ABSTRACT

of the dissertation on the topic:

Features of renovation of the housing stock in Kazakhstan, taking into account various structural schemes of buildings

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Relevance of the study. Over a long period of development of populated areas in the world, the territories of modern cities have completely built up, growing and turning into agglomerations. At the same time, the ongoing process of urbanization is forcing the creation of new residential units for the increasing number of urban populations. In the current situation, architects, urban planners and city authorities faced several challenges: firstly, to solve the problem of providing housing for urban residents; secondly, to create favorable living conditions for citizens that meet modern comfort and safety requirements.; The third task is to create a sustainable environment that guarantees the ecological and socio-economic balance of the urban area.

Modernist architects were first puzzled by a comprehensive solution to the problem of housing urban residents at the beginning of the 20th century. Housing in large cities in Europe, Asia and America was mainly represented by buildings up to three floors, less often up to five. Such a development could not accommodate an increasing number of residents, and its use meant only expanding the boundaries of cities, increasing transport and pedestrian paths, which would negatively affect the accessibility of urban facilities and the integrity of the entire environment. As a result, architects from different countries (adherents of the international style) came to the conclusion that increasing the density of buildings through the construction of multi-storey buildings was the only correct solution. At the same time, the modernist trend, together with scientific and technological progress, marked the beginning of industrial construction, which completely transformed the appearance of modern cities that we see today. Thus, in the CIS countries, Eastern Europe, the Far East, and to a lesser extent Western Europe and North America, urban residential areas are built up with mass-type housing characterized by monotony, monotony, similar planning solutions, and low comfort levels.

In the absence of vacant territories in cities and a growing urban population, as well as taking into account modern requirements for housing and construction, the issue of adapting existing buildings has become acute. The first solution is reconstruction and modernization, the second is demolition and construction of new housing. When assessing the quality of residential buildings, their physical and moral deterioration, a more relevant solution is the demolition of buildings and the construction of housing that meets all relevant requirements. However, an analysis of world practice shows the choice of architects and citizens in favor of renovation (renovation) of residential buildings while maintaining the spatial organization of the territory. Also, an important factor in favor of preserving and renovating existing urban

development is the diversity of the environment, which guarantees its sustainability and attractiveness.

A problematic situation

The situation in the CIS countries and in Kazakhstan, in particular, requires special attention. In Kazakhstan, mass construction as a phenomenon has become widespread. This is due to economic, political and social factors. Since the beginning of the last century, cities in Kazakhstan began to be built up with standard series of apartment buildings, which continued until the 1990s. Thus, the predominant buildings in modern cities of Kazakhstan are represented by typical series of residential buildings characterized by moral and physical deterioration. Despite attempts to improve the urban environment of cities through the development and implementation of design code, the buildings have retained the same qualities and parameters. It is necessary to understand that the problem of typical buildings lies not only in the visual qualities of buildings (facade elements, color, texture of finishing materials), but primarily in spatial and planning features. Therefore, to change these parameters, an analysis of each building is required, followed by the identification of possible adaptation options.

Issue status

The issue of renovation of multi-family residential buildings with varying degrees of moral and physical deterioration requires an interdisciplinary approach, namely, determining the parameters of housing comfort, physical and mental health of residents. **Physical comfort** in the home is deeply studied in the works of V. Litskevich, Y. Gubernsky, M. Myagkov, and L. Konova. In the middle of the last century, Heidegger M. began to rethink the concept of "housing." in his work "Building, dwelling, thinking". This work is the basis for reflections on the characteristics of the dwelling, its significance for the person living in it. Taking into account the fact that a modern dwelling is an apartment or an apartment building located in a populated area or an urbanized environment, it is important to note the contribution of Relph E. The author reveals the concept of "place" as a unique and unrepeatable space that disappears over time in modern cities with typical and similar buildings. In architectural science, housing problems are not considered as parameters of living space, but extend to the human environment, to the process of vital activity. Jacobs J. laid the **foundations of modern urbanism**, exposing the modernist approach to planning and urban planning. Subsequently, a number of scientists and architectural practitioners devoted their work to the **principles of designing a healthy environment** for humans. For example, Appleyard D., Lintell M., Jacobs A., Lyle J., McHarg I., Mumford L., Newman O., Nolen J., Duany A., Speck J., continuing and revealing the ideas of Jacobs J., identified common criteria for a healthy living environment. It is worth highlighting the works of Gehl J., as the author has developed a model for determining the sustainability and comfort of a residential environment based on human needs. In general, all of the above works formed the basis of the Charter of New Urbanism.

Housing problems are directly related to **general architectural problems**, in particular the modernist approach to design. In his writings, Alexander C. clearly designates the properties of architecture based on the objects of the natural environment. These properties provide adaptability to architecture and a positive

human perception. The fundamental properties identified by the author are confirmed in the research of Salingaros N. Therefore, when designing such a type of object as housing, the above-mentioned properties cannot be ignored.

Works on **psychology and neurophysiology** stand apart in research on the architecture of the home. The issues of the influence of the anthropogenic environment on humans have been deeply studied in the works of: Barros P., Fat L., Garcia L., Slovic A., Thomopoulos N., de Sa T. H., Mindell J., Clark C., Freeman H., Fujiwara T., Michikawa T., Suzuki K., Takebayashi T., Yamagata Z., Gifford R., Ellard C., Larcombe D., van Etten E., Logan A., Prescott S., Horwitz P., Oda M., Taniguchi K., Wen M., Higurashi M., Steiner F. At the same time, special attention is paid to the problems of living in apartments in multi-storey complexes. The above-mentioned authors clearly define the correlation between a person's mental health and the architecture of a home.

Scientific works are devoted **directly to the topic of building improvement** and restoration: Blesinger, D., Krawczyk, D., Linnebacher, F., Motzko, C., Nowak, P., Rosłon, J., Sobieraj, J., Steinberg F., Chro Ali Hama Radha, Chan, Rebecca C., Roberts P. It should be noted that the authors use different terms to describe the process of restoration and updating. In this way, the following concepts can be distinguished: gentrification, revitalization, modernization, reconstruction, renovation, etc. All of these definitions have their own specifics, but are generally similar in meaning.

Methods of reconstruction and renovation of residential buildings in various natural and climatic conditions, urban planning situations are considered in the research of: Jaksch S., Kuusk K., Pihelo P., Kalamees T., Bogdanovich I., Mitkovich P., Woodman E., Leshchenko N., Tsymbalova T., Korjenic A., Klarić S., Phuong D., Malevich S., Romanova L., Pukhkal V., Murgul V., Garifullin M., Meerovich M., Frantseva Yu., Devyataeva G.

The issues of reconstruction of standard series of residential buildings built during the Soviet period have been studied in depth in the research of: Bakhmutov Y. N. Y. Berzhinsky. E. Matveev. T. Asafova. V. Kasyanov. K. Kiyanenko. K. Markova. I. Susoev. S. Ovsyannikov. A. Ovsyannikova. O. Razumova. A. Denisenko. I. Cherkashina. I. Chuvilova. V. Kravchenko. These authors consider the reconstruction techniques of the most common series of residential buildings and the technology of reconstruction work.

In Kazakhstan, **the typology of residential buildings** has been studied in the works of: B. Glaudinov, M. Seidalin, A. Karpykov, B. Kuspangaliev, A. Saduakas, D. Adilova. **The specifics of the modernization** of the housing stock of Kazakhstan are reflected in the works of Bayramukov S., Dolaeva Z., Ryspekova M., Timoshina T., Rakhimzhanova N., Musabaev T., Karibaeva A., Tkach O., Shalbolova U., Zeynolla Z., Baykin A., Danilov V., Danilova M., Mardanov A., Baybosynova A., Reva M., Maulenova G., Barsukova O., Turlybaev A. **Methods of reconstruction of some typical series** of residential buildings in Kazakhstan have been studied in the research of: Murzabayeva K., Lapshina E., Tuyakaeva A., Spivak A., Turganbayeva L.

Despite the study of the topic of housing architecture, the problem of renovation of residential buildings in Kazakhstan has not yet been solved. The impact of housing modernization on the country's economy and its advantages over demolition have been

well studied. At the same time, the works devoted to the renovation of residential buildings are exclusively descriptive, without proper study of individual types of residential buildings, their architectural and planning characteristics, their connection with the urban context and the necessary adaptation measures.

The purpose of the dissertation is to reveal the patterns of decision-making in the renovation of multi-apartment residential buildings, to develop scientifically sound recommendations and proposals for the renovation of residential buildings in Kazakhstan.

The following **tasks** follow from the purpose of the dissertation:

- to identify the pattern of making design decisions during the renovation of apartment buildings;
- to identify the correlation between the structural scheme of residential buildings and the type of renovation used;
- classify the types of renovation of multi-family residential buildings;
- to analyze typical series of residential buildings in Kazakhstan with identification of renovation potential;
- to develop proposals for the renovation of standard series with a load-bearing wooden frame;
- develop proposals for the renovation of standard series with load-bearing brick walls;
- develop proposals for the renovation of standard series of large-panel residential buildings;
- to develop proposals for the renovation of standard series with a load-bearing reinforced concrete frame;
- to develop proposals for the renovation of standard series of monolithic reinforced concrete;
- to develop a model of housing renovation in the Republic of Kazakhstan.

Research methodology.

- collection of primary data and design materials;
- analysis of literary sources and statistical data;
- graphoanalytical method of urban planning situation research and building drawings;
- synthesis of the identified results in the analysis of primary data;
- a hermeneutic method for assessing the renovation potential of buildings.

Object of research: multi-family residential buildings of standard series in Kazakhstan.

Subject of the research: methods and principles of renovation and their relationship with the structural and planning features of residential buildings.

The leading hypothesis. Based on the structural schemes of multi-family residential buildings and the urban situation, it is possible to determine the potential for renovation of buildings and identify preferred methods of building regeneration.

The boundaries of research. This study is limited to typical series of residential buildings built in Kazakhstan in the period 1930-1990. The boundaries of the study are determined by the fact that typical buildings are predominant in the cities of the Republic of Kazakhstan and are widespread.

The scientific novelty of the work is as follows:

Multi-family apartment buildings of standard series in Kazakhstan were studied for the first time using the hermeneutic method, namely, assessing the quality of housing and the living environment using the results of research on neurophysiology, psychology, sociology, architecture and urban planning. The housing renovation model developed in this study is the basis for more narrow scientific research.

The developed decision-making methodology for the renovation of multi-family residential buildings takes into account the urban context, social and economic impact.

Practical significance of the thesis:

Based on the purpose and objectives of the study, this work is applicable for specific practical purposes. The typical series of residential buildings considered in the work are distributed throughout the territory of Kazakhstan. Therefore, this study is the basis for the development of renovation projects in the country. In addition, the series of houses described in the work have analogues in the CIS countries, which makes it possible for foreign architects and urban planners to use the research results for adaptation and application in the development of renovation projects for typical housing.

The results of this study can be applied in the development of educational programs on urban planning, urban renovation, housing design and the principles of sustainable architecture.

The scientific reliability of the provisions established in the work is justified by the following:

- successful examples of renovations from 14 countries of the world are analyzed, the results of which are published in scientific publications, articles and books;
- technical passports of standard series of residential buildings in Kazakhstan, obtained in the archive of NAO "State Corporation" "Government for Citizens", in Almaty, have been studied;
- The methodology of renovation decision-making is based on research in the fields of architecture, urban planning, economics, sociology, psychology and neurophysiology.

Approbation of the work.

- The results of the research work were used in the development of diploma renovation projects by students of OP 6B07301 "Architecture and Design".
- The main provisions of the research formed the basis of the lecture course "Renovation of urban spaces" for undergraduate students of OP 6B07307 "Architecture".
- Based on the results of the research, the course "Urban Housing Renovation" was developed in the format of the Coursera online platform, and recorded with the assistance of the Institute of Digital Technologies and Professional Development.
- Based on the results of the work, a textbook "Renovation of urban housing" was written for students of architectural universities.

The following provisions of the dissertation are submitted for defense:

- a model of renovation of apartment buildings in Kazakhstan;

- a model for determining the renovation potential of multi-family residential buildings in Kazakhstan;

- methodology of decision-making in the renovation of apartment buildings in Kazakhstan.

The applicant's personal contribution consists in analyzing primary data, summarizing research results, formulating research objectives, developing proposals and recommendations for the renovation of multi-family residential buildings in Kazakhstan.

The results of the study. The main results of the study were reported and discussed at seminars and scientific and practical conferences devoted to urban studies, architecture, planning, development and construction of urban infrastructure.

2 articles have been published on the topic of the dissertation in publications reviewed by the international databases Scopus and Web of Science:

1) Article "Rethinking soviet era mass housing in Kazakhstan" Spatium, (49), 42-50. DOI: https://doi.org/10.2298/SPAT221002001S , Architecture – 58% percentile, quartile – Q2.

2) Article "Correlation between Renovation Type and Structural Scheme of Residential Buildings" Civil Engineering and Architecture, 13(2), 1037 - 1043. DOI: https://doi.org/10.13189/cea.2025.130221 , in the direction of Architecture – 70% percentile, quartile – Q2.

1 article in a journal included in the list of publications recommended by the Control Committee of the Ministry of Education and Science of the Republic of Kazakhstan:

1) Article "Renovation and modernization issues of residential development in Kazakhstan" Bulletin of L.N. Gumilyov Eurasian National University Technical Science and Technology Series, 142(1), 44-55. https://doi.org/10.32523/2616-7263-2023-142-1-44-55

2 reports at international scientific conferences:

1) Planning adaptation of mass housing as an aspect of the culture of modernism and postmodernism // Proceedings of the international scientific conference "Dialogue of cultures of East and West through the prism of unity and diversity in the continuity and modernization of public consciousness: the Ancient world, the Middle Ages, modern and modern times": collection of scientific articles /ed. by V.N. Vdovin – Almaty: Institute of Oriental Studies named after R.B. Suleimenov of the Committee of Science of the Ministry of Education and Science of the Republic of Kazakhstan, 2020. – 31-37s.

2) The problem of forming a comfortable home in the multinational society of modern Kazakhstan // MATERIALS of the International Scientific and Methodological Journal "GLOBAL SCIENCE AND INNOVATIONS 2019: CENTRAL ASIA" No. 2(3). THE SERIES "CULTURAL STUDIES" - Nur-Sultan: 2019.

As well as 2 articles in other scientific publications:

1) Peculiarities of interpretation of the traditional way of life of the people of Kazakhstan in modern housing // Science and education today. 2019. №11 (46).

2) Evolution of the design of mass housing layouts in Kazakhstan // ELS. 2024. no. March.

The structure and scope of the work. The thesis is presented on 132 pages of typewritten text and consists of an Introduction, three sections, conclusions and suggestions, a list of sources used (126 titles), an Appendix and illustrative material representing a single whole with the text.

The first section examines the parameters of renovation of multi-family residential buildings in various urban planning, socio-economic situations. A review of the literature and published results on successful renovations in the world has been conducted, followed by a classification of renovation types. The current situation in the housing and communal services and housing stock of the Republic of Kazakhstan has been studied. The possibility of installing openings in walls and ceilings in seismic and non-seismic areas is considered.

The main conclusions of the first chapter:

1. The analysis revealed a global trend towards preserving existing buildings through comprehensive renovation of buildings. Scientifically based architectural solutions and a competent renovation strategy not only solve the problems of housing comfort, but at the same time ensure a variety of building types, preserving the authenticity of cities and their recognition.

2. The results of the study demonstrate the advantages of renovation over the demolition of buildings. The architectural approach aimed at the restoration and regeneration of residential areas makes it possible to improve the aesthetic qualities of the environment without disturbing the historical fabric of the city. Renovation should be especially considered for cities where the residential area is represented by typical residential buildings. The main conditions for making decisions on building renovation should be noted: consideration of the urban planning context, a sociological survey of residents and the architect's collaboration with residents, a historical analysis of the territory, as well as an economic calculation that determines the desired energy efficiency indicators.

3. Buildings with the same structural scheme have a common renovation potential, i.e. the possibility of applying certain architectural solutions. Therefore, the results of this study can be applied as generalized recommendations for the renovation of residential buildings. However, it is important to note that in each individual case, the renovation of residential buildings is unique in its urban planning characteristics, climatic and socio-economic conditions.

4. The classification of typical apartment buildings in Kazakhstan obtained during the study allows us to identify groups of buildings with similar characteristics for further analysis and identification of renovation potential. It is important to note that architectural renovation solutions should be developed for each house separately, taking into account the unique urban situation. Nevertheless, the typical nature of housing suggests the possibility of creating a generalized renovation model for each series and group of residential buildings. Thus, the model, which includes scientifically based proposals and recommendations for renovation, will accelerate the adoption of design decisions in each individual case.

5. Multi-apartment housing, differing in age, number of floors, and spatial solution, will significantly improve the morphology of buildings, bringing adaptability to the urban environment. Therefore, when conducting a full-scale survey of buildings and issuing an opinion on the condition of structures, it is necessary to consider all possible options for preserving the structure.

6. Renovation of buildings and complexes is a complex, interdisciplinary process that requires the participation of many parties. Taking into account various factors and the desires of the participating parties can lead to partial demolition, preservation, superstructures, extensions, redevelopments, increased volumes and other renovation options.

The second section analyzes the technical data sheets of standard series of apartment buildings. Drawings of structural schemes of buildings for frame-reed, brick, large-panel, frame-brick and monolithic series have been developed on the basis of technical data sheets.

The main conclusions of the second chapter:

1. Mass housing in Kazakhstan is represented by an extensive list of standard series of various construction periods, construction technologies, structural schemes, architectural and planning solutions, materials of load-bearing and enclosing structures. The beginning of standard design in Kazakhstan is associated with low-rise series of residential buildings made of wooden frames filled with reeds and a binder mixture. Later, mud brick buildings with load-bearing walls appeared. Due to the unfavorable seismic conditions in many regions of Kazakhstan, the structural schemes of residential buildings were developed in order to create a rigid connection between the load-bearing elements of buildings. Thus, buildings with load-bearing walls were replaced by panel buildings with a reinforced concrete frame, and later with a monolithic load-bearing structure.

2. It is necessary to highlight some features and indicators of standard series built in the period from the 1930s to the 1990s. All floors are residential, with the exception of special cases involving the conversion of apartments into public spaces. All houses have summer rooms in apartments, usually limited by the area of a unified balcony plate. The most common types of apartments are two- and three-bedroom, one- and four-bedroom apartments available in only two series.

3. The average area of one-room apartments varies from 30m2 to 43m2. The average area of two-room apartments varies from 40m2 to 62m2. The average area of three-bedroom apartments varies from 52m2 to 80m2. The average area of four-room apartments varies from 73m2 to 85m2. Starting from the 308 series, the average kitchen area is 7-8m2. The largest apartment areas are in the 308, 158 and VT series.

4. The studied technical data sheets of residential buildings demonstrate a tendency to maintain an isolated kitchen. In rare cases, the kitchen space is combined with the living room or other rooms. The entrance space in almost all series of residential buildings is limited by vertical communications and an entrance area to apartments. Only such series as E-147, 158 and monolithic residential buildings have additional spaces on the ground floors.

5. Typical series with load-bearing brick walls, such as 275 and 308 have angular variations that create a closed building. Such solutions are absent in large-panel

residential buildings and appear only in frame-brick ones. Despite the age of the buildings, this nuance should be taken into account when assessing the renovation potential of buildings.

In the third section, a model for the renovation of multi-family residential buildings, a model for determining the renovation potential of multi-family residential buildings, and a methodology for making design decisions during renovation are developed using the hermeneutic method. Based on the developed models, recommendations and corresponding renovation design schemes have been developed for all the studied standard series.

The main conclusions of the third chapter:

1. In conditions of mass residence of residents in apartments, it is necessary to pay attention to mental health and personalization of space. For a sense of belonging to a particular place, an apartment building and its surrounding area must have unique characteristics and properties.

2. The decision-making methodology for the renovation of residential buildings should take into account the social effect, the economic effect and the urban context.

3. The complexity of the renovation process lies in the number of participants and their impact on the result. Thus, a strategy based on the preliminary identification of relevant renovation solutions and then offering these solutions to interested parties is the most rational.

4. Multi-apartment housing in Kazakhstan is represented by a wide range of buildings built since 1930. Despite the differences in design, architectural and planning solutions, the majority of houses belong to the Soviet era of mass housing design, embodying a number of common characteristics.

4.1. First of all, standard housing design has led to the emergence of absolutely identical residential buildings, despite the different natural, regional, urban and social conditions. In other words, these apartment buildings contradict the principles of new urbanism and “reasonable growth.”

4.2. A critical problem is the insufficiently intensive use of territories and the lack of mixed use, which gives residential areas a depressive character. Since all floors are residential and poorly connected to their surroundings, social activity in residential buildings is limited only to short-term neighborly relations. The second obvious problem of this housing is the monotony of layouts and facades. The uniformity of apartment layouts and types correlates with social segregation, which also negatively affects life in the city. Thus, the concentration of people with the same income, social status, and family composition clearly isolates them from society and limits their opportunities for socialization.

4.3. In addition, the general characteristic of the housing in question is the lack of summer facilities and the chaotic glazing of existing balconies to compensate for this. The glazing of balconies is associated with cultural peculiarities, accompanying features of life and traditions of residents. Moreover, the problem is compounded by the facades of buildings, as noted above, associated with modernist architecture. Thus, faceless facades create a monotonous living environment and, consequently, have an adverse effect on the mental health of residents.

5. The planning decisions of apartments in the considered series of residential buildings cannot be the basis for renovation. Only a general analysis of the nature of the building, the availability of places of social interaction, and the intensity of the use of territories can form the basis for the development of a renovation project.

6. The most important aspect in decision-making methodology is the social effect. The correct assessment of the renovation results on the quality of life of the residents of the buildings and territories under consideration guarantees the expediency of the decisions taken.

6.1. Excluding residential buildings in disrepair, existing buildings should be preserved as much as possible, considering only partial demolition and reconstruction. This decision is aimed at preserving social ties and giving the territory a unique character.

6.2. The redevelopment of apartments should be aimed at creating the most diverse types of housing. This solution shapes the process of gentrification by offering living space to people with different social status, family composition, and income levels.

6.3. It is necessary to consider the superstructure for standard series of residential buildings, not exceeding six floors (for 4- and 5-storey buildings). This solution preserves the "connection with the earth", creates favorable conditions for the mental health of residents, especially for children.

Conclusion

As a result of the conducted research, a model of renovation of multi-family residential buildings, a model for determining the renovation potential and a methodology for decision-making during home renovation have been developed. The main conclusions and recommendations of the work are as follows.

1. The hypothesis about the possibility of determining the renovation potential of buildings based on the design schemes of multi-family residential buildings and the urban planning situation, with the identification of preferred methods of building regeneration, is confirmed.

2. The current state of the housing stock in Kazakhstan requires a rethink of the concept, strategy and goals of renovation. The concept of replacing typical apartment buildings with new residential complexes ignores a number of important problems: often modern buildings have the same architectural qualities as typical ones, therefore, the nature of the residential environment does not improve; demolition of an apartment building entails construction work for a long period, creating inconvenience for residents of all nearby territories; social ties and neighborhood relations are being disrupted, which is extremely important in creating a stable and safe environment; the demolition of several apartment buildings and the construction of new housing in their place is an approach that does not consider the creation of an ensemble and an integral composition of buildings.

3. Human well-being and quality of life should be a priority when making decisions about the environment. Using the example of this work, the deep problems of Kazakhstani multi-apartment housing as a product of Soviet modernism are revealed. The interdisciplinary approach used in this study allows us to move from direct criticism to possible solutions to the problems described here. Given the existing

social ties and the peculiarities of apartment buildings, the most practical solution is to renovate typical apartment buildings in the cities of Kazakhstan. Despite the many negative characteristics of the buildings under study, the potential opportunities make it possible to radically improve the living conditions in each apartment building and restore the environment in the cities of Kazakhstan. It is important to note that the above recommendations for improving living conditions are advisory in nature, and each individual case is unique. Moreover, in the field of design and construction, the various types of housing explored in the thesis have significant potential for adaptation and accommodation. Therefore, better alternatives are possible than maintaining the status quo or demolition and replacement.

4. An architect, a specialist engaged in the renovation of multi-family residential buildings, must be competent in conducting interdisciplinary research that takes into account issues of architecture, urban planning, structures, energy efficiency, physical and mental health of residents.

5. The revealed correlation between the structural scheme of the building and the type of renovation makes it possible to provide all participants in the process with possible options and to conduct a preliminary assessment of the results. Also important is the lack of specialists in the renovation of multi-family housing, therefore, the recommended types of renovation serve as the basis for decision-making.

6. The results of the analysis of the renovation of residential buildings indicate a tendency to preserve the existing fabric of the city, even in cities where typical buildings are less represented. This approach is driven by economic and environmental considerations. The removal of construction debris, the transfer of engineering infrastructure, and the provision of temporary housing, which accompanies the demolition of facilities, entail significant costs and lengthen the renovation process. At the same time, scientifically based renovation, which excludes the complete demolition of residential buildings, reduces financial costs, minimizes environmental impact and does not create problems related to the relocation of residents.

7. The fifteen typical series of residential buildings studied in this study provide a fairly complete picture of the evolution of typical housing construction in Kazakhstan. Residential buildings with a similar design scheme have similar planning solutions and apartment parameters. Therefore, the results of this work can be applied to the renovation of other standard series common in cities of Kazakhstan (e.g.. №207, 228, 230, 204, 1- 335A, 121, 97, 86, 1-105, 1-43, 1-310 and others).

8. In conditions of living in multi-apartment residential buildings, the assessment of the quality of housing should not be limited to a single apartment, but should extend to the entire apartment building and adjacent territories. The quality of the living environment is determined by the intensity of use of the territory, the presence of private and semi-private areas, and unique planning characteristics that meet the needs of residents of each individual house.

9. Ensuring the mental health of residents is a key element of the renovation model of apartment buildings. Mental health is affected by the following factors:

- the height of the accommodation (it is optimal to stay no higher than the 6th floor);
- the architecture of the building (the building must have an "organized

complexity", i.e. there is a hierarchy of scales in the architecture of an apartment building).

10. The developed theoretical model of renovation of apartment buildings is based on fundamental research in the field of architecture and urban planning, as well as empirical data from scientific papers on neurophysiology, psychology and mathematics. Thus, renovation takes into account the quality of the urban environment and the quality of life of residents.

11. The prospects for the development of renovation of standard series of residential buildings in Kazakhstan are related to the further improvement of an interdisciplinary approach aimed at a deep understanding of the qualities of a healthy residential environment as an integral part of the urban environment, and overcoming a narrowly focused view of the renovation process.