

TOWN-PLANNING AND URBAN DESIGN STUDIES

Original article

UDC/УДК 728.2(479.24-25)

DOI: 10.24412/1998-4839-2023-3-168-181

Architecture of high-rise residential buildings in Baku: evolution, challenges and innovative solutions

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Abstract. This article explores the architectural and urban development of Baku, a historically evolving city, focusing on the planning and design of high-rise residential buildings. The study examines the evolution of Baku's architecture from the 1920s to 1930s, influenced by Russian and foreign architects, which played a pivotal role in shaping the city's current urban planning and architectural landscape. With modern societal developments and the need for efficient land use, there has been a significant rise in high-rise residential construction in Baku over the past decade. These structures, while complementing the existing low-rise housing, exhibit distinct features in both their exterior and interior spaces, influenced by contemporary demands such as social needs, technological advancements, and new construction materials. The economic factor has historically played a crucial role in the city's development, shaping the architectural planning, constructional aspects, and artistic solutions in housing development. Innovative designs for mass housing architecture, considering cultural, household, and commercial services, have been introduced by notable Azerbaijani architects.

The evolution of high-rise housing construction, from 5–7 storeys in the 1950s to 9–12 storeys in the 1960s and 1970s, raised concerns about service, engineering, and communication issues. Efforts to increase living space in the 1970s and 1980s led to the construction of large houses for dwelling purposes, impacting the city's architectural landscape. The article also examines the development of micro-cities on the outskirts of Baku, facing various challenges related to greenery and landscaping. Analytical investigations demonstrate the need for different planning methods due to the varying relief in different districts of Baku. The article highlights the evolving trends and the need to explore new types of living spaces with artistic aesthetic solutions, considering contemporary demands and individual needs. Emphasizing efficient land use, proper service and transport systems, and architectural integration with greenery, the article encourages exemplary design methods to create a comfortable living environment using modern technology and materials.

Keywords: architectural and urban development, landscaping, green areas, construction, district, multi-storey residential buildings in Baku

For citation: Eynullayeva M. Architecture of high-rise residential buildings in Baku: evolution, challenges and innovative solutions. Architecture and Modern Information Technologies, 2023, no.3(64), pp. 168–181. Available at:

https://marhi.ru/AMIT/2023/3kvart23/PDF/11_eynullayeva.pdf DOI: 10.24412/1998-4839-2023-3-168-181

ГРАДОСТРОИТЕЛЬСТВО И УРБАНИСТИКА

Научная статья

Архитектура многоэтажных жилых зданий в Баку: эволюция, вызовы и инновационные решения

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Аннотация. В статье рассматривается архитектурно-градостроительное развитие Баку – исторически развивающегося города, с особым акцентом на планировку и проектирование высотных жилых зданий. Исследование охватывает эволюцию архитектуры Баку с 1920-х до 1930-х годов, оказавшую значительное влияние русских и зарубежных архитекторов и на формирование современного градостроительного и архитектурного облика города. За последнее десятилетие в Баку наблюдается значительный рост высотного жилищного строительства в связи с современными требованиями общества и необходимостью эффективного землепользования. Эти новые здания дополняют существующее малоэтажное жилье и характеризуются особыми чертами внешнего и внутреннего пространства, отражающими социальные потребности, технологические достижения и использование новых строительных материалов. Экономический фактор также сыграл ключевую роль в развитии города, определяя архитектурно-планировочные, конструктивные и художественные решения в жилищной застройке. Известные азербайджанские архитекторы представили новаторские проекты архитектуры массового жилья, учитывающие культурные, бытовые и коммерческие услуги.

Эволюция высотного жилищного строительства, прошедшая от 5–7 этажей в 1950-х годах до 9–12 этажей в 1960-х и 1970-х годах, вызвала озабоченность вопросами обслуживания, инженерии и связи. В 1970-х и 1980-х годах усилия по увеличению жилой площади привели к строительству больших жилых домов, оказавших значительное влияние на архитектурный облик города. Статья также рассматривает развитие микрогородов на окраинах Баку, которые сталкиваются с различными проблемами, связанными с озеленением и благоустройством. Аналитические исследования показывают, что в различных районах Баку необходимы различные методы планировки, учитывая разный рельеф. Статья также обсуждает развивающиеся тенденции и необходимость изучения новых типов жилых помещений с художественными эстетическими решениями, отвечающими современным требованиям и индивидуальным потребностям. Акцент делается на эффективном использовании земли, обслуживающих и транспортных системах, а также архитектурной интеграции с зелеными насаждениями, поощряя образцовые методы проектирования для создания комфортной среды обитания с использованием современных технологий и материалов.

Ключевые слова: архитектурно-градостроительное развитие, благоустройство, зеленые зоны, строительство, район, многоэтажные жилые здания в Баку

Для цитирования: Эйнуллаева М. Архитектура многоэтажных жилых зданий в Баку: эволюция, вызовы и инновационные решения // Architecture and Modern Information Technologies. 2023. №3(64). С. 168–181. URL:

https://marhi.ru/AMIT/2023/3kvart23/PDF/11_eynullayeva.pdf DOI: 10.24412/1998-4839-2023-3-168-181

Introduction

It is known that Baku, as an evolving historical city, has always been the subject of significant interest among Azerbaijani scholars, who have extensively studied its architectural and urban development in their research. Specifically, these studies have analyzed the architectural planning solutions of the settlement of Baku from various perspectives. Notably, the architecture of the 1920s to 1930s, influenced by Russian and foreign architects such as A. Ivanovsky, L. Ilyin, Y. Koslavski, Y. Plosko, and others, played a crucial role in shaping the current urban planning and architectural image of Baku.

However, it is essential to recognize that Baku's architecture has evolved at a different pace due to contemporary demands [2]. Therefore, it would be intriguing to examine the architectural solutions of existing high-rise residential buildings using a systematic approach within Baku's historically formed planning environment.

We understand that modern society's development and the efficient use of land necessitate large-scale construction of high-rise buildings in Baku. Over the past 10–15 years, Baku has witnessed significant growth in high-rise residential construction, both in the city center and on the western and eastern slopes of the Baku amphitheater. These high-rise structures complement the existing low-rise housing stock, and from a structural and architectural perspective, they do not diverge significantly. However, the changing demands of our time, such as evolving social needs, technological advancements in construction methods, and the utilization of new materials, contribute to distinct features in both their exterior and interior spaces.

A brief examination of historical stages reveals that the economic factor plays a significant role in the development of a country. The progress of each city is inevitably linked to the utilization of its surface and underground resources. For instance, by the end of the 19th century, increased investment in oil refining in Baku expedited its development significantly. This led to the construction of four to five-storey residential buildings on the city's outskirts, bringing a new layout to Baku's street system. Consequently, the economic factor is closely intertwined with the architectural-planning structure, constructional aspects, and artistic-architectural solutions in direct housing development.

However, it's worth noting that high-rise houses and buildings tend to have a one-sided architectural design, facing their facades towards the streets, which results from social imbalances (a trend that persists). These houses, forming smaller squares, create enclosed living environments, with their balconies and terraces facing the streets. Courts were added to the yards to regulate insulation and shelter in residential houses. These features not only serve residential areas but also contribute to interior lighting and communication within homes.

During that time, prominent Azerbaijani architects like M. Huseynov, Q. Majidov, and Q. Alizadeh introduced several innovative designs for mass housing architecture, considering the necessary cultural, household, and commercial services while considering local natural and climatic conditions and traditional motifs. Despite the trends, taller floors in individual squares played a dominant role. For instance, the architectural details and elements used in the 10-storey building constructed for oilmen at the southern border of the present Narimanov square were incorporated into a new design. Among residential constructions, two five-storey buildings designed for employees of the "Paris Communal" factory on Huseyn Javid Street stood out with their distinctive features, such as corner pillars reminiscent of deep portals, vertical groups of balconies, and others.

Subjects and methods

This article employs a systematic approach to examine the architectural solutions of high-rise residential buildings in Baku within the historically formed planning environment. The research is based on a comprehensive review of existing literature, historical records, and architectural plans, as well as an analysis of the city's evolving urban development.

To understand the historical context of Baku's architectural evolution, the study reviews the architectural planning solutions from the 1920s to 1930s, influenced by Russian and foreign architects, such as A. Ivanitsky, L. Ilyin, Y. Koslavski, I. Plosko, and others. Historical data and documents related to economic factors, population growth, and industrial development are considered to trace the city's transformation over time.

To assess the recent trends in high-rise construction, the study analyzes data from the past 30 years to identify the changes in design, construction techniques, and material diversity that have contributed to cost reductions in building high-rise structures. The research also examines how the advancements in technology and materials have influenced the architectural elements and facade designs of modern high-rise buildings [3].

To investigate the urban planning and placement of high-rise buildings, the study examines the existing city plans, particularly those focusing on compact settlement, green spaces, and

infrastructure development [4]. The research analyzes the planning and development of specific districts, such as Badamdar, Yeni Gunashli, and Bulbul, to understand the challenges and successes in each case.

The study also explores the principles of insulation and winding in high-rise buildings to understand how different architectural designs affect the distribution of natural light, ventilation, and overall comfort within the living spaces. Additionally, the research considers international practices and experiences in high-rise construction to draw insights into effective methods for integrating greenery, public service facilities, and transportation systems in large cities [5]. To analyze the impact of recent high-rise construction on Baku's urban landscape, the study examines various building forms, including home complexes, free alienation designs, and individually arranged buildings. It explores the unique architectural planning and indoor solutions of each building type [1].

The methodology incorporates a multidisciplinary approach, combining historical analysis, urban planning assessments, architectural investigations, and international case studies. By integrating these diverse perspectives, the article aims to provide a comprehensive understanding of the evolving trends and challenges in the construction and architecture of high-rise buildings in Baku.

Results and Discussion

In general, the construction of state-owned housing was limited due to the lack of construction equipment in the 1950s. As a result, construction mainly focused on public buildings, creating a high demand for mass housing construction. Consequently, in the early 1950s and early 1960s, the design process for dwelling houses, considering climate and environmental factors, became widespread. Some notable examples include the first floors located on H. Hajiyev Street and the five-storey residential buildings with significant showcases and other service facilities.

A 32-apartment residential complex, designed for employees of the Ministry of Oil Industry, was completed on Neftchilar Avenue. This development defined Baku's image, enhanced the street's appearance, and contributed to the revitalization of coastal buildings with its artistic-architectural design.

While the 1950s saw only a small amount of 5–7-storey dwelling house development, the 1960s and 1970s saw the advent of 9–12 level panel homes in the Baku settlement planning system [10]. However, it's important to note that this expansion led to various issues in the city's service, engineering, and communication systems. As a result, the matter of increasing the height of residential buildings in large cities became a social concern, shifting its focus towards living spaces. In the past, constructing single buildings (1940–1960) was not considered sufficient and feasible [6] (Fig. 1).

The construction of residential buildings with a semi-long and long-lasting "wall" form has led the city to lose its distinct image. Additionally, the Gulf's terrace relief was compromised by a large complex of buildings. Considering these issues, a specific approach was devised for the construction of high-rise houses in Baku.

During the 1970s and 1980s, a new construction stage emerged with the construction of large houses for dwelling purposes. The primary focus during this period was to "increase the living space," with artistic and architectural considerations taking a secondary role. Consequently, the extensive construction of housing using prefabricated elements from several French "Kamyu" housekeeping plants in Baku undermined the unique architectural experience and visual appearance. Although the structure of these buildings lacked spatial understanding, innovations in interior spaces were already evident.



Fig. 1. A five-storey building located in H. Javid street for the workers of the factory «Parizhskaya kommuna»

Micro-cities were mainly built on the outskirts of Baku, with high-rise houses on the western and eastern slopes resembling small courtyard-style buildings. However, greenery and landscaping were not adequately addressed [15]. Different approaches were explored for the development and renovation of Baku's housing construction. Analytical investigations indicate that the use of different planning methods can be justified due to the varied relief in the northwestern districts of Baku, including hills, plains, slopes, and mountains [19]. Meanwhile, most complex and micro-projects in the eastern settlement were constructed on a unilateral slope, facing the sea. This resulted in contrasting positions regarding the embodiment of residential houses on the eastern and western slopes of the Baku amphitheater.

The eastern part of residential houses in the western Yasamal district can be considered average, while the eastern part of the settlement provides a satisfactory living environment, benefiting from the shielding "gilavar" winds. The residential area has expanded to 226 hectares with a population of 82,000, owing to the addition of 6-9 microns to the 5th micro-district in the northwestern residential area, a development that began in the 1960s. The intensive development of this area was influenced by the concentration of some industrial enterprises.

Due to objective reasons, the population flow formed the quota of the district. As a result, the increase in the number of high-rise buildings and adequate service facilities confirmed the establishment of a new residential area [16]. A new phase of development is marked by the settlement of the Baku Amphitheater on both its east and west slopes, with an intriguing compositional solution made possible by the functional zoning division of the region. The most advanced technique then started to be used, and that is experimental design.

Since the 1980s, the general plan for the city of Baku has focused on improving building infrastructure, accommodating public facilities, and, in some cases, demolishing existing buildings

to provide essential services. However, due to the rapid increase in the housing stock and population density, new construction projects were planned for the suburbs of Baku (such as Bulbul, Yeni Guneshli, Badamdar, Bilajari, and others), and experimental projects were initiated. Unfortunately, these plans did not materialize as intended.

The construction of New Gunashli and Badamdar experienced significant development, while Bulbula's project faced formulation issues. The intensity of development in these areas was attributed to the presence of communication facilities and centralized service amenities. The housing construction in Badamdar initially included two-story "Fin" houses and later transitioned to middle-story gallery houses, providing suitable living space [11].

Yeni Gunashli's massif was mainly developed in areas with sharp relief, presenting opportunities for harmonious integration with the surrounding nature. The placement of commercial and household service facilities on the passages between residential buildings and lower floors of the buildings was more feasible here compared to Ahmedli massif. Additionally, landscaping efforts in Ahmedli settlement were more extensive, ensuring ecological balance in the eastern zone.

The expansion of housing construction in this region caused significant changes in the planning structure, affecting major highways and transport routes. The creation of new Heydar parks in various directions also added distinct features to the region.

The city's three-part plan (living - industrial - living) was influenced not only by the population growth and industrial zones but also by the favorable plan structure and relief, which provided good sanitary and hygienic conditions. Over time, the central coastal strip has gradually expanded along the coastline, and the planning structure of 13 settlements reflects the city's natural relief conditions, the direction of main highways, railway lines, and territorial distribution of residential areas.

During the reconstruction of the central district, smaller neighborhoods were combined to reduce densely packed transport routes and create a cohesive structure for housing complexes. Although the idea of enlarging the central planning area with the participation of four countries in the 1972 international competition was proposed, it was not realized due to various reasons.

By the end of the 1980s, although new housing construction was not widespread, existing buildings underwent certain modifications. There was a transition from 6–9-storey buildings to taller constructions of 12, 17, or 20 floors. The construction style preferred multi-occupancy buildings, and some structures were built along the building's red line or with free spaces on the street. The addition of one-blocked "skyscrapers" to the main streets contributed to their revival in appearance. In the 1980s, the galleries proposed the installation of staircases in their intermediate spaces to provide access to double-glazed buildings. These homes were constructed at the intersection of Azadliq Avenue (formerly Rev.) and Hasan Aliyev Street, while Friendship's buildings near Narimanov metro station on Press Avenue were designed with a rational constructive scheme, consisting of three blocks with nine floors, relatively angled to each other to maximize accommodation space [1] (fig. 2).

The 17-storey building, constructed in the 1980s in Tbilisi Prefecture, was a pioneering example of utilizing the sliding construction method. The building's elegant balcony elements and its tall floors were well-oriented towards the city's northern entrance. This high-rise structure was constructed using a monolithic reinforced concrete system with pillar sills [12].

In the subsequent years, several 16, 18, and 20-storey residential buildings were built based on projects proposed by the Baku and Chisinau Project Institutes. Most of these buildings were predominantly constructed using monolithic reinforced concrete molds. However, it should be noted that high-rise buildings were relatively few during this period, leading to inadequate housing availability. Urban planning was favored more in the 1970s and 1980s.



Fig. 2. Residential area of Akhmedli

The main development direction outlined in the 1987 plan for Baku faced significant challenges and disapproval, as the country underwent a radical transformation in its settlement character. By 1990, Azerbaijan's construction policies underwent a complete shift, adapting to the conditions of a market economy. This transformation was not coincidental; the country's improved socioeconomic status, coupled with Baku's emergence as a new strategic center in Europe, influenced a major shift in attitudes towards living spaces and significantly increased investments in construction.

Consequently, the construction of high-rise residential buildings proliferated across all administrative districts of Baku – central, western, eastern, northern, and southern areas [18]. These buildings were designed in various forms, including "home complexes" or "free alienation" designs (as seen in Press Avenue), with some being individually arranged and surrounding a central yard [17]. Each of these building types boasted unique architectural planning and indoor solutions.

During the early 1990s, a substantial residential area was developed in Baku, mainly comprising 5 to 9 micro-districts. Housing construction on the western slopes of the Yasamal district showcased distinct features in contrast to the previous micro-district plans, paying attention to the local relief. Notable characteristics of the residential buildings in this region include floor height, special projects for corner blocks, and staircases designed with double winding. Most of the rooms in these residential houses faced the western and eastern neighborhoods, while insulation and ventilation were regulated according to the local conditions. This planning approach resulted in more satisfactory architectural solutions for the Yasamal district, as it created favorable conditions for interior greenery and public catering facilities.

Over the years, the construction and architecture of high-rise buildings have undergone changes to meet fire safety, sanitary, and hygienic requirements. Notably, over the last 30 years, substantial improvements in the architecture of residential buildings have been observed due to advancements in design, material diversity, and construction techniques. These improvements have led to cost reductions in construction, even with increased floor heights in buildings. For instance, the cost per square meter of living space in a high-rise building, with similar planning solutions, is sometimes lower than that of a five-story building (around 3.5–4%) [13].

Although costs for technical equipment, such as passenger and freight elevators, increase with the number of floors, the increased housing stock, reduced land availability, and improved engineering networks balance development costs. Passenger elevators are considered essential elements in high-rise buildings and should be complemented by load elevators in the same space.

In the past, many tall buildings only had smaller passenger lifts, but in recent years, larger, faster load elevators have been implemented for equipment transportation.

Recent high-rise buildings in Baku demonstrate various floor planning approaches, affecting apartment arrangements, entrance door orientations, and overall planning forms. Some tall buildings incorporate various services, such as healthcare facilities and shopping malls, within their sub-floors. While this has positive aspects, it can also lead to some discomfort, as seen in buildings on highways like Tbilisi Avenue and Neftchilar Avenue, where access and traffic congestion become issues due to the proximity of service facilities.

High-rise buildings in Baku's central district have embraced advanced and technically sophisticated construction schemes, focusing on isolating walls from the carcass system. These "hanging" walls bear their loads while skillfully separating interior spaces. This design offers the advantage of sun protection, but in Baku's warm climate, the lack of double-sided winding might be considered a disadvantage. Nonetheless, emphasis is placed on efficient use of building materials in such structures.

The construction of high-rise buildings in large cities requires careful consideration of various factors. Comfortable living now extends beyond well-equipped apartments with technical communications. Residents seek a comfortable living environment with easy access to public services, good sanitary and hygienic conditions, and proximity to essential facilities such as education, workplaces, and leisure facilities. Well-planned transportation connections between residential areas and public services are of great social significance.

In historical cities like Baku, organizing greenery at both ground level and upper floors of high-rise buildings, based on foreign experiences, would be beneficial. Constructing residential buildings around closed yards or complexes, allowing for two-way winding of flats, natural lighting, noise isolation, comfortable well-being, and social communication, is essential [7]. Additionally, establishing effective links between service, transportation, and pedestrian systems significantly impacts the grouping and placement of homes, determining their level of comfort.

Recent trends in Baku have placed high-rise buildings along major transport lanes, which enhance the architectural-urban image of the highways but poses challenges in providing services to the population. Learning from the construction experiences of foreign countries can help address this issue. Elevated first floors on columns and using the ground for pedestrian movements, walking paths, and greenery, while placing facilities on the 2nd and 3rd floors in densely populated areas, especially in central settlements, may offer viable solutions.

In the bustling city of Baku, communication costs are high, necessitating a more compact settlement of housing construction. This results in a decrease in the area's density, allowing for more green spaces, improvements, and construction work. Global practice has shown that mixed-floor trends in construction have proven effective in large cities for various reasons. Considering the current condition of Baku, we believe that implementing mixed-paved construction in certain parts of the amphitheater on the western and eastern slopes will yield positive results. This approach can enhance the level of domestic and interior amenities while adhering to the principle of apartment ownership and creating good opportunities for different groups of flats. Additionally, interconnecting one-block high-rise buildings with intermediate 3-5-storey buildings, alongside sports facilities and green spaces, enhances the architectural appearance and artistic expression of the area, providing new dimensions in artistic design for mixed-floor constructions.

It's crucial to remember that the new type of high-rise residences have improvements that go beyond exterior modifications. Apartment interior planning incorporates important factors, including room prices, the concept of mutual accommodation, and interior improvements. Innovations in this aspect expand the range of apartment sizes, increasing the useful area from 80-85 m² to 200-220 m² and varying the size of rooms for different functions. This allows the creation of suitable microenvironments within the apartments' interior spaces and facilitates

periodic transformations of home appliances and equipment. The principles of improving the structure and interior space of high-rise buildings align with modern requirements and advancements in technology, construction, and modern building materials. Most of the innovations in high-rise construction are reflected in architectural elements and façade designs.

We emphasized that addressing insulation and winding issues is a crucial condition for grouping or isolating high-rise buildings. These requirements can influence the form and layout of housing. Consequently, the diversity of high-rise residential buildings will always be justified. For example, houses located along highways are characterized by limited orientation, preferring meridional planning, where windows open on only one side of the horizon [8]. On the other hand, two-sided distribution in most rooms can be achieved when windows are directed towards the south, east, or southeast.

In Baku, there are three types of residential buildings [9]:

- north-to-south orientation at 10-15°, allowing part of the rooms to be normally tempered;
- flats in houses with windows facing south, east, or southeast may have cooler rooms;
- north-south division is most suitable for the direction of high-rise buildings, where rooms are directed at a 30° angle to the meridian, balancing the facades of the houses with sun rays.

To mitigate direct sunlight in Baku, some buildings should be positioned in the south-east and kept close together to provide shade for each other. These buildings can be arranged in a linear manner or as individual elevations. However, considering Baku historic nature, it would be more appropriate to opt for individual buildings and employ selective reconstruction methods within its central planning area. This approach would enable the creation of green strips by disassembling certain nearby constructions. While the experience of incorporating green spaces in high-rise multifunctional dwellings from foreign countries demands considerable resources and advanced technology, implementing a similar approach in Baku soon could yield positive results.

In the construction of high-rise buildings, integrating parking and service facilities within the boundaries of the complex is highly advantageous. Firstly, it allows for free space dedicated to service facilities and parking, making these services easily accessible to residents. Secondly, these properties can be incorporated into the architectural design of buildings, bringing about visual and functional enhancements. Notably, the Sunny Park Gardenia residential complex in Istanbul and the "Koru Florya" residential complex serve as prominent examples of effective public service organization. In both complexes, high-rise buildings are strategically situated along highways with a linear plan [9].

The new tendencies observed in the planning of high-rise buildings in Baku (fig. 3) result in the following outcomes:

- properly organized service and transport systems allow for different spatial compositions in the grouping of high-rise buildings;
- in the city center of Baku, visual architectural compositions are used as elements that integrate with greenery, revitalizing the surrounding environment and enhancing the area's aesthetics. This approach also improves the microenvironment condition as the new buildings' facades are directed towards the streets, leading to a decline in air temperature in the yards and allowing the buildings to blend with the local natural space. A good example of this is seen in residential areas of Istanbul, such as Şişli and Ege, where intensive construction is combined with open spaces, natural greenery, and sea views, providing a comfortable living environment. Additionally, terraced buildings in Kartal and the Bosphorus City residential complex in Küçükçekmece, both in Istanbul, promote a healthy lifestyle in harmony with the environment.

Considering the ongoing development of Baku, there is still a great need to explore new types of living spaces with appropriate artistic and aesthetic solutions, incorporating individual yards for houses. Transitioning to an exemplary design method would facilitate the implementation of the improvements and enable the design of new housing that caters to customers' personal and social needs [14]. Only in such cases can a comfortable living environment be created, taking advantage of modern technology and new materials.



Fig. 3. Current residential buildings of Baku of last 20 years

Conclusion

The architectural and urban development of Baku has been a subject of great interest for Azerbaijani scholars, who have extensively studied its evolution over the years. From the architectural planning solutions of the 1920s to 1930s, influenced by Russian and foreign architects, to the contemporary high-rise residential buildings, Baku's urban landscape has evolved to meet the changing demands of modern society.

Over the past few decades, Baku has witnessed significant growth in high-rise residential construction, driven by the need for efficient land use and the increasing demands of a growing population. The architectural solutions of these high-rise buildings have evolved, incorporating technological advancements, new materials, and innovative design elements to cater to contemporary social needs.

The historical stages of development reveal the significant influence of economic factors on Baku's architectural landscape. The city's progress has been closely linked to the utilization of its resources, with industrial growth leading to the construction of new housing stock and shaping the city's street system. As the economy and social needs evolved, so did the architectural and planning solutions of Baku's residential buildings.

The construction of high-rise buildings in Baku has been marked by various stages, each reflecting the prevailing socio-economic conditions of the time. From the construction of five-story buildings in the 1950s to the emergence of 9-12 floor high-rise panel houses in the 1960s and 1970s, and the subsequent proliferation of high-rise residential buildings in the 1990s, each period brought its unique challenges and opportunities.

Despite the increasing number of high-rise buildings, the architectural design often remained one-sided, facing the streets, which affected the visual appearance and architectural experience of the city. Addressing the architectural and planning challenges of high-rise construction required innovative approaches that considered climatic conditions, relief, and the need for green spaces and service facilities.

Architecture, design, and building methods have all advanced with Baku's high-rise development. Technology developments and a wider variety of materials have reduced costs, making high-rise

structures more accessible while having higher floor heights. The integration of green areas and public services inside the confines of the structures, however, as well as technical apparatus, access to transit, and these factors all need to be carefully taken into account.

As Baku continues to develop, it is essential to balance the need for high-rise buildings with the preservation of its historical and cultural identity. Integrating greenery, architectural elements, and interior spaces effectively can contribute to creating a comfortable living environment that meets the contemporary demands of the population.

In conclusion, the architectural solutions of high-rise residential buildings in Baku reflect the city's ever-changing socio-economic landscape. While progress has been made in terms of design and construction techniques, there is a need to strike a balance between modern development and the preservation of Baku's unique identity. By carefully considering climatic conditions, relief, and urban planning principles, Baku can continue to evolve as a vibrant and thriving city while retaining its rich architectural heritage.

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