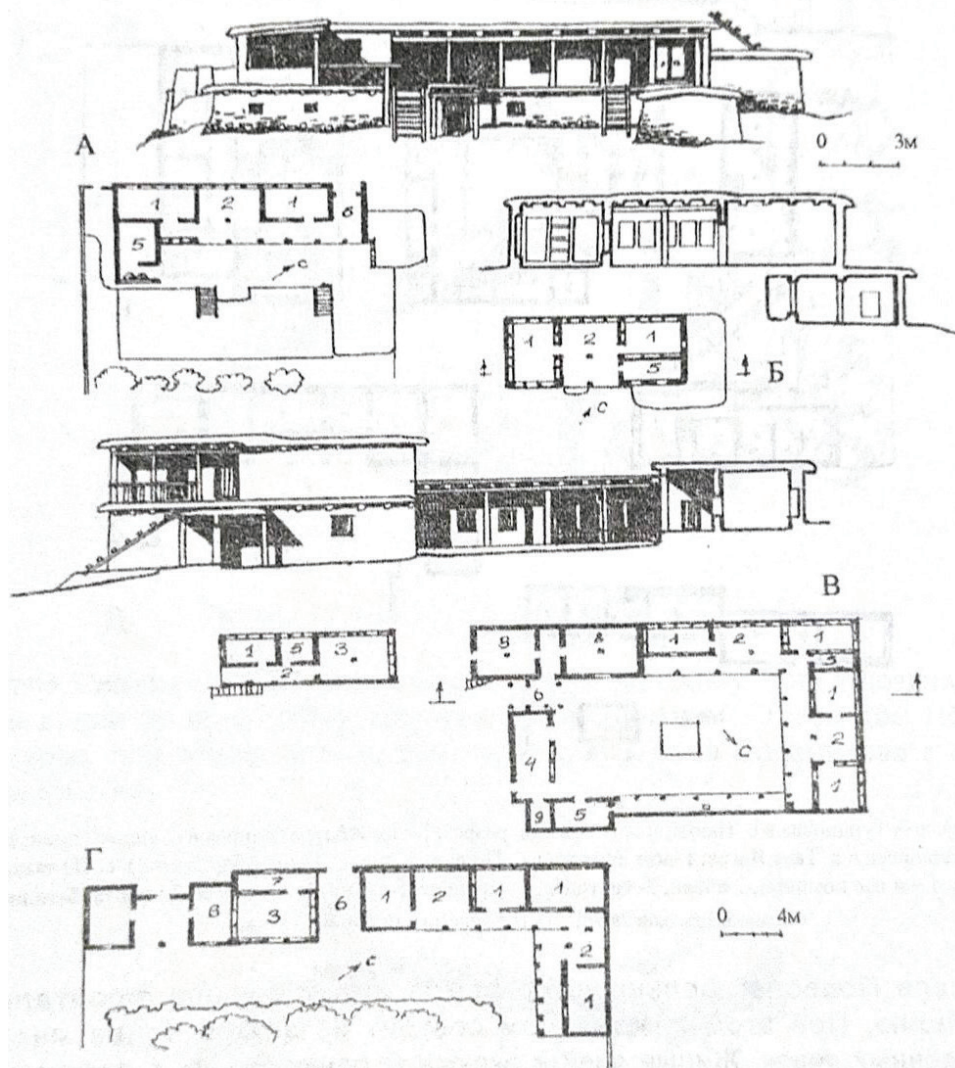


Figure 2. A – House of Usto Makhkam in village Pekem. Facade, plan; B – House of Usto Azamatov in village Pokem. Plan, section; C – House of Abduyusupov in village Pokem. Plan, section; D – House of Khaitov in village Pskem. Plan; 1 – living room, 2 – ivan, 3 – guest room, 4 – kitchen, 5 – storage, 6 – gate, 7 – dolon, 8 – livestock room, 9 – wood storage (Nazilov D.A. Architecture of the Mountain Regions of Central Asia. Tashkent: TashGTU Publishing, 1999)

In the context of the classification of dwellings by type of terrain, houses classified as mountain type are termed “Pamiri.” Distinctive attributes of this type of dwelling include roofing structures supported by pillars installed inside the room, a unique device for smoke extraction, and high-strength clay walls. Typically, these houses are single-story structures, though two-story versions also exist, distinguishing them as a separate category. A flat roof is a common element for most such constructions. In cases where a second floor is present, it is usually limited to a single room called “balakana.” These buildings are characteristic of mountain regions, but over time their popularity has significantly declined, and the construction of such houses has almost completely ceased. Two-story dwellings are particularly typical for Tajiks and Uzbeks living in mountainous areas [9] (Figure 3).

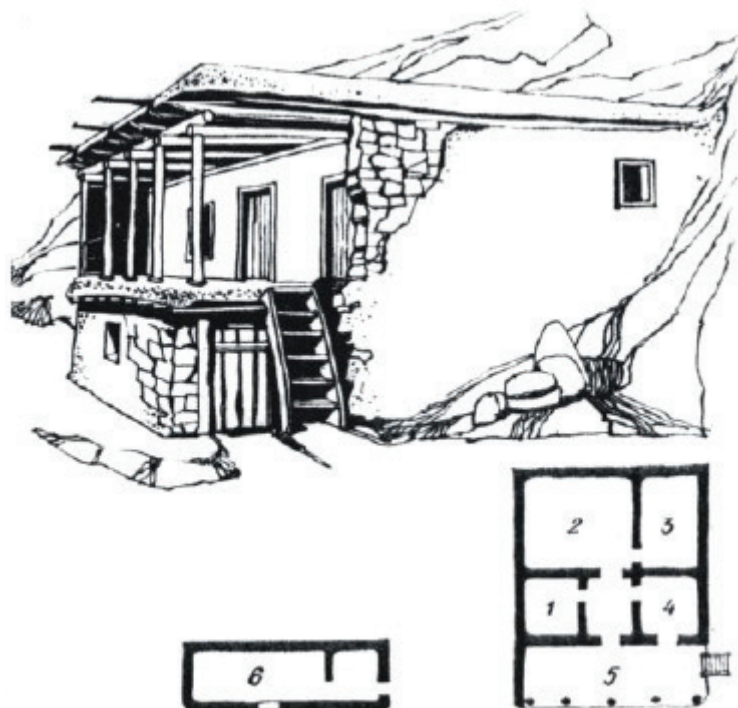


Figure 3. Mountain-type residential house in the village of Papal, Batken district (Muksinov R.M., Tursunov A.T. M 90. Architecture of the Villages of Kyrgyzstan / Art by Sh. Djekshenbaev. Frunze: Adabiyat, 1989. 80 p.: ill.)

The architectural analysis of the residential complex of the near-Pamiri type in Kyrgyzstan reveals the uniqueness of construction traditions, distinguished by the integration of residential and economic functions in a single architectural ensemble. In this context, the absence of a delineated courtyard space is due to the unity of the entrance, intended for both people and livestock, which emphasizes the multifunctionality and compactness of the construction. The use of mud-brick material with high walls, reaching 3-3.2 meters in height, and the features of the roofing structure without edge protrusions reflect adaptation to local climatic conditions. Internal columns, located along the walls and in the central part of the room, perform a supporting function and contribute elements of stability and durability to the architectural composition [8] (Figure 4).

The roofing of homes of the near-Pamiri type is characterized by the presence of a wooden stepped vault, the central element of which is a smoke hole known as “tunduk.” This structure, serving as an important element for lighting and ventilation in the absence of traditional windows, also performs an aesthetic function, reminding of the cultural connection with the traditional nomadic dwelling – the yurt. The ceiling structure, formed through the sequential reduction in the sizes of wooden frames, creates a visually dynamic and functional architectural element, emphasizing the skill of ancient builders [9].

Utility spaces, such as stables, livestock rooms, barns, and storerooms, are closely integrated with living spaces, facilitating the efficient use of available space and resources. The multi-level arrangement of the roofs of residential and utility buildings reflects the differentiation of the estate’s interior space depending on their functional purpose.

The placement of homesteads on mountain slopes without the use of fences, as well as the two-level organization of space, demonstrate the architecture’s adaptability to the complex geographical and climatic

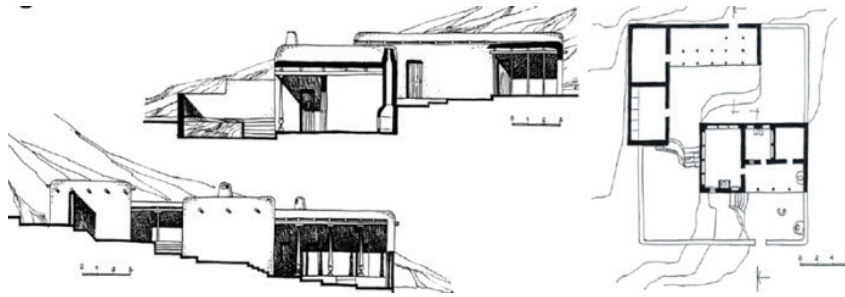


Figure 4. Foothill-type residential house in the village of Gulcha, Alay district  
(Muksinov R.M., Tursunov A.T. M 90. Architecture of the Villages of Kyrgyzstan / Art by Sh. Djekshenbaev.  
Frunze: Adabiyat, 1989. 80 p.: ill)

conditions of Kyrgyzstan. Such positioning not only ensures the efficient use of land resources but also reflects the social organization and cultural characteristics of the local population.

Overall, the architectural heritage of near-Pamiri type dwellings in Kyrgyzstan represents a valuable source of information about construction traditions, social structure, and adaptation to the ecological conditions of the region. These estates, as the research indicates, embody the profound knowledge of the local population about building materials, construction techniques, and the optimal use of the natural landscape to create sustainable and functional housing.

The architectural appearance and structure of these homesteads highlight the close connection of Kyrgyz culture with nature and traditional ways of life, based on nomadism and settlement. The integration of living and utility spaces under one roof not only provided protection from inclement weather and cold but also facilitated the strengthening of family and community ties, playing a significant role in the social organization of traditional Kyrgyz society.

The terraced type, used on sloped plots, reflects a unique adaptation of dwellings to the conditions of mountainous terrain, where the first floor is typically allocated for utility purposes, and the second directly for living space. An important feature is the use of the first floor's roof as a terrace for relaxation, underscoring the importance of the social status of the owners of such houses [10] (Figure 5).

Combining these approaches, one can see how deeply rooted construction traditions and interactions with neighboring cultures have shaped a unique architectural diversity of residential houses in Kyrgyzstan. This mosaic reflects the complex socio-cultural and economic processes that have defined the life of the peoples of Central Asia over the centuries.

During the survey of enclosed-type estates, dwellings of the Fergana type were identified, distinguished by enriched architectural decor of ivans and ceilings. In the Frunze district, enclosed-type estates were found, containing elements of the near-Pamiri style, except for stepped-vaulted ceilings. Estates surrounded by a wall (duval) with various planning solutions were also identified, most common in the Osh region, especially in its western part [10].

The Fergana type of dwelling is characterized by a flat roof, architectural elements including an open ivan and wall niches, which recreate the image of traditional medieval culture in its planning features (Figure 6).

Architectural analysis of foothill residential types facilitates the distinction between Pamiri and Fergana houses, with the latter not being limited to the Fergana Valley but also spreading to Eastern Turkestan. Distinctive features of these homes include flat roofs, the presence of an open terrace (ivan), niches in the walls, and double doors, although there exists a multitude of variations of these characteristics. In particular, Fergana houses may possess a flat gabled roof with varying degrees of slope steepness, the presence or absence of niches and an ivan, usually featuring single doors. Analyses suggest that such structures around Andijan may have been influenced by European designs [11].

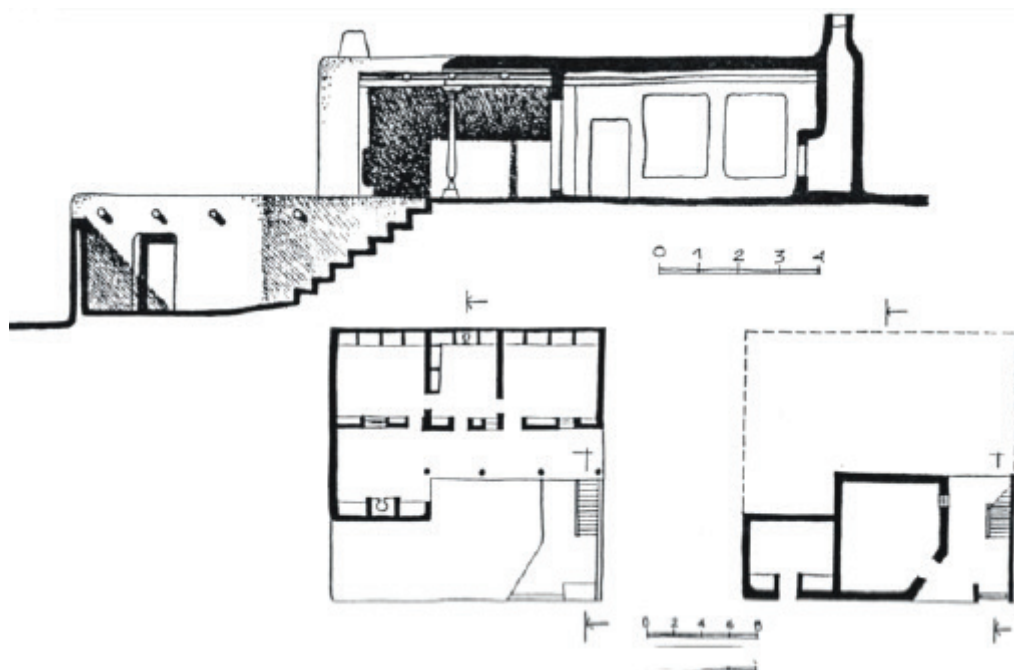


Figure 5. Terraced-type residential house in the village of Papal, Batken district  
(Muksinov R.M., Tursunov A.T. M 90. Architecture of the Villages of Kyrgyzstan / Art by Sh. Djekshenbaev.  
Frunze: Adabiyat, 1989. 80 p.: ill.)

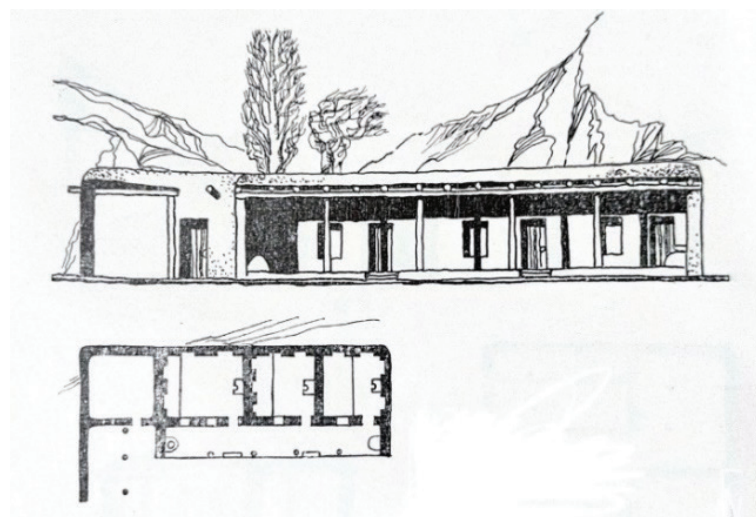


Figure 6. Fergana type residential house. Facade, Plan  
(Muksinov R.M., Tursunov A.T. M 90. Architecture of the Villages of Kyrgyzstan / Art by Sh. Djekshenbaev.  
Frunze: Adabiyat, 1989. 80 p.: ill.)



The distribution of mountain-type dwellings is limited, whereas houses of the foothill and plain types in the southern part of the Osh region possess a significant historical background and widespread occurrence. Foothill homes are typically characterized by a closed estate, which most fully reflects medieval architectural traditions, forming a rectangular shape enclosed by a high clay wall, reminiscent of feudal fortifications. Entry into such an estate is through monumental double wooden gates, often the only ones in the entire complex.

These architectural solutions not only reflect the social stratification of that time but also demonstrate affiliation with specific social layers, including the higher administrative echelons and the trading bourgeoisie. Research confirms that the presence of closed-type estates among the Kyrgyz dates back to the mid-19th century, evidencing the long history of such an architectural form.

In the context of the socio-historical development of the region, closed-type estates represent a significant element in the study of Central Asia's architectural heritage, highlighting the interconnection between social structure, traditions, and architectural practices. Their examination and analysis contribute to a deep understanding of the cultural and historical processes that occurred in the region and present considerable interest for archaeology, architecture, and social anthropology.

In the plains regions, dwellings characterized by a mixture of architectural traditions from Russian, Uzbek, and Tajik cultures predominate, featuring aspects of both Fergana and mixed types of structures. It is noted that wall niches and ivans are not mandatory elements in every house, but a common feature among all is the gabled roof, emphasizing architectural integration. Brick construction lends these homes particular strength and durability. By the beginning of the 20th century, such houses had gained significant popularity and continue to spread, demonstrating the adaptation of architecture to the development of social and cultural processes in the region.

The layout solutions for both foothill and plain types of dwellings range from simple single-room to multifunctional multi-room structures. The simplest form – a one-room house with a minimum number of windows and a fireplace near the entrance – serves as an example of an economical dwelling. More complex constructions feature separate kitchen and living areas, where each room performs specific functions and provides living comfort for the family [11].

Families consisting of several generations prefer elongated houses with separate living modules, each with its own entrance. This ensures privacy and independence for each family unit while maintaining closeness and a shared space. Such houses are characterized by flat roofs and are often built in Southern Kyrgyzstan, where the climatic conditions favor this type of construction [12].

Homes of the plain type not only reflect a mixture of cultural influences in architecture but also demonstrate a diversity of layout solutions adapted to the needs of modern families. Open terraces–ivans–become an important element of the dwelling, used for family relaxation and receiving guests, emphasizing the importance of social and family connections in the region's culture [13].

The architectural diversity of plain dwellings in Kyrgyzstan reflects the historical, cultural, and social processes occurring in the region, highlighting the adaptation of residential architecture to changing conditions and societal needs.

The features of residential house formation in Central Asian settlements of the 21st century are characterized by the integration of traditional architectural practices with modern construction technologies and sustainable development concepts. The architecture of residential houses reflects adaptation to the region's extreme climatic conditions, sociocultural peculiarities, and the dynamically evolving lifestyle of Central Asia's population, including maximum adaptation to the hot, dry climate and terrain through the use of traditional materials and modern energy-efficient technologies. The preservation of traditional elements in architecture, such as ivans and tented roofs, contributes to maintaining cultural identity. Innovation and sustainability are manifested through the application of innovative approaches to planning and construction, aimed at improving residents' quality of life and reducing environmental impact. The multifunctionality and flexibility of residential home spaces are oriented towards adapting to the diverse needs of residents, including open layouts and mobile partitions. The development of residential architecture is also accompanied by the

creation of quality public spaces that promote social integration and community development, making the architectural and planning structure of residential homes in Central Asia in the 21st century a reflection of a unique combination of deep traditions and innovative approaches, aimed at creating a sustainable and functional living environment.

Currently, the process of developing mountainous areas for residential construction has either halted or is progressing at a minimal pace due to a number of problems and limitations. The key factors slowing development include the geological features of the terrain, which require specific construction approaches and can significantly increase the cost of projects. Economic constraints also play a significant role, as high construction costs in challenging conditions make projects less attractive to investors and developers. Technological barriers are related to limited access to modern and mountain-adapted building materials and methods, reducing opportunities for innovative and sustainable development.

For instance, in cities of Kyrgyzstan such as Bishkek, Naryn, and Osh, although there is interest in developing mountainous terrain, this process is in its initial stages. A preference is given to individual construction of the foothill type, while more traditional mountain constructions are implemented very rarely. This is due to the lack of necessary infrastructure and engineering networks, as well as limited access to adequate construction technologies in these regions.

Despite the difficulties mentioned, examples of successful adaptation to mountainous terrain can be found in individual tourist complexes. These projects demonstrate the effective use of lightweight pile structures, which minimize impact on the environment and ecosystem and promote integration of buildings into the natural landscape.

**Conclusion.** The development of residential construction in mountainous areas requires a comprehensive approach, including not only overcoming the aforementioned problems but also developing new construction technologies adapted to local conditions. An important aspect is also the improvement of the regulatory framework and development of infrastructure to ensure access to modern building materials and technologies, which collectively will allow for more efficient use of the potential of mountain regions while preserving their ecological value and cultural heritage.

Thus, the study of architectural traditions and the formation of residential houses in Central Asia reveals a deep connection between historical heritage, climatic conditions, cultural practices, and socio-economic processes of the region. The analysis shows how centuries of accumulated experience in folk construction and adaptation to local conditions have formed unique architectural forms that reflect ethnic identity, cultural traditions, and residents' preferences. Modern construction, aimed at preserving and adapting these traditions to current conditions, faces a number of challenges, including the need to integrate modern technologies and materials while maintaining uniqueness and functionality of dwellings. The continuation of scientific research and the development of innovative architectural and construction approaches that consider both historical and contemporary needs contribute to the enrichment and development of housing construction in Central Asia, ensuring its sustainability, comfort, and cultural relevance.

Поступила: 20.03.24; рецензирована: 04.04.24; принята: 08.04.24.

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