Architecture and Planning of Residential Complexes in Kazakhstan

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Abstract

Planning and designing of urban residential complexes with all the functions in beautiful environments responding to the local customs is a difficult task. In Kazakhstan, as a result of the growth of the economy, the improvement of needs, and the transformations of socio-economic functions, housing is changing fast. Urban residents now make complex and higher demands related to the environments of residential areas.

In this context, this article examines the history of the design of residential construction in Northern Kazakhstan in relation to the stages of urban developments. The research analyzes the four most popular residential areas of the city of Astana, built at the beginning of the 21st century.

A variety of research methods were employed such as historical method, analysis method, comparative method, and method of interpretation. The study revealed that the level of development of residential areas has a direct impact on the living environment of residents, and depends on whether their planning is reasonable.

In summary, the reconstruction of old residential areas in Astana is a major livelihood project, which can not only effectively improve the living conditions environment of residents, but also improve urban support facilities and promote the healthy development of urban construction.

Keywords: residential area, environment, urban development stages, general plan, housing structure, planning concept.

Introduction

The development of contemporary architecture in Kazakhstan is lagging behind; it has evolved in the style of architecture. Kazakhstan has developing economy, with its society and the living standards of people improving (Jakubik et al., 2017). Urbanization is fast accelerating and poses a growing number of problems for planning and the design of residential areas. However, if appropriately approached, urban construction and development can effectively reduce the consumption of resources and funds as well as the environmental pollution caused by the reconstruction of residential buildings (Mysak et al., 2017). That includes the rational

renovation of old residential areas, which is a significant way of exploiting urban areas (Bessimbayev et al., 2022). This paper examines the planning architectural reconstruction in old areas. It explores the major ideas and methods of planning and designing the residential environments in Kazakhstan.

With the recent the rapid population increase and the urban developments, a large number of intensive and diversified urban complexes have begun to emerge. However, the construction of residential areas poses complex planning and design issues, such as a lack of any distinctive architectural style, ill-conceived residential layouts, inappropriate community functions, lack of facilities, stereotyped models, and 'unsafe living environments", which significantly affect the quality of living. undeniably, the amorphic and uncontrolled construction often results in negative consequences for urban spaces, such as large areas of leftover space close to linear infrastructure (Stepanchuk et al., 2020).

This issue is known as "community division" at the area scale, which can lead to inaccessible and uninhabited sections of public spaces, as well as the shutting down of active tourist networks (Shahini et al., 2022). This article examines the characteristics of residential and other functions in urban complexes and analyses the independence and confidentiality of housing according to different characteristics.

The aim of this paper is to examine the city of Astana in detail, which plays an important role in the integration of contemporary architecture, the implementation of international architectural technologies, the absorption of Western culture, the inheritance of ancient architectural heritage and prediction of architectural development.

Review of Literature

According to S. Ziyadin et al. (2018), the planning of residential complexes plays a crucial role in addressing the changing needs of housing and urbanization. As cities grow and evolve, it becomes essential to design residential complexes that are responsive to the diverse requirements of residents, while also considering broader urbanization trends and sustainability concerns. A.M. Berestovoi et al. (2020) consider that planning residential complexes near public transportation hubs and prioritizing pedestrian and cycling infrastructure enables convenient mobility and reduces reliance on private vehicles. Transit-oriented development principles help create vibrant, compact communities that offer seamless connectivity to jobs, services, and recreational opportunities (Danchuk et al., 2021).

T. Somogyi and R. Nagy (2022) convince that incorporating sustainable design principles into the planning of residential complexes addresses the changing needs for environmentally friendly and energy-efficient housing options. This includes integrating renewable energy sources, implementing energy-efficient building practices, using sustainable materials, and incorporating green spaces. Providing ample green spaces, parks, and urban gardens not only enhances the quality of life for residents but also contributes to urban biodiversity and mitigates the heat island effect (Komilova et al., 2021).

To address changing housing needs over time, residential complexes should be designed with flexibility and adaptability in mind (Shults et al., 2022). According to B. Tultayev et al. (2017), this involves incorporating modular or flexible floor plans that can accommodate changing family sizes or needs. Designing spaces that can be easily modified or repurposed allows for future adaptability without extensive renovations, ensuring that the complex remains relevant and functional as societal needs evolve. M.A. Aitkazina et al. (2019) assert that considering the impacts of climate change and natural disasters is crucial in the planning of residential complexes. Incorporating resilient design features, such as flood-resistant construction, improved drainage systems, and reinforced structures, helps mitigate risks and ensures the safety of residents. Implementing disaster preparedness plans, including evacuation routes and emergency facilities, further enhances the resilience of the complex in the face of unforeseen events.

The general situation of Kazakhstan and its architecture can be described by three major stages of development in terms of the planning concepts applied in housing: pre-industrial, industrial and post-industrial periods. They begin with two aspects: the inheritance and

transformation of traditional and the Western architecture. In contrast to the developments in the Western countries however, the development of the theory of housing environment planning in Kazakhstan is relatively underdeveloped. In fact, public planning of residential areas still follows functionalism (Mamedov, 2020).

The problems of residential environments in terms of modern urban planning are widely considered in the works of some Kazakh authors. Auzhanov (2000), Glaudinova (1999), and Kornilov (2003) describe developmental aspects of urban development, and the aesthetic issues of designing and planning. They also provide a brief overview of the history of architectural and planning formations of residential environments of Kazakhstan. Montgomery (2019) has also discussed the impact of urban structure on the ecological environment and the behavior of the population. However, these authors focus mainly to social, historical or architectural aspects.

Donchenko and Samoilov (2020a; 2020b) also discuss the stylistic innovations in the architecture of the capital cities of Kazakhstan, as well as the features of the formation of the first metropolitan ensembles of the city. They describe in detail the development of the historical appearance of the city of Astana in terms of architectural landmarks. T Mamedov (2020) discuss the majority of the scientific works in this area. He has paid particular attention to the study of historical urban complexes. He classifies the organizational characteristics between residential and other functions in urban complexes into functional, spatial and movement organisation. From these three points of view, he analyses the synergy, independence and confidentiality between multifunctional complexes and their functions under various characteristics and offers a solution as to how to reduce the interference of the residential space. In addition, it was concluded that the planning of residential complexes should adapt to the changing needs of housing and urbanization.

Research Methods

The study uses and analyses several data on the residential complexes of the city of Astana. Four of the most popular residential areas built at the beginning of the 21st century were selected as material for the research.

Given the focus on housing developments built in the early 21st century, a historical research method was used to understand the context, motivations, and influences that shaped design and planning decisions during the period. The analysis method was used in the study of specific residential complexes to understand their planning processes, design features, and how they meet needs. The analysis method provided an understanding of the design intent, regulatory requirements, and policy frameworks that influenced the architecture and planning of the complexes.

The comparative method was applied in the study of the existing literature in order to gain insight into the historical aspects of the architecture and planning of residential complexes and their components. By studying the scientific works of various authors, the methods of increasing the independence of housing functions in the design were considered, and proposals for the development and construction of urban complexes were put forward. In addition, this method made it possible to identify similarities, differences, and regularities between complexes and draw conclusions about the trends in the development of residential architecture and planning. This helped create a theoretical framework and identify key concepts and trends.

The method of interpretation was used to identify the concept, development, and evolution of the city of Astana, hierarchical division, and the main characteristics of the "urbanization" of urban complexes. It also summarized the role, obstacles, organizational structure, pedestrian flow line of traffic management, traffic flow line, and the impact of traffic at the entrance to the city. It is worth noting that the information obtained during this study can be used in the future to develop the urban environment of the country, as well as to create well-designed and well-built places that benefit people and communities.

Findings

According to Artykbaev (2007) in the pre-industrial period in Northern Kazakhstan, there was traditional housing, which was divided into several types: nomadic or collapsible, mobile and stationary. Collapsible and nomadic types of dwellings were built from felt and were common among the nomadic settlements of vast steppes in Kazakhstan, Altai, Central Asia and Mongolia. The main element of the nomads' living unit was the yurt (from the 12th century to the beginning of the 19th century), consisting of wood and felt, had frame type, a collapsible and sliding base, which was connected by separate sections of gratings. With the emergence of the settled farming culture of the Kazakh peoples, stationary dwellings appeared (from the 15th century to the middle of the 19th century). This type includes: dugouts, semi-dugouts and ground forms of residential premises such as toshala or shoshala, duken and others. The location of the dwellings of settled tribes was determined by economic interests: such settlements were built near the banks of rivers and consisted of 10-15 meters semi-dugouts and recesses up to 1-1.5 meters, covered with pitched roofs, connected by corridors with cattle pens attached to them.

By the beginning of the 20th century, the structure of the traditional Kazakh residential building had undergone significant changes. The transition of the population to a new way of life has led to adaptation to the environment, the landscape of the territory and a variety of natural and climatic conditions. As a result, all these enriched architectural forms, planning and functional concepts, expanded construction techniques, and formed the further development of traditional dwellings. In the industrial period (60s-70s of the last century) on the territory of the city of Astana, the main types of buildings were low-rise apartment buildings, designed taking into account the standards of the wind condition and solar exposure. After another construction boom and population growth, the city was in need of the construction of multi-storey residential complexes. Thus, a complex consisting of 9-12-storey buildings appeared along Respublika Avenue. In this period, the construction of more than 50 multi-storey residential buildings was completed (Mamedov, 2020).

The architecture of residential complexes of the 90s is distinguished by professional elaboration, portability, individuality, decent service and an increase in the number of storeys. At the end of 1997, the Government of the Republic of Kazakhstan decided to move the capital from Almaty to Akmola (the old name of Astana). One of the symbols of the new capital is the residential complex “Svechki” (1998), located along the Bogenbai Batyr Avenue.

In 2006, a 22-storey Residential Complex “Sezam” was built, located in the city center on the Kenesary Street. This complex has retail outlets on the first and second floors and a parking lot on the ground floor with an exploitable roof and a courtyard, where pedestrian connections, playgrounds with greenery and fire-fighting passage are provided. The facade architecture of the two new buildings represents the culture of the Kazakh people, their history and traditions. Gradually, latest technologies in design and artistic direction began to replace the methods and techniques of the past.

The construction of the intellectual Residential Complex “Highvill”, in high-tech style, on the A. Baitursynov Street, became a significant event of the first decade of the 21st century. The complex, designed with the participation of Kazakhstani specialists, set a high standard of architectural quality for the future (Mamedov, 2020). Residential Complex “Green Quarter” is located in one of the most picturesque places on the left bank of the city of Astana, and consists of 13 multi-storey buildings, three of which are commercial, and the rest are intended for housing. The design of the complex consists of a well-reinforced monolithic frame filled with a gas block. In order to improve protection from sunlight and achieve decent energy saving, German Schuco stained-glass windows with American glass were used in the arrangement of the facade. Such minimalist and elegant houses can be seen in Berlin, Warsaw, Sydney and Stockholm (“Green Quarter” in Astana – a new standard of housing in Kazakhstan, 2017).

When planning and constructing a high-rise building, it is necessary to take various laws, regulations, guidelines and standards into account. Conventional technical building codes, and generally applicable technical rules, must be considered and observed in addition to

standards and regulations. It is important to note that each country has its own rules and guidelines governing the construction of high-rise buildings, all of which are similar in content with some distinctions depending on the local circumstances. The design of high-rise residential and public buildings in Kazakhstan must be constructed in accordance with the requirements, taking the additional features outlined in the following standards into consideration:

1. Building Norms of the Republic of Kazakhstan 3.02-01-2018 "Buildings Residential Multi-apartment" (2018).
2. Building Norms and Rules of the Republic of Kazakhstan 1.01-01-2001 "Codes in Field of Architecture, Urbanization and Construction" (2001).

The placement of high-rise residential and public buildings on the territory of a neighbourhood is determined by the design concept based on urban planning conditions and restrictions on the land plot, taking into account the requirements:

1. Building Norms and Rules of the Republic of Kazakhstan 2.02-05-2009 "Fire Safety of Buildings and Structures" (2009).
2. Code of Rules of the Republic of Kazakhstan 3.03-101-2013 "Roads" (2013).
3. Sanitary rules and regulations 42-128-4690-88 "Sanitary Regulations of Maintenance of Populated Areas" (1988).

Architectural and planning concepts must be conceptualized in accordance with the Code of Rules of the Republic of Kazakhstan 3.02-107-2014 "Public Buildings and Structures" (2014). These rules are intended primarily to ensure personal safety, and then to protect the building from damage and defects. In addition to the requirements imposed by government agencies, there are also requirements imposed by insurance companies in order to provide better protection to property. Usually, the necessary structural analysis is enough for building sustainability regulations. In addition to demonstrating the intrinsic structural strength of the structure and the safe weight transfer on the ground, stability calculations must also include possible deformation due to thermal expansion, wind and temporary loads, or dead weight. This is closely related to demonstrating the safety of the structure. For instance, one should take steps in order to limit the inevitable concrete cracks. Regulations governing the social aspects and protection of the area around the high-rise buildings are designed primarily to prevent any indirect risk or threat to people. These regulations may concern planning aspects such as the minimum distance between a high-rise building and neighboring buildings, or these may be the rules defining the maximum acceptable impact that a building can have on the environment.

Since the introduction of progressive design concepts, the transport planning of residential areas has also been developed. Traditional planning can no longer satisfy people's needs. In the traffic planning of a residential area, a reasonable vehicular traffic system should be established, and measures such as the scientific use of object restrictions, landscape management, and green separation should be used to maximise the distraction of people and vehicles in order to ensure safety (Almukasheva et al., 2020a). Specific operations include well-managed traffic flow, landscaping to separate sidewalks and vehicle lanes, and the installation of roadblocks and one-way lanes at intersections to limit vehicle speeds to ensure pedestrian safety and unimpeded movement (Yang et al., 2019). Traffic is an important component of the living environment and the skeleton of the structure of society. It determines the trajectory of the behavior of the inhabitants, arranges the order of spatial forms and describes the vivid scenes of the community life, thus forming a distinct character of the place (Yang et al., 2019).

Demographic increase and the growth of megalopolises mean that the world will have to accept more urban dwellers with limited resources, including Kazakhstan. This is a model of urban compaction that can be solved by building high-rise buildings, but it is by no means a good or final solution. The main thing is to have a reasonable mix, focusing on public spaces, considering both infrastructure and social relations. In multiple cities of Kazakhstan, the demands for economic power of luxury residential buildings and their impact on social cohesion are of concern (Hardy, 2020).

The high population density required for public transport and ecological life can be achieved with the help of multifunctional new projects, which have been discussed many times, for example, such residential complexes as "Alpamys", "Sat City", "Budapest", "Apple City"

and the "Bravo Family" (Hardy, 2020). These houses are of high value as they are built with a varied mix of shops, cafes and work spaces making streets safe, lively and peaceful. These houses have shown that projects built on the basis of traditional urbanism tend to generate higher sales and resale profits than traditional suburban sprawls. High-rise buildings that take the right time and space, if they are in line with the city's strategic planning framework and adopt sensible designs, can bring maximum merit to the environment.

In addition to functionality, the city needs attractiveness, and well-designed high-rise buildings allow the population to focus on work, delivering physical and mental pleasure. From a sustainable development point of view, there is no clear answer to this question, since the construction of high-rise buildings consumes more resources, but the transport infrastructure is also used more efficiently. In the coming years, as the conflict between population and resources intensifies, solutions for high-rise buildings may take on a different image, for instance, buildings could connect to each other at high altitude, and traditional buildings-at ground level and streets could be repeated on a different dimension. Technological innovations can also make taller buildings lighter, more efficient and more cost-effective (Almukasheva et al., 2020b).

Discussion

Since the analysis of the urban and architectural structure of the post-industrial heritage and assessments of its potential use often appear in the literature, the authors found out that scholars rarely discuss the redevelopment of post-industrial areas through housing projects. There were a lot of conclusions in publications, methods and tools that could support decision-making on the re-development of post-industrial territories in housing, taking into account the needs of the population (Lawrence, 1991; Hamdi, 1995; Habraken, 2021). Due to the specificity of dilapidated and degraded territories, any action taken is association with a high risk and requires a wide range of analyses, which, due to the mentioned specifics, are rarely done (Artykbaev, 2007; Vestergaard, 2019). Responsible exploitation of resources, viewed in terms of basic natural resources and cultural behavior, is seen from three distinct analytical perspectives:

1. Social, cultural – how life is organised at a certain period of time and how culture is expressed through the physical shape of the house and how the exploitation of the house is arranged.
2. Environment – how context, landscape, topography, settlement, climate affect the shape, organisation, choice of material and technique, necessity of daylight, temperature, air quality, and thus the quality of the indoor climate.
3. Economic – how the use of tangible and intangible resources, energy and transport affects the level of the ecological footprint based on time, and how the cost of these resources is related to time.

The possibility of comparing units from the two mentioned time frames is theoretical. Montgomery (2019) describes how cities can shape the thoughts and behavior of the people, and also considers the impact of urban structure on the ecological environment. The paper argues that when designing residential areas of cities, one should not focus upon the construction of houses and disregard the environment in order to improve the space (Montgomery, 2019). When designing residential construction, the ecological environment should be prioritised, adhere to the principle of "people-centricity", and be combined with actual local environmental requirements, transportation and housing system planning. This should provide sufficient sunlight and fresh air, clean water surfaces, make an attempt to expand green areas and improve the oxygen generating vegetation function. For the sake of urban construction, it is impossible to destroy the natural environment, as well as the ecological balance. When planning urban residential areas, it is necessary to have a concept of environmental protection and energy saving, apply the most of environmental and energy-saving materials, encourage residents to save water and install solar energy, and use harmless handling of household waste. A beautiful and pleasant living environment as an organic part of the urban environment can also improve the regional ecological quality of the city. At the same

time, creating a pleasant community living environment with technology, environmental protection, health and comfort, and unhindered information is also a vital part of building a harmonious and friendly society. In addition, the authors of the presented study believe that all this can be repeated for Kazakhstan.

In addition to this, Donchenko and Samoilov (2020a; 2020b), analyse stylistic innovations in the architecture of the capital cities of Kazakhstan. They consider examples of architectural objects that are significant for the formation of both a private and a general image of the modern capital. They also provide a description of innovations that determine the development of the historical appearance of the centers of the three capital cities of Kazakhstan. This paper shows that the development and historical patterns have significantly influenced the formation of stylistic diversity, each time experiencing another transformation. It is suggested that the most expressive concept to the city's appearance exists precisely in Astana, since religious buildings have always played a significant role in shaping the appearance of large cities.

Almukasheva et al. (2020b) articulates these and describe in detail the problems and role of colour, as well as colour trends in the design of the spatial image of the city. He addresses the positive and guiding impact of colour on human life in the urban environment and how best to solve the problems of innovation in planning residential complexes. Mamedov (2020) discusses the residential complexes from the point of view of the city, using the relevant theories of architecture, urban planning, system dynamics and public administration. It is equally important to analyse its connotation and comprehend the development of the complex, taking into account urban and architectural design, to reveal the development and mechanism of functioning. It is noted that the residential area is a vital part of the city. When planning, it is necessary to adapt measures to local conditions, according to the customs of local residents, living habits, historical and cultural environment, so as to rationally integrate the entire residential area into the local development environment.

Now, in the construction of urban residential areas, it is worth considering planning from a developmental point of view, carefully studying every detail, and making effort to do one’s best to plan and build a living environment with local characteristics and reasonable layout, all functions of society, convenient transportation in accordance with all regulations for city residents to live in a comfortable, calm and safe environment (Palumbo, 2018). After understanding the local human history through sufficient research based on the protection of cultural characteristics, the historical trees, streets and city walls should be preserved. From the point of view of the traditionally preserved architectural model, it is appropriate to add some monuments, halls, squares, corridors, etc. in various places of the residential area and build traditional iconic classical buildings functioning as a continuation of the historical and cultural environment (Mutaliev and Samoilov, 2020). Then after the completion of construction the residential area reflects the local human history and culture, and at the same time has a contemporary living environment that can meet the high requirements of urban residents for functional space and cultural atmosphere. Moreover, it is necessary to highlight the unique modern cultural quality of the residential area, emphasise the features of the integration of regional culture, historical culture, promote the formation and display of the cultural characteristics of the residential area.

Conclusions

This article summarises the strategy for improving the efficiency of public space in an urban complex. Therefore, the urban complex functions as a three-dimensional junction, adopts an open network structure, and accommodates various types of public places in space. The study revealed that the rational and scientific design of residential areas contributes to improving the living environment of residents and improving the quality of life. It is worth mentioning that economic factors are increasingly shaping the needs of the new millennium, and the construction industry is responding to them, seeking to speed up construction processes. High-rise buildings are of particular importance. Government, researchers and firms are directing their efforts globally to reduce the construction time of high-rise buildings.

It can also be concluded that in the development of urban mixed residential areas of Kazakhstan, heritage and built environment differ in architectural value, size and nature of design. It provides a natural environment for mixed use in terms of property, tangible and intangible business ventures. Its new identity, based upon the heritage of design, should provide a worthy alternative to the consumer city and growing inequality. To achieve this objective, urban policy must focus on the potential of the existing built environment, encourage mixed use and create new environments with local entrepreneurs, architects, designers and other active stakeholders.

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