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"OUTDATED HOUSING STOCK" AS AN OBJECT OF COMPLEX RECONSTRUCTION PROGRAMS AND PROJECTS: CHALLENGES FOR UKRAINE

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Abstract: European countries have accumulated quite a wide experience in the reconstruction of the multiapartment housing stock of the first period of mass industrial construction. But, in Ukraine, where such a stock is about 18%, the solution to this problem has not been properly implemented. The reasons for the lag of Ukraine compared to other European countries in the reconstruction of outdated buildings are analysed. The paper describes the features of identified outdated residential buildings by typological groups, which are typical for Ukrainian cities – historical type buildings, barrack type buildings, "stalinka" type buildings, buildings of the first period of industrial housing construction ("khrushchevka" type panel and brick buildings). The features of their cluster spatial localization on a large city plan are also considered. Based on the European countries' wide experience, the authors analysed the features of solving such a problem for Ukrainian cities. In particular, the indicators of physical deterioration are too high (from 50% up to 70%), and there are a high privatized housing percentage (up to 92%) and a low population income, which does not allow to attract the residents' own funds for the complex preconstruction programs and projects realization. The study was carried out on the example of the city of Kyiv statistical data. The conclusions of the study can be useful mainly for post-Soviet countries and for other countries with similar socio-economic conditions.

Key Words: *outdated housing stock, objects of reconstruction, program for the reconstruction, methods of reconstruction.*

Introduction

Mass housing construction after the end of the World War II became the characteristic feature of the destroyed European cities' restoration. The best example of solving such a problem is the German Economic Miracle of 1949-1963, as part of a recovery plan for post-war Europe – the specially developed "European Recovery Program", also known as the "Marshall Plan" (Hogan 1987, Berger and Ritschl 1995, Bobrova 2011). There was a similar analogue in the former Soviet Union – the restoration of the national economy after the Second World War and the solution of the housing problem based on the development of industrial housing construction in the '50-'60s of the last century, or the "Housing Development Program in the USSR", approved by the decree of the Central Committee of the CPSU and the Council of Ministers of the USSR of July 31, 1957 (Iankovska and Bachynskyj 2013). In this context, the last three decades have been marked by a new challenge – the need for mass reconstruction of post-war housing construction buildings. The mission has been successfully solved in many countries of Western and Eastern Europe. Unfortunately, Ukraine lags significantly behind other countries on this issue. One of the important lessons of such an experience for Ukraine is "having a reliable program of economic reforms" (Sharov 2014).

On March 1, 2020, the Government of Ukraine presented the Infrastructure Development Program: "Big Construction" (Government Portal 2020). According to this program, it is

planned to build: 6.5 thousand km of roads by the end of 2021, 236 schools, 155 kindergartens, 212 multidisciplinary hospitals, and many other facilities, which will contribute to the creation of 150,000 new jobs. But, in addition to the construction and reconstruction of infrastructure facilities in Ukraine, there is another problem area that requires immediate government intervention – the reconstruction of the housing stock, which was mainly built after the war, and it has already exhausted its operational resource.

According to the State Statistics Service of Ukraine (2020), as of 01.01.2019, the total area of the country's housing stock, excluding the area of buildings within the temporarily occupied territories of Ukraine, amounted to 993.3 million m^2. At the same time, the housing stock of urban settlements represents 60.9% (599.4 million m^2) of the total amount (State Statistics Service of Ukraine 2020). Most of this housing stock – 62.4% or 374.0 million m^2 – was built before 1980 or more than 40 years ago: before the 1920s – 6.2%; in the 1950s – 8.9%; in the 1960s – 19.6%; in the 1970s – 27.7% (State Statistics Service of Ukraine 2018a). In fact, every fourth residential building – 28.5% or 105.6 million m^2 of the housing stock of urban settlements – was built in the period of the '50-'60s of the 20th century, known as the period of the first industrial housing construction, with a maximum service life up to 70 years. Unfortunately, over the past forty years, this housing stock has not undergone any massive reconstruction or even major repairs, which has led to its extremely poor technical condition, with high rates of physical deterioration and the moral aging of houses. The construction of a quarter of the country's housing stock in a rather short period of 15-20 years and the failure to carry out planned repairs have led to an extremely acute situation with the technical condition of these buildings, and the threat of their avalanche-like collapsing.

After the Second World War, in many European countries, blocks and neighbourhoods appeared, in which four and five-storey large-panel and brick residential buildings dominated. At the same time, large-panel construction prevailed in most countries (Hess et al. 2018). Already in the late 1960s, its share in new housing construction was as follows: 50% in France, 64% in Germany, 65% in Sweden, 70% in Finland (Kostetsky and Gurko 2003). In Ukraine and Russia, the share of large-panel housing construction in the total construction of that period was also up to 60% (Sunak et al. 2014). In the twentieth century, experiments with mass mid-rise panel buildings in the social sector of housing were carried out in many countries of the world. The reconstruction of the buildings of these blocks (neighbourhoods) in Western Europe began to be carried out in the '70s of the 20th century. During that period, considerable experience had been gained in the practice of the outdated housing stock reconstruction in Europe.

The development of settlements and the formation of their material infrastructure usually takes place at an uneven pace, experiencing either the rapid growth of construction activity, in other words, "building booms", or a long slowdown under the influence of economic, political, religious and social factors (Pleshkanovska and Savchenko 2019, Pleshkanovska and Savchenko 2020). The mass short-term increase in the residential buildings amount required, mainly, large free urban territories and, in turn, a wave-like city area increase. That led to the formation of a concentric urban spatial structure model, especially in former socialist countries (Hirt and Stanilov 2007).

The foreign experience of reconstruction

Each European country, while solving the problem of the need for major repairs, modernization or reconstruction of residential buildings, is faced with a number of features due to the socio-economic conditions of a particular historical period, the specifics of the legislative regulation of property issues, the regulatory and methodological framework for design, etc. However, in the experience of various countries, there are also common features of solving such an important issue as the reconstruction of the outdated housing stock and of residential buildings of the mass series of the first period of industrial housing construction.

In post-Soviet countries, the main discussions regarding the direction of such buildings' reconstruction are concentrated around two main dominants: to demolish or to reconstruct? The answer to this request was given by the calculations of specialists from Estonia, Poland, East Germany and Russia, according to which the reconstruction was cheaper than the construction of new houses. In East Germany, the cost of reconstruction of panel buildings, according to average estimates, was up to 30% of new construction costs (Tzonev 2013). Similar figures were obtained in Estonia: 29-33% (Tzonev 2013). At one time, the Polish Housing Institute developed a program according to which 22% of the country's housing stock should have been reconstructed (Regulska 1987). Under that program, the "limit of expediency" of the reconstruction works was determined by the works cost at 70% of new constructions. In the case when the cost of reconstruction works exceeded the threshold of 70%, those works were advisable only for architectural monuments buildings (Grabovoi and Kharitonov 2006). Those figures were confirmed by the practice of reconstruction of 5-storey buildings in Moscow. So, according to the Center for Housing and Communal Services of the Institute of Industrial Management of the Russian Academy of National Economy and Public Administration under the President of the Russian Federation, the cost of overhauling a building is 30% of the cost of constructing a similar building in terms of area and comfort level, and the reconstruction is not more than 80% (Volynskov 2016).

A combination of various methods of reconstruction of housing estates built after the World War II –maintenance and repair, demolition and partial demolition, combined with various mixed changes – is common in countries of Central and Eastern Europe (Marin and Chelcea 2018). The ambiguity of the attitude towards the future of mentioned areas is due to the significant volumes of this kind of housing, the socio-economic status of its inhabitants, and the relatively low cost of such a housing stock (Kovács et al. 2018).

The most wide-scale experience of demolition of shabby five-storey houses was gained in Russia and in Moscow, where a program for the complex reconstruction of the five-storey buildings of the first period of industrial housing construction areas was adopted and implemented until 2010. According to this program, it was planned to demolish 6 million m^2 of the total area of housing stock by 2010, including at least 700 thousand m^2 annually, to accomplish the new housing construction of at least 1 million m^2 per year for the purpose of relocating the residents of houses subject to demolition. Also, since 2001, it was envisaged to modernize the buildings not subject to demolition in the amount of at least 200 thousand m^2 of total area annually (Government of Moscow 1999). As of mid-2017, 1,675 houses with an area of 6.1 million m^2 had been demolished since the beginning of this program (Kostrikin 2017).

That experience introduced a new term into practice – *renovation of the housing stock*, which meant the partial or complete demolition of the housing stock (houses) with the subsequent preparation of the territory (site) for new construction on the freed territory (Mogzoev and Kuzmicheva 2017). In 2017, the Government of Moscow adopted the new "Program for the Housing Renovation in the City of Moscow", which provided for a new wave of demolition of 5175 houses or about 350 thousand apartments with about 1,6 million population (Government of Moscow 2017). It is expected to be the largest residents' resettlement (Luhn 2017). European countries – France, Germany, Denmark and Sweden, which solve the problem of reconstruction, at the present stage, of the urban environment formation according to the criteria of the sustainable development of settlements, pay primary attention to considering the social aspects, namely: the improvement of physical performance, correspondence to the needs of the elderly, improvement of energy efficiency, and social cohesion and area revitalization (Baek and Park 2012). Such an approach leads to the decision of demolition for the entire blocks of houses that have already undergone reconstruction (Bernt 2017, Charan 2018, Marin and Chelcea 2018).

In Ukraine, the mass construction of the post-war period was carried out in Kyiv (9.2 million m^2) and in the cities with highly developed industrial production, or in certain regions, as follows: Donetsk (15.7 million m^2), Lugansk (10.06 million m^2), Odessa (6.22 million m^2), Kharkiv (5.19 million m^2), and the Autonomous Republic of Crimea (3.03 million m^2). The total number of houses was about 25,000 units (State Statistics Service of Ukraine 2018b). Nowadays, when the technical condition of buildings is catastrophically worsening every year (Barashykov et al. 2000), houses are beginning to collapse, resulting in property damage and, worst of all, in human casualties. So that, a clear awareness of the urgent need to develop a system of immediate measures for the reconstruction of the buildings of the first industrial series and of the outdated housing stock, in general, has emerged in the country.

The issue of the reconstruction of mass housing of the first period of industrial housing construction in Ukraine has not arisen for the first time. Even during the period of development of mass housing construction projects and their implementation, it was clear to designers and builders that this was not the final solution to the housing problem. It was understood that the validity period of those projects, developed according to the minimum social standards, as well as housing construction based on low cost technology was not optimal. The real life of both projects and buildings according to the most optimistic expectations could not exceed 50-70 years. First of all, that period was determined on the basis of the “vitality” of the building structures, as well as the obvious low quality of the construction as a whole. Now, these residential buildings have already exhausted their moral and technical resources and they have come into conflict with the general practice of housing construction in the recent years. Also, inequality in the conditions of comfort between the different types of buildings by their date of construction was formed.

The first steps in the reconstruction of buildings can be dated to the beginning of the 80s of the 20th century. Architects and engineers proposed a number of projects aimed at improving the constructional qualities of houses, the facade architecture, and, to some extent, the layout of apartments. Attempts to reconstruct separate buildings began to be carried out as to implement those projects. The legislative consolidation of this approach to reconstruction was embodied in the State Program of Ukraine: “Reconstruction of residential buildings of the first mass series”, adopted in 1997 and designed for the period 1997-2010 (Cabinet of Ministers of Ukraine 1999). Its purpose was to maintain and update the existing housing stock built on the projects of the first mass series. A complex reconstruction of those buildings was to significantly increase the density of the housing stock, the level of improvement and arrangement of the built-up territories and consequently, the efficiency of their use. It was assumed that the average cost of reconstruction and modernization of residential buildings should be 53-77% of the cost of new construction (Bolshakov et al. 2005).

In the development of this program, a study on the possibility of reconstruction of five-storey residential buildings constructed in the ‘60s of the 20th century was carried out in 8 districts of the city of Kyiv (“KYIVPROEKTREKONSTRUKTSIIA” Design Institute 1996). According to the analysis, the report noted that by the time of its development, the normative deadlines for major repairs with a complete or partial reconstruction of the five-storey residential buildings of the first mass series had come. 879 residential buildings in 8 administrative districts of the city were examined. The city reconstruction program included residential buildings that allowed the superstructure of the attic floor, the attachment of parts (bay windows along the entire height of the building or only along the 1st floor), the extension of the ends, and the internal layout change. In addition, the examination identified the buildings that required major repairs, the buildings which did not need reconstruction, the buildings with a room height of more than 2.5 m, and with a good layout, separate toilets and bathrooms, as well as the buildings that were recommended for demolition (those that had irreversible deformations, transverse load-bearing walls, with showers combined with kitchens of 3-4 m^2, as a rule, etc.), and the layout of which could not be improved. The results of the examination indicated that,

as of 1996, 4% of the five-storey residential buildings of the first mass series were classified as subjects to demolition ("KYIVPROEKTREKONSTRUKTSIIA" Design Institute 1996).

In 2006, Ukraine adopted the law "On the complex reconstruction of the blocks (neighbourhoods) of outdated housing stock" (Law of Ukraine 2006). Ideologically, it was mainly based on the implementation model of the Moscow program (Government of Moscow 1999), and other Russian cities, using the so-called "wave" method. In order to test the validity of this regulation (Law of Ukraine 2006), a pilot project was implemented in 2007 – "Urban planning concept for the renovation of buildings of the territory along Marshal Grechko street in the Podilsky district of the city of Kyiv (from No. 2 to No. 26-a)", developed by the Institute of Urban Planning, Kyiv. The project demonstrated the organizational capability, the cost-effectiveness and the advisability of using such a method of reconstruction for the outdated residential stock areas in the conditions of the city of Kyiv. Based on the results of the development of the pilot project, proposals of amendments to the current Law of Ukraine (2006) were made. The next step was the development of the draft program for the complex reconstruction of the blocks (neighbourhoods) of outdated housing stock in the city of Kyiv. The development of such a program was started in 2008. However, the economic crisis of 2008-2009 prevented the completion of its development and the start of its implementation.

The active transformation of the residents' idea on the necessary level of comfort and efficiency of maintenance of residential buildings, both new and already reconstructed, requires constant attention to this issue. In 2019, the development of a new program for the complex reconstruction of outdated housing stock began preceded by an analytical and research stage.

The purpose of the present study included:

- The clarification of the criteria for classifying residential buildings as outdated and for forming an outdated buildings' typology for the conditions of Ukraine, considering the stages of urban development;
- The determining of spatial localization patterns of outdated buildings typological groups as potential objects of complex reconstruction – blocks (neighbourhoods), groups of residential buildings or separate residential buildings;
- Determining the specific features and reasons for the delay in the implementation of programs and projects for the complex reconstruction of outdated housing stock in Ukraine, based on the analysis of the experience of reconstruction in the countries of Western and Eastern Europe.

Methodology

This article presents the results of a study of the outdated housing stock reconstruction problem considering the specifics of modern socio-economic conditions in Ukraine. The study was carried out as a part of the research and analytical stage of the development of the draft Program for the Complex Reconstruction of Blocks (Neighbourhoods) of Outdated Housing Stock in the City of Kyiv. The Program was commissioned by the Department of Construction and Housing of the executive body of the Kyiv City Council to the Institute of Urban Planning (Kyiv), as contractor. The development of the draft Program included three stages: the preparatory stage, the research and analytical stage, and the design stage. The *preparatory* stage included an inventory of property, an inventory of land, and the technical examination of buildings. During the *research and analytical* stage, the following was carried out: analysis of the current legislative framework; analysis of the regulatory framework; systematization of possible reconstruction methods based on the analysis of foreign and domestic experience in the reconstruction of such a stock; analysis of the available urban planning documentation for the city of Kyiv; forming of a typology of outdated housing stock; conducting a sociological

survey regarding the consideration of public opinion on the reconstruction of outdated housing stock; development of financial mechanisms for the implementation of reconstruction projects. Based on the results of the research and analytical stage, recommendations were made on amendments to the legislative framework for the development and implementation of programs and projects for the reconstruction of outdated housing stock in Ukraine. The *design* stage included the development of project documentation for the separate reconstruction objects determined during the second stage of the Program development.

One of the main tasks of the research and analytical part of the Program development was to clarify the concept and to determine the territorial boundaries of the reconstruction object – the blocks of outdated housing stock. The term "outdated housing stock" is widely used both in research publications and in the publicist sources of Ukraine. However, its formalized, legislatively fixed definition is given only in one legislative document – the 2006 Law of Ukraine. The incorrectness of the mentioned definition necessitated the use of methods for formalizing the criteria for the concept of an outdated stock on the basis of a comparative analysis of the legislative framework, the methodological base and the terminological apparatus for implementing the reconstruction processes.

The authors analysed the materials of the address list of residential buildings built before 1980 and intended for the complex reconstruction, formed in the context of administrative districts of Kyiv. The list contained information on 5068 houses. Considering the construction period of residential buildings, their basic design schemes, their technical condition and the minimum necessary engineering equipment supply, the entire analysed housing stock was divided into four typological groups: *historical type buildings; "Stalinka" type buildings; barrack type buildings; and houses of the first mass series of the period of industrial housing construction ("khrushchevka" type)*. Comparative and generalized characteristics of the various types of outdated buildings are given in Table 1.

The study analyses the results of a comparative research of the implemented foreign and domestic programs for the complex reconstruction (renovation, rehabilitation) of the buildings of neighbourhoods formed by the houses of mass series of the first period of industrial housing construction, and of the modernization projects, and the projects of reconstruction of separate buildings of this type. A retrospective analysis of the urban planning documentation at local level, developed for the city of Kyiv over the past 30 years, was also performed. The analysed documents are:

1. Report on the possibility of reconstruction of five-storey residential buildings constructed in the 1960s in 8 districts of the city of Kiev ("KYIVPROEKTREKONSTRUKTSIIA" Design Institute 1996);
2. The current Master Plan of the City of Kyiv and the draft planning of its suburban zone until 2020, PJSC "Kyivproekt", 2002;
3. The Concept of Strategic Development of the City of Kyiv for the period up to 2025 (The first stage of the Master Plan of the City of Kyiv and its suburban area until 2025), Municipal organization "Institute of the Master Plan of the City of Kyiv", 2010;
4. The draft Master Plan of the City of Kyiv, which is at the approval stage now, Municipal organization "Institute of the Master Plan of the City of Kyiv", 2019;
5. Urban planning concept for the renovation of buildings of the territory along Marshal Grechko street in the Podilsky district of the city of Kyiv, Institute of Urban Planning, Kyiv, 2007;
6. Detailed plans of the territory of separate parts of the city of Kyiv (approved and under development);
7. Other projects and predesign proposals.

Using grapho-analytical methods, a list of the reconstruction objects was formed with an indication of their spatial boundaries. At the next stage of the program development, those

objects, namely: whole planning formations – blocks, neighbourhoods; or separate buildings, groups of buildings, will act as objects for the development of project documentation.

Table 1

Main characteristics of various types of outdated residential buildings

Parameter	Historical type buildings	Barrack type buildings	"Stalinka" type buildings	
			ordinary	"nomenklatura"-intended
Series			I-201 – I-405	II-01 – II-07
Construction period	before 1914	1950s	1950s	1950s
Load-bearing wall material	brick, wood	brick (of destroyed (demolished) buildings)	brick	brick
Load-bearing wall thickness	0.51-0.80 m		0.51 m	0.51 m
Bridging	wooden	wooden	wooden	reinforced concrete floor slabs
Roof	sloped, with an attic	sloped, with an attic	sloped, with an attic	sloped, with an attic
Number of storeys	1-8	1-2	3	5-10
Room height	2.5-4.5 m	2.8 m	2.8-3.0 m	3.3-3.6 m
Kitchen area	4.5 - 12 m^2	6-15 m^2 (shared)	7.0-7.8 m^2	7-12 m^2
Elevator	absent / present	absent	absent	present

Parameter	"Khrushchevka" type 5-storey buildings			"Khrushchevka" type 9-storey panel buildings
	panel	brick	brick / panel	
Series	1-464	1-438	1-480	1-464A
Construction period	1960s	1950s-1960s	1960s-1970s	1960s-1970s
Load-bearing wall material	reinforced concrete panels	brick, brick large-block	brick, reinforced concrete panels	reinforced concrete panels
Load-bearing wall thickness	0.35 m	0.51 m	0.35-0.45 m	0.35 m
Bridging	flat-slab, reinforced concrete	flat-slab or hipped, reinforced concrete	hipped, reinforced concrete	hipped, reinforced concrete
Roof	flat-slab, combined	flat-slab, combined	flat-slab, combined or separate	flat-slab
Number of storeys	5	5	5	9
Room height	2.5 m	2.5 m	2.5 m	2.55 m
Kitchen area	5.6-6.3 m^2	5-6 m^2	5-6.5 m^2	6.4-7.6 m^2
Elevator	absent	absent	absent	present

Source: *own research, especially designed for this paper*

Solving a number of important economic, technical and urban development problems, the Program for the reconstruction of outdated housing stock should provide another, the most important, component – the social one, in order to create comfortable and safe living conditions for the inhabitants and for guaranteeing the property rights of the residents. To ensure maximum public support for the implementation of the reconstruction program, a sociological survey was conducted as part of the study – an online questionnaire with

distribution on social media networks and in social groups of Kyiv. In the social survey, the results of an online questionnaire of 733 respondents were analysed with a confidence interval of 3.6% (Filvarova and Pleshkanovska 2020). The study was conducted also by using the analysis of the statistical reporting materials of structural units of the Kyiv City State Administration in terms of the amount and the condition of the existing housing stock in the city of Kyiv. Altogether, 5,068 houses were analysed, with a total area of 11,296.4 thousand m^2, in which 524 thousand residents lived in 257,235 apartments.

Results and Discussion

The reconstruction of the outdated buildings is a multidimensional subject, and it is widely covered in the scientific literature. But, even for countries that have accumulated a large theoretical and practical experience in solving this issue, the problem of maintaining the proper technical condition of residential buildings, their compliance with energy efficiency requirements and an appropriate level of the living environment comfort are constantly relevant. A significant lag behind European countries in the practical implementation of projects for the reconstruction of the outdated stock has presented Ukraine with challenges of rethinking the experience of other countries and its adaptation to the economic and social conditions of the country.

The concept of "outdated housing stock"

According to the 2006 Law of Ukraine, the term *outdated housing stock* is defined as "a set of housing units under five storeys, except for individual estate, which, in technical conditions, do not meet the current standards for safe and comfortable living, the maximum service life of which has expired or the physical deterioration of the main structural elements of which is at least 60%" (Law of Ukraine 2006). Any other quantitative and qualitative characteristic of this term is absent in the legislative and regulatory framework of Ukraine. At the same time, the term *outdated housing stock* is used quite widely in the scientific literature (Shcherbyna and Valiashchuk 2013, Serdiuk 2016, Kalentieva 2018). In general, it is applied to residential buildings of the first period of industrial housing construction, while residential buildings that have almost exhausted their operational resource and they are physically and morally outdated while they require immediate reconstruction are much more diverse.

The list of criteria for classifying residential buildings as "outdated" was clarified as part of the study and recommendations were given on the parametrization (quantitative indicators) of these criteria. In the legislative definition of the term *"outdated housing stock"* or *"outdated residential buildings"*, four criteria of such a stock can be determined (Law of Ukraine 2006):

- *Number of storeys.* The analysis of residential buildings built in the city of Kyiv more than forty years ago and of the ones that potentially require immediate reconstruction indicates that the above mentioned attribute cannot be a criterion for classifying them as an outdated housing stock. The number of storeys can only act as a characteristic feature, especially for residential multi-apartment buildings of mass industrial series, both previously built and modern.
- *Technical condition of houses.* The category of technical condition is characterized by the degree of physical deterioration of structural elements and of the object as a whole. However, the deterioration of "not less than 60%", determined by the law as a criterion for classifying the building as outdated, defines the technical condition of the building as "dilapidated" or "unserviceable", and the condition of structural elements as "emergency" (State Building Standards of Ukraine 2009). The indicator of physical deterioration should be reduced to at least 50% and it should cover buildings that at the time of the analysis belong to the "unsatisfactory technical condition" group with a physical deterioration from 41% to 60%.

- *Comfort of living conditions*. According to the results of a sociological survey, only 8.9% of the participants expressed satisfaction with the conditions of their residence. Most of all, the residents are dissatisfied with the state of the engineering networks (57.7% of respondents) and the technical condition of the structural elements of the building (38.1%). Almost half of the respondents – 47.8% – expressed dissatisfaction with the inconvenient layout of the apartments (walk-through rooms, small areas of kitchens and bathrooms, etc.), as well as with the absence of elevators – 17.1% (Filvarova and Pleshkanovska 2020).
- Separate signs of comfort, which have become extremely relevant in recent years, are the *energy saving and energy efficiency* of the building indicators (Grabovyy and Kiseleva 2015, Oliynyk and Murgul 2016). Energy efficiency is an indicator that is characterized by the ratio of energy use effect to energy consumption. We are talking about electricity, heat, water, gas consumption, etc. Furthermore, indicators of the thermal characteristics of the building envelope are important (Marique and Rossi 2018). The compliance with this criterion is extremely difficult in terms of historical buildings' renovation (La Fleur 2019).

Outdated buildings typology

Despite the significant amount of housing stock lost during the Second World War, the existing buildings in Kyiv are very diverse in terms of architectural and planning characteristics, as well as by the construction period. The typology of residential and non-residential buildings was considered by numerous authors in the context of various criteria. From the point of view of the subject of research, the following typologies can be mentioned: by the construction period (Kornieva 2013), according to the historical and architectural value, by design schemes (Zakharov et al. 2019), by the number of storeys, by the wall material (Oliynyk and Murgul 2016), and by many others.

The scientific literature, while considering issues of outdated buildings reconstruction, mostly talks about the mass blocks development of the period after the World War II (Hess et al. 2018). Other authors (Marin and Chelcea 2018) also include the buildings constructed after the 1990s, as a separate type. In this research, the authors analysed the materials of the address list of residential buildings built before 1980 and intended for complex reconstruction, as formed in the context of administrative districts of Kyiv. The list contained information on 5068 houses. In terms of outdated housing stock reconstruction for the conditions of Ukraine, considering the construction period of residential buildings, their basic design schemes, technical condition and minimum necessary engineering equipment supply, the entire analysed housing stock can be divided into four typological groups:

1. ***Historical type buildings.*** There are a large number (2.58 million m^2 of total area) of historical buildings, built before 1914 (of the First World War and the Civil War period), which can be divided into two subtypes:
   - *Cultural heritage monuments* listed in the State Register of Cultural Heritage Sites. Most of these memorial objects are used as public buildings, they are under state protection, and they have quite a good technical condition (for example, the House with Chimaeras of the architect Horodecky). However, even despite the status of the monument, sometimes they have a too shabby technical condition, and they are on the edge of collapsing (e.g. I. Sikorsky's house).
   - *Objects that do not have the status of a cultural heritage monument*, but those that belong to the so-called "background historical buildings" of the city.
2. ***Barrack type buildings.*** The construction of such housing took place mainly after the Second World War of improvised materials (usually of brick of destroyed houses) as temporary housing, but even now, there are up to 0.27 million m^2 of total area of such houses in Kyiv. Their main disadvantages are: cracking of the external brick of the load-

bearing walls, the emergency condition of the internal wooden walls, the unsatisfactory condition of the internal electrical networks and sanitary equipment, the internal layout providing for communal apartments.

3. ***"Stalinka" type buildings.*** Buildings of this type were built in the '30s and '50s of the twentieth century (the period of I. Stalin's governance) and they total about 0.73 million m^2 in Kiev. Houses are divided into two subtypes – ordinary and "nomenklatura"-intended.
   - *Ordinary houses* – three-storey buildings, they have brick walls, bridging – wooden; roof – sloped, with an attic.
   - *"Nomenklatura"-intended houses* have 5-10 storeys and elevators. The internal layout of apartments, common areas, stairwells, entrance halls and service rooms, balconies, loggias, bay windows are quite spacious.

   In the "stalinka" type buildings, signs of series housing appeared: external resemblance, similar layout and building materials. During this period, the production of unified parts (reinforced concrete floor slabs, foundation parts, prefabricated columns, etc.) was established, that laid the groundwork for the transition to mass construction.
4. ***Houses of the first mass series of the period of industrial housing construction ("khrushchevka" type).*** These are the houses built according to the program for the restoration of the housing stock destroyed during the Second World War, which was begun by the head of the USSR of that time, Nikita Khrushchev (the '50-'70s of the 20th century). The total area of these houses in Kyiv is almost 9.23 million m^2. Of these, 47% are panel houses, 50% are brick houses, 3% are large-block ones. The most widely used series were 5-storey ones, such as: 1-438, 1-464, 1-480 (8.73 million m^2 of total area).
   - *"Khrushchevka" type 5-storey brick buildings* (series 1-438). Design scheme – frameless with longitudinal load-bearing walls.
   - *"Khrushchevka" type 5-storey and 9-storey panel buildings* (series 1-464) were not widely used in the city of Kyiv. Design scheme – frameless with transverse load-bearing walls.
   - *"Khrushchevka" type 5-storey brick or panel buildings* (series 1-480) were the most widely used in the city of Kyiv. Design scheme – crosswall. Foundations – concrete, walls – brick covered with ceramic tiles or reinforced concrete panels.

Distribution of the total amount of the outdated stock by its main characteristics (population, total area of apartments, number of apartments, number of houses) is shown in Table 2.

Table 2

Distribution of the outdated housing stock in the city of Kyiv, by type

Type of buildings	Number of houses	Number of apartments	Total area of apartments (thousand m^2)	Population (thousand people)
Historical type buildings	918	15 182	1 054.1	35.7
Barrack type buildings	393	6 038	276.9	13.9
"Stalinka" type buildings	369	14 121	731.8	32.6
"Khrushchevka" type buildings (total)	3 509	222 530	9 233.6	439.8
including:				
brick buildings	2 001	121 189	4 869.3	233.6
panel buildings	1 387	100 705	4 364.3	208.2
Total within the city	**5 068**	**257 235**	**11 296.4**	**524.0**

Source: *own research (2019); archival materials are kept at the Institute of Urban Planning*

An analysis of the spatial distribution of outdated residential buildings was carried out in the context of the administrative districts of the city of Kyiv (Fig. 1). The present administrative-territorial structure of the city was formed in 2001, and it now includes ten administrative districts, each of which differs in area, population, and the number and type of outdated houses (Fig. 2). These are:

1. Holosiivsky district
2. Darnytsky district
3. Desniansky district
4. Dniprovsky district
5. Obolonsky district
6. Pechersky district
7. Podilsky district
8. Sviatoshynsky district
9. Solomiansky district
10. Shevchenkivsky district

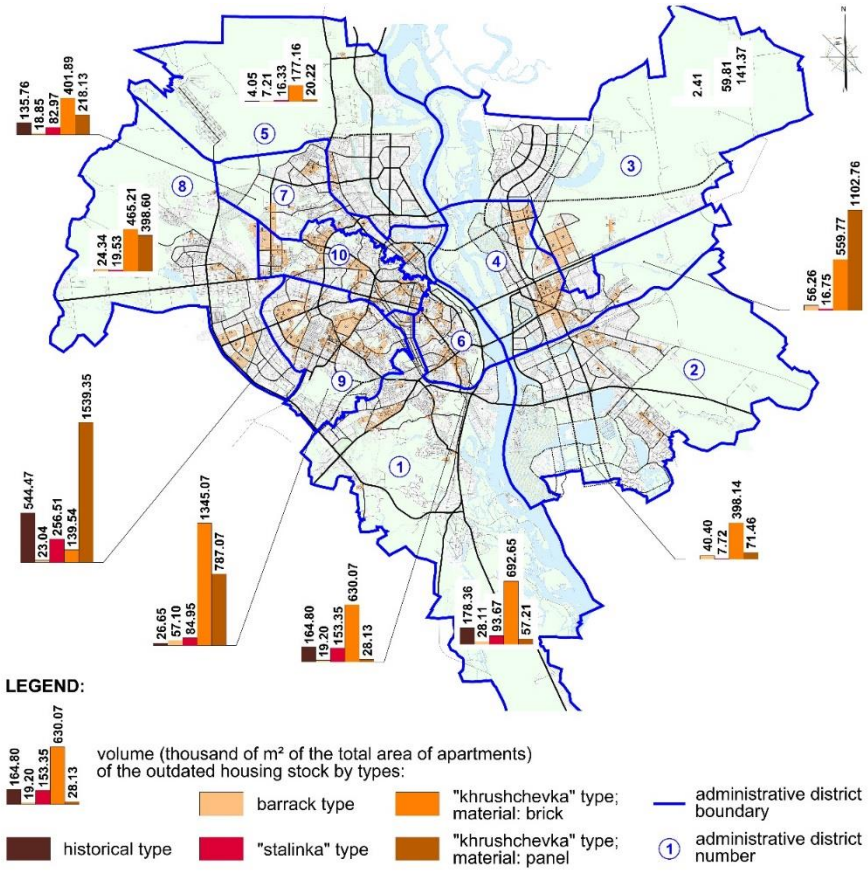

Fig. 1 **– Scheme of distribution of outdated housing stock, by the type according to the city administrative-territorial structure**

Source: *own research (2019); archival materials are kept at the Institute of Urban Planning*

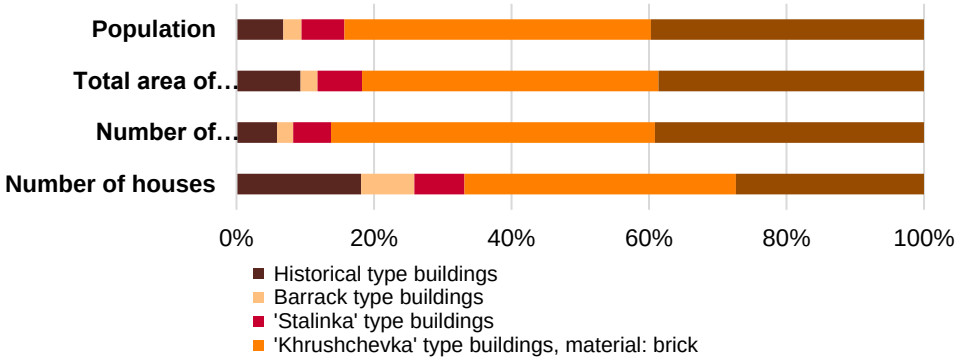

Fig. 2 **– Distribution of outdated housing stock, by types, in Kyiv**
Source: *own research, especially designed for this paper*

General characteristics of outdated stock

The inclusion of buildings of an earlier construction period (before the World War II) is due to the long period of not carrying out this stock reconstruction measures, since the part of the stock (barrack type buildings) was considered as temporary housing of extremely poor quality and low level of engineering equipment. As noted above, according to the Main Department of Statistics in Kyiv (2020), as of 2018, there are 63.5 million m^2 of the total area of housing (including individual estate) in the city of Kyiv, which amounts to 1,081.7 thousand apartments. Therewith, 1.9% of the total number of apartments (20,539 units) are not provided with cold water supply, and 3.3% (35,691 apartments) are not provided with hot water supply. There is no sewage system in 4.3% of units (46,513 apartments) and 3.9% of them (42,185 apartments) are not provided with heating (Main Department of Statistics in Kyiv 2020). This indicates a significant amount of the housing stock in Kyiv that does not fully comply with the general understanding of comfortable living conditions.

Another characteristic of comfort may be the average housing sufficiency, that is the total area of the apartment provided for 1 resident. By this indicator, Kyiv has one of the last places in Europe. In Ukraine, as of 2008, the housing sufficiency is 22.8 m^2 per person (State Statistics Service of Ukraine 2020). For comparison with other data, in Kyiv, as of 2008, the housing sufficiency was 20.6 m^2 per person, and as of 2018 – 21.8 m^2 per person (Main Department of Statistics in Kyiv 2020). At the same time, the highest average housing sufficiency is in Norway – 74.0 m^2 per person, and in Denmark – 65.0 m^2 per person. In Eastern European countries this indicator is: Czech Republic – 28.7 m^2 per person, Hungary – 28.0 m^2 per person. A lower level of housing sufficiency is only in Poland – 22.2 m^2 per person, and in Russia – 21.1 m^2 per person (Kyrychuk 2009).

One of the important characteristics that influences the choice of financial support options and possible outdated stock reconstruction methods is a form of housing ownership. This indicator differs significantly in Western Europe and in post-socialist countries. Before 1990, the number of privately-owned apartments was: approx. 25% in Poland and in Bulgaria, approx. 37% in Hungary, and approx. 50% in Slovenia; in the USSR, the part of which Ukraine was, it reached only 8% (Mandič 2010). Then, in 1994, in Hungary, Slovenia, Bulgaria and Romania, for instance, the rate of home ownership reached close to 90%.

In Western Europe, the share of people living in rented housing reaches: for people with a low income – from 40-45% in France, Germany, and the Netherlands; to 50-62% in Sweden, Belgium and Great Britain; for people with an average income – from about 34% in Great

Britain and Belgium; to 40-45% in France, Germany, Sweden and the Netherlands (Van der Heijden 2002).

As part of the study, the features of the legal status of the outdated housing stock of Kyiv were analysed. According to official data (State Statistics Service of Ukraine 2018b), as of 2018, in big cities, including Kyiv, 92.4% of apartments are in private ownership (privatized, purchased); the state and departmental property is 0.7% of total apartments, and 6.9% of families rent the housing from private owners. According to the results of our own sociological survey conducted as part of this study, in the city of Kyiv, among the respondents living in housing which may be considered outdated, 84.3% own their apartments, 10.4% rent the housing, and the rest of 5.3% live in non-privatized apartments (Filvarova and Pleshkanovska 2020). The high percentage of people living in their own housing and who have no other (rented) one creates additional complications for the outdated stock reconstruction option with the total demolition. Such an option requires the need for additional compensatory measures to solve the property issues.

The formation of a system of complex reconstruction objects

The program is aimed at ensuring the further sustainable development of the city of Kyiv and it sets goals of:

- counteracting housing stock degradation;
- forming of comfortable living conditions for the inhabitants;
- ensuring the further development of social infrastructure and updating the existing engineering and transport infrastructure;
- helping to improve the efficiency of the urban territory use and increasing tax revenues to the local budget;
- attracting additional investment in the development of the city.

As noted above, the following typological groups can act as objects of reconstruction of outdated housing stock: 1) *separate residential buildings or groups of residential buildings* within the set boundaries of house plots or without them; 2) *whole planning formations* – blocks, neighbourhoods with clearly determined boundaries (red lines of the adjacent streets or other artificial or natural bounds). In determining the boundaries of potential reconstruction objects, the authors based on the following principles: 1) the territories of the individual estate and the territories built up over the past four decades were not included in the territories under consideration; 2) buildings should correspond to the category "outdated housing stock". The layout of areas of complex reconstruction of the blocks of outdated housing stock in Kyiv is shown in Fig. 3.

The first typological group includes buildings or small groups of buildings located dispersed within the existing built-up territories and the ones that do not form the whole blocks and neighbourhoods. These are:

- buildings or groups of buildings, which belong to the historical type of outdated housing stock (cultural heritage monuments, background historical buildings);
- "stalinka" type buildings; groups of the barrack type buildings;
- separate buildings or groups of buildings of other types of outdated housing stock.

The second typological group consists of blocks and neighbourhoods that form residential areas of the mass post-war housing construction period – "khrushchevka" type outdated buildings. This group can be divided into several subgroups:

- neighbourhoods as whole planning formations, within which five-storey brick buildings prevail. A typical example is the Voskresenka residential area. On the territory of 245 hectares, 11 neighbourhoods were formed with a total area of housing stock of about 680 thousand m^2; neighbourhoods as whole planning formations, within which five-storey panel buildings prevail. A typical example is the northern part of Nyvky residential area with the territory of 46.9 hectares and a total area of housing stock of about 204 thousand m^2. It was this type of neighbourhoods that the first "pilot" project in Ukraine was developed for in 2007.
- neighbourhoods as whole planning formations, within which mixed five- and nine-storey brick or panel buildings prevail. A typical example is Lisovy residential area, which consists of 9 neighbourhoods with a total area of houses of about 360 thousand m^2. The territory is of 96 hectares.

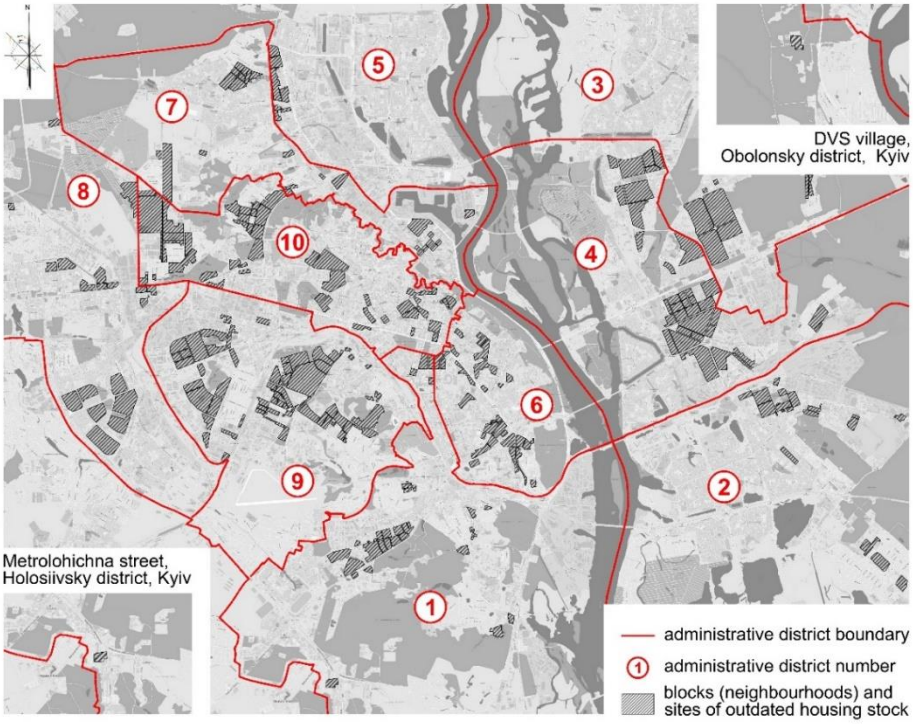

Fig. 3 **– Layout of the objects of potential reconstruction of outdated housing stock in Kyiv**

Source: *own research (2019); archival materials are kept at the Institute of Urban Planning*

Also, this subgroup contains blocks of small area formed by:

- residential buildings of barrack type or ordinary "stalinka" type. Typical examples are blocks within Nova Darnytsia residential area, formed by two-storey houses built by German prisoners of war. These blocks are also called "German blocks".
- blocks in the historical part of the city, mainly formed by the historical type of residential buildings interspersed with separate modern buildings.

According to the results of the analysis, in the city of Kyiv, in general, 274 blocks and neighbourhoods were allocated, of which 31 blocks with prevailing historical type and "stalinka" type buildings, 6 blocks of barrack type buildings and 22 neighbourhoods formed mainly by five-storey panel buildings of the first period of industrial housing construction. The

rest of the blocks and neighbourhoods contain a combination of different types of outdated buildings.

Analysis of the spatial localization of obsolete buildings' typological groups

The spatial organization of the city's territory develops during the period of its existence, experiencing wave-like changes under the influence of socio-demographic, economic and political factors (Pleshkanovska and Savchenko 2019, Pleshkanovska and Savchenko 2020). After the World War II, in most European countries, in order to restore the destroyed housing stock, mass construction took place over large areas. The following factors facilitated that process:

- large volumes of the destroyed stock within previously developed territories to be cleared after the total destruction of houses;
- state ownership of land in socialist countries of that time that made it possible to allocate large free territories, mainly in suburbs;
- attempts to minimize the cost of construction through mass industrial housing construction.

Most often, the spatial allocation of such areas in the planning structure of cities was concentric (Hirt and Stanilov 2007, Marin and Chelcea 2018). However, in Kyiv, such a model is not clearly defined. For a more reliable assessment of the spatial localization of areas of mass residential development during the post-war revival, their placement on the Kyiv map, based on cartographic materials such as the Stadtplan Kiew of 1943, was considered.

The first Soviet Master Plan of Kyiv was carried out under the leadership of Haustov and it was approved in 1938. Kyiv's development along the west-east latitudinal direction (along the historic Via Regia) with the city's exit on the left bank of the Dnieper was to be a major novelty of the city's spatial planning. More than 20 suburban settlements were planned to be added. On the other hand, the cardinal transformations should have led to a significant increase in the spatial compactness of the city with the creation of powerful industrial and residential areas, and the formation of a large-scale governmental centre (Pleshkanovska 2019). But the beginning of the Great Patriotic War of 1941-1945 did not allow the completion of this ambitious plan. As a result, the spatial organization of Kyiv remained quite dispersed (Fig. 4).

The need to place significant volumes of new housing construction during the period of Kyiv restoration after the war led to the predominant localization of residential blocks in the peripheral part of the post-war city. However, some of that blocks were built on the central areas of the city, freed from the remains of destroyed houses. So, most of the "khrushchevka" type residential buildings are located in the Solomiansky district (2,132.2 thousand m^2 of which 1,345.1 thousand m^2 are built of brick and 787.1 thousand m^2 are of panel ones), the Shevchenkivsky district (1,678.9 thousand m^2, of which 139.5 thousand m^2 are brick ones and 1,539.4 thousand m^2 are panel ones), and in the Dniprovsky district (1,662.6 thousand m^2, of which 559.8 thousand m^2 are built of brick and 1,102.8 thousand m^2 are panel ones).

The entire blocks of groups of houses, formed by the historical type of residential buildings are located mainly in the central areas of the city (Fig. 5), namely: in the Shevchenkivsky district (544.5 thousand m^2), the Pechersky district (164.8 thousand m^2), the Golosiivsky district (178.4 thousand m^2), and the Podilsky district (135.8 thousand m^2). It should be noted that we are talking only about residential buildings. A significant number of historical type buildings are used as public ones. The amount of the barrack type of buildings is quite little – 276.9 thousand m^2. These buildings are located mainly in the Darnytsky district (40.4 thousand m^2), the Dniprovsky district (56.3 thousand m^2), and the Solomiansky district (57.1 thousand m^2), of the city of Kyiv. The "stalinka" type buildings are also located mainly in the

central areas of the city – in the Shevchenkivsky district (256.5 thousand m^2), and the Pechersky district (153.4 thousand m^2).

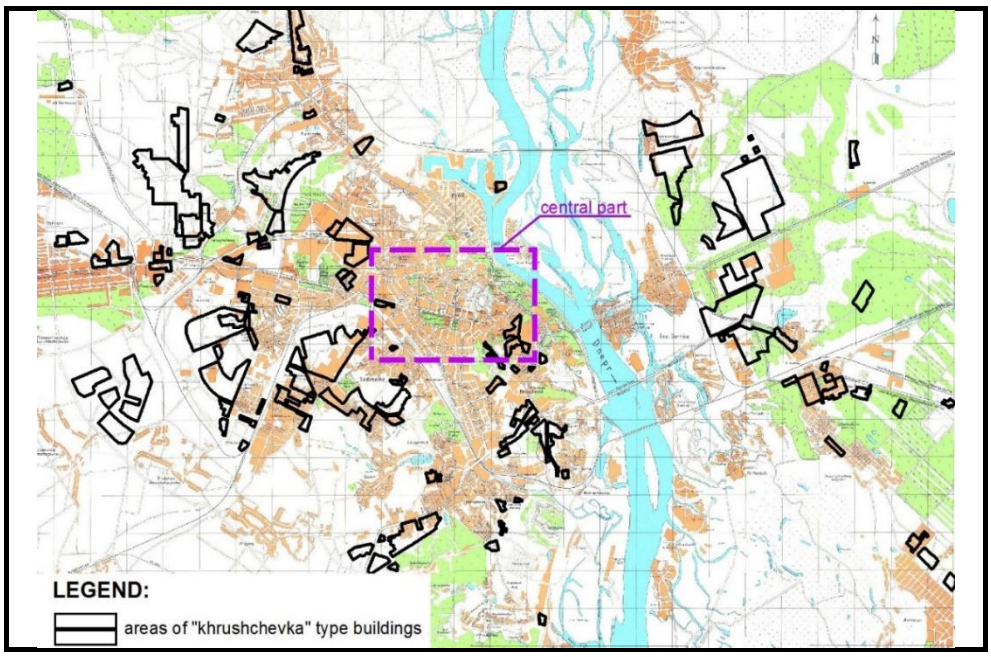

Fig. 4 **– Spatial localization of blocks of barrack type and of "khrushchevka" type of outdated buildings in Kyiv**
Source: *own research based on the Stadtplan Kiew (1943), especially designed for this paper*

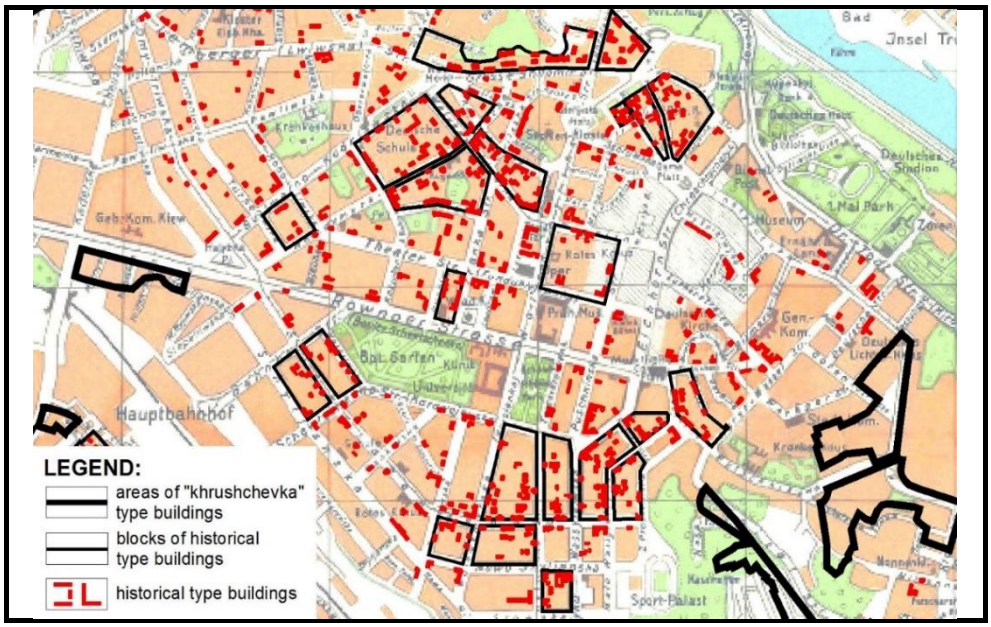

Fig. 5 **– Spatial localization of outdated buildings' blocks in the central part of Kyiv**
Source: *own research based on the Stadtplan Kiew (1943), especially designed for this paper*

Thus, the spatial localization of potential objects of complex reconstruction – blocks of outdated residential buildings, groups or separate residential buildings – has a mixed pattern with the domination of:

- a circular arrangement of significant areas formed by the "khrushchevka" type of residential buildings of the first mass series of industrial housing construction and by the barrack type buildings moderately concentrated in peripheral (at the time of construction) districts of the city;
- concentrated allocation of blocks and groups of historical and "stalinka" type of residential buildings in the central zone;
- dispersed in the planning structure of the entire city localization of complex reconstruction objects, formed by representatives of different typological groups of outdated housing stock.

The legal status of land plots as a factor influencing the choice of the reconstruction method

The evolution of the spatial planning organization of the territory of the city is quite clearly seen in the change of the localization of residential formations (residential areas, districts) of outdated housing stock. The blocks and neighbourhoods formed during the first period of industrial housing construction (1950s-1960s), were located mainly in the peripheral zone of the city at the time of construction. Now, in the process of spatial growth, these areas are in the middle, and sometimes even in the central parts of the cities, with a rather high cost of land. So, almost all the areas formed by the first mass series of residential buildings (the "khrushchevka" type) in Kyiv are now located within the middle zone and only Lisovy residential area (in the eastern part of the city) and Mykilska Borshchahivka residential area (in the western part of the city) remain in the peripheral zone of the city (Fig. 6).

Unlike the countries of Western Europe, the formation of cities in Ukraine, as well as in other post-Soviet countries, took place for a long period under the conditions of state ownership of land and planned economic development. At that period, the decision to allocate large territories for areas of mass construction did not consider the factor of the cost of land, but only the town planning value and the need for solving a social task of providing the population with housing and of developing the necessary material infrastructure of the city. This led to the fact that the technical and economic parameters of the territory use and development had provided rather low indicators of building density (15-18% of the total area of the neighborhood) and population density (230-270 people per hectare).

The comparison of the land valuation at the present stage of the city's development and the cost-effectiveness assessment of the technical, architectural and planning reconstruction of these outdated houses became possible as a result of the inclusion of land in the system of market relations, where land acts as a high-value product. Regarding the barrack type buildings, an unambiguous decision has been made on its complete demolition followed by a new construction on the freed territories. As for the "khrushchevka" type buildings, two basic options are possible: complete demolition followed by new construction, for the panel residential buildings of the first mass series; and modernization with a set of measures to modernize the engineering equipment and to insulate the facades of brick buildings; or the complex reconstruction of buildings of this period with additional new construction on separate vacant land plots and modernization of existing buildings.

A particular aspect of the analysis of the territory of blocks and neighbourhoods as objects of the potential reconstruction of outdated housing stock was the consideration of land management issues and property rights of owners / users of both individual land plots and individual residential and non-residential premises. The territory of outdated housing stock was formed during the Soviet era, when there was only one type of land ownership – the state.

It means that the entire territory of blocks and neighbourhoods belonged to the residential territory of state property without dividing it into separate land plots for each building or object within them. To understand the heterogeneity of the legal status of land plots of blocks of outdated multi-storey residential buildings, an example of such a block can be considered. The block is located in the Obolonsky district of the city of Kyiv, in the Priorka residential area. On the area of 7.36 hectares, there are 6 barrack type residential buildings and 6 residential buildings of the first period of industrial housing construction (Fig. 7.A). The fragment of the Public Cadastral Map of Ukraine (Fig. 7.B) clearly shows that:

- the majority of land plots within the block are not formed as objects of law;
- the land category is not determined;
- the purpose of land use is not determined;
- the land management materials are not available.

In Fig. 7.B, the boundaries of the reconstruction objects (blocks) are shown in yellow; the land plots with set boundaries are in blue.

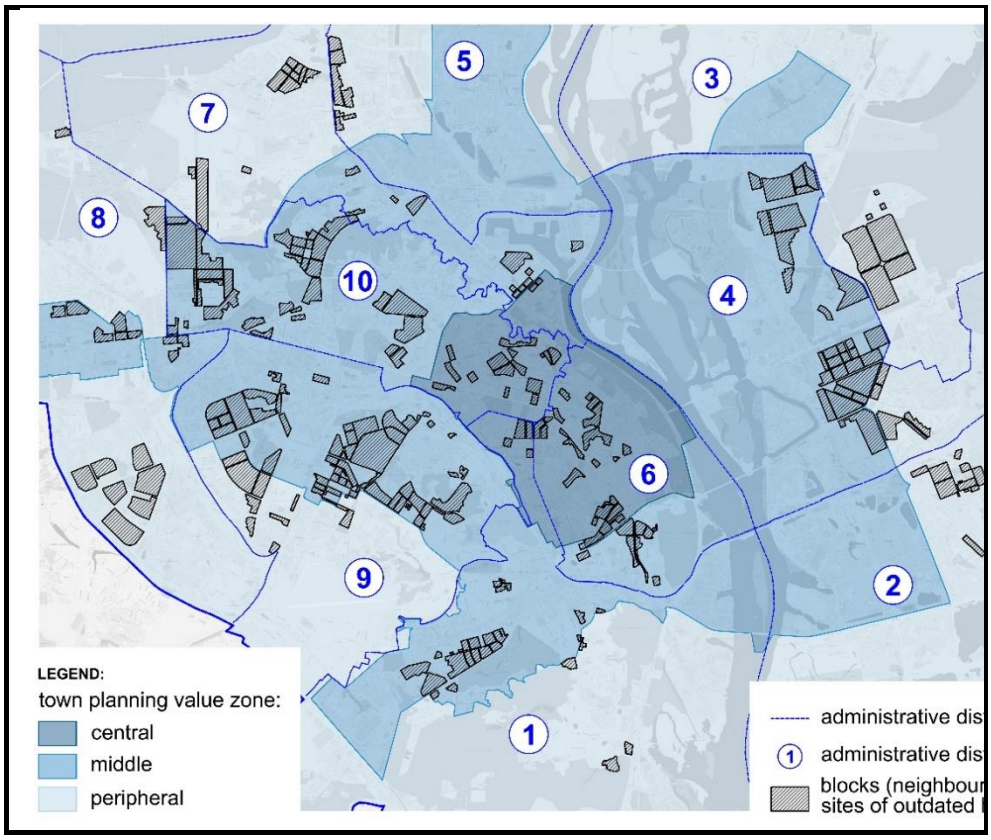

Fig. 6 **– Layout of the objects of potential reconstruction of outdated housing stock on the zoning scheme of the territory of Kyiv, according to the town planning value**
Source: *own research (2019); archival materials are kept at the Institute of Urban Planning*

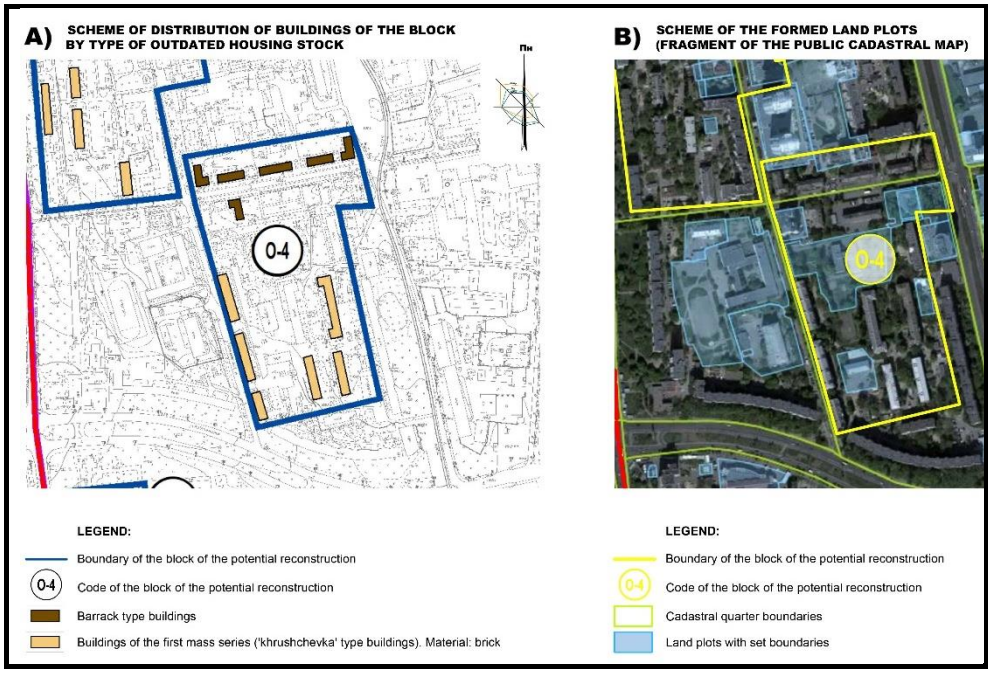

Fig. 7 **– Structure of the block of outdated housing stock in Kyiv**
A) Scheme of distribution of buildings of the block, by the type of outdated housing stock
B) Scheme of the formed land plots (fragment of the Public Cadastral Map of Ukraine)
Source: own research (2019); archival materials are kept at the Institute of Urban Planning

There are separate formed land plots of other land users with certain boundaries and purpose interspersed within the block territory. In addition to the outdated residential buildings, there are also other buildings and structures in the block owned by third persons with not set land plots for them. Land plots formed and provided to third persons for ownership or use mostly belong to the category of "land for residential and public buildings". The buildings of educational institutions or public health institutions of municipal property are located on them, which is a positive point. The uncertainty of the legal status of the territory of potential complex reconstruction objects in terms of setting the land plots boundaries and determining their area significantly complicates the procedure for holding investment tenders to choose an investor for the implementation of complex reconstruction projects.

Conclusions

The awareness of the need to permanently maintain the proper technical condition of the housing stock of settlements was widely considered by a large number of foreign and Ukrainian scientists and practitioners in the field of urban planning. However, unfortunately, Ukraine came to a practical solution to this problem much later than other countries in Western and Eastern Europe. The operational resource of residential buildings is almost exhausted. In the absence of planned repair measures, the technical condition of the housing stock has approached an emergency level or it has even crossed this line. There are cases of spontaneous collapsing of residential buildings.

The minimum necessary legislative and regulatory framework on the complex reconstruction of the outdated housing stock has been developed in Ukraine through the 2006 Law of Ukraine, based on the Russian model for the implementation of reconstruction projects, using

the “wave” method (Law of Ukraine 2006). But, the lack of domestic practice in implementing such programs has led to the loss of relevance of this Law and its inconsistency with the current socio-economic conditions and with the legislative framework developed over the past decade on land management and property rights consideration.

In our opinion, final recommendations on amendments to the 2006 Law should be made only after the development of programs and pilot projects for the complex reconstruction of blocks. The main principles for the development of such programs and projects should be:

- *The principle of social necessity and the principle of social justice* – creating a safe living environment, reducing social tension in the society, increasing energy efficiency and the architectural attractiveness of buildings;
- *The principle of guarantee of property rights* – compliance with the constitutional requirements regarding the equality of all subjects of property rights, the guarantees of property rights and the obligations of owners;
- *The principle of complexity* – the implementation of programs and projects as a system of comprehensive measures for the reconstruction, renovation and modernization of outdated housing stock with the updating of engineering and transport infrastructure, and the creation of new social infrastructure facilities;
- *The principle of public-private partnership* – ensuring a balanced respect of private, public and state interests at all stages of the implementation of the reconstruction programs and projects;
- *The principle of expanding the role of the public in the reconstruction processes* – supporting public initiatives, holding public dialogue (“public hearings”), clarifying future benefits and legal guarantees;
- *The principle of consistency* – carrying out the complex reconstruction of the existing residential buildings as part of a single socio-economic and urban development policy of the capital.

Developing programs and projects for complex reconstruction should be based on the type of outdated housing stock. Using the example of the city of Kyiv, four such types were identified: 1) *historical type buildings*, 2) *barrack type buildings*, 3) *“stalinka” type buildings*, and 4) *buildings of the first period of industrial housing construction (“khrushchevka” type buildings)*. The totality of outdated houses can be divided into two typological groups: 1) *separate residential buildings or groups of residential buildings* within the set boundaries of house plots or without them; 2) *whole planning formations* – blocks, neighbourhoods with clearly determined boundaries.

A comparative analysis of the experience in the reconstruction of separate buildings and blocks (neighbourhoods) of the outdated housing stock in various countries revealed that this process reflects the constant progress in creating and maintaining a comfortable living environment for people in cities. During the entire “life cycle” of the house and depending on its service life, various methods and models of reconstruction are used in the European practice, such as:

- Complete demolition;
- Partial demolition;
- Technical improvement of buildings: repairs, modernization, rehabilitation;
- Protection of the housing estate structure including cultural activities;
- Restoration of the area of the housing estate;
- Extending the range of services on the estate (Tofiluk et al. 2019).

The formed types of outdated housing stock determine the preferred method of reconstruction. So, the historical type of building requires, first of all, restoration measures, the modernization of the engineering equipment with a possible internal layout change and the preservation of the exterior view. Buildings of the "stalinka" type and the 5-storey brick buildings of the "khrushchevka" type require reconstructive measures with the attic floor superstructure, modernization and measures to increase the energy efficiency indicators, and with additional construction of new buildings. The barrack type buildings should be completely demolished, followed by the new construction on the freed territory. The exception is a separate predefined group of blocks that should be fully restored to preserve such a type of buildings for tourism purposes.

The preferred method for the complex reconstruction of neighbourhoods formed by 5-storey panel houses of industrial housing construction should be the renovation method. Four typical situations can be determined, depending on the features of the architectural and planning design of the territory and buildings of the blocks of potential renovation:

1. the availability of free territory for the construction of the start house within the block or the neighbourhood;
2. the availability of free territory for the construction of the start house within the neighbouring blocks or neighbourhoods. In this case, it is advisable to carry out the mass reconstruction in a comprehensive manner, starting with a planning formation, where it is possible to place a start house, and only after that moving to a neighbouring planning formation;
3. construction of the start house due to the demolition of a low-value non-residential building with the appropriate compensation to the owners;
4. construction of the start house with a temporary violation of insolation and a number of other regulated distances during the construction period.

The use of the renovation method is complicated by the presence of the almost complete private ownership of the apartments in these houses, unlike the common European practice of rental housing. Accordingly, the property rights of the owners of both residential and non-residential premises must be fully respected, and all the proposed projects must be agreed with the owners.

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References

BAEK C.-H., PARK S.-H. (2012), *Changes in renovation policies in the era of sustainability*, Energy and Buildings 47, 485-496.

BARASHYKOV A. Y., HOMILKO V. O., MALYSHEV O. M. (2000)*, Technical exploitation of buildings and urban territories*, Vyshcha shkola, Kyiv.

BERGER H., RITSCHL A. (1995), *Germany and the Political Economy of the Marshall Plan, 1947-52: A re-revisionist view*, in: Eichengreen B. (ed.), Europe's Postwar Recovery, Cambridge University Press, Cambridge, pp. 199-245.

BERNT M. (2017), *Phased Out, Demolished and Privatized: Social Housing in an East German 'Shrinking City'*, in: Watt P., Smets P. (ed.), Social Housing and Urban Renewal, Emerald Publishing Limited, Bingley, pp. 253-275.

BOBROVA V. D. (2011), *The program of economic assistance in restoring the economies of post-war Europe (Marshall Plan)*, Vestnik MGUP 12, 71-79.

BOLSHAKOV V. I., MOTORNY N. A., RAZUMOVA O. V., SHCHEGLOVA O. Y. (2005), *Basics of assessing the economic efficiency of the reconstruction of residential buildings,* Dnipropetrovsk: Bulletin of Prydniprovska State Academy of Civil Engineering and Architecture 10, 4-10.

CABINET OF MINISTERS OF UKRAINE (1999), *On measures for the reconstruction of residential buildings of the first mass series*, Resolution of the Cabinet of Ministers of Ukraine dated 05.14.1999 No. 829, Retrieved from: www.zakon.rada.gov.ua.

CHARAN S. P. (2018), *Study on Urban Sustainable Restructuring of Leinefelde, Germany and Revealing the Important Strategies for Environmental Well-Being for Shrinking Cities*, European Journal of Engineering and Formal Sciences 2 (3), 76-86.

FILVAROVA N. G., PLESHKANOVSKA A. M. (2020), *Attitudes towards outdated housing stock reconstruction: a sociological study*, Institute of Urban Planning, Kiev.

GOVERNMENT OF MOSCOW (1999), *Decree on the missions of the complex reconstruction of the five-storey building of the first period of industrial housing construction areas until 2010*, Dated 06.07.1999 No. 608, Retrieved from: www.docs.cntd.ru.

GOVERNMENT OF MOSCOW (2017), *Program for the housing renovation in the city of Moscow*, Retrieved from: www.mos.ru.

GOVERNMENT PORTAL (2020), *Construction work has begun at 300 sites – the "Big Construction" has started in Ukraine*, Retrieved from: www.kmu.gov.ua.

GRABOVOI P. G., KHARITONOV V. A. (2006), *Reconstruction and renewal of the existing buildings of the city*, Izd-va "ASB" i "Realproekt", Moscow.

GRABOVYY K. P., KISELEVA E. A. (2015), *Energy Efficiency of Housing Stock as an Economic Incentive to Increase the Performance of Real Estate Objects*, Vestnik MGSU 3, 79-91.

HESS D. B., TAMMARU T., VAN HAM M. (eds.) (2018), *Housing Estates in Europe: Poverty, Ethnic Segregation and Policy Challenges*, Springer, Dordrecht.

HIRT S., STANILOV K. (2007), *The perils of post-socialist transformation: Residential development in Sofia*, in: Stanilov K. (ed.), The post-socialist city: urban form and space transformations in Central and Eastern Europe after socialism, Springer, Dordrecht, pp. 215-244.

HOGAN M. J. (1987), *The Marshall Plan: America, Britain, and the Reconstruction of Western Europe, 1947-1952*, Cambridge University Press, New York.

IANKOVSKA O., BACHYNSKYJ D. (2013), *UkrSSR reforms in the social sector (1950–1960s): Housing provision*, Ukraine in the 20th century: Culture, Ideology, Politics 18, 132-149.

KALENTIEVA N. A. (2018), *Structural-logical model description the recovery management of obsolete housing*, Economy, business innovation. Penza. 5th int. science and practical conf. digest. part 2, 175-178.

KOSTETSKY N. F., GURKO A. I. (2003), *Foreign experience of state regulation of the housing stock reproduction, its conservation and modernization*, Ekonomika stroitelstva (Construction economics) 1, 13-30.

KOSTRIKIN P. N. (2017), *Problems of Efficiency of Realization of State (Municipal) Housing Renovation Programs*, Vestnik MGSU 12 (11), 1221-1228.

KOVÁCS Z., EGEDY T., SZABÓ B. (2018), *Persistence or Change: Divergent Trajectories of Large Housing Estates in Budapest, Hungary*, in: Hess D. B., Tammaru T., van Ham M. (eds.), Housing Estates in Europe, Springer, Cham, pp. 191-214.

"KYIVPROEKTREKONSTRUKTSIIA" DESIGN INSTITUTE (1996), *Report on the possibility of reconstruction of five-storey residential buildings constructed in the 1960s in 8 districts of the city of Kiev,* Kyivproektrekonstruktsiia, Kiev.

KYRYCHUK Y. L. (2009), *Foreign experience of state influence on housing affordability*, Theory and Practice of Public Administration 4 (27), 380-387.

LA FLEUR L. (2019), *Energy renovation of multi-family buildings in Sweden: An evaluation of life cycle costs, indoor environment and primary energy use, and a comparison with constructing a new building*, Linköping University, Linköping.

LAW OF UKRAINE (2006), *On the Complex Reconstruction of Blocks (Neighbourhoods) of Outdated Housing Stock*, dated 22.12.2006 No. 525-V, Retrieved from: www.zakon.rada.gov.ua.

LUHN A. (2017), *Moscow's big move: is this the biggest urban demolition project ever?*, The Guardian, Retrieved from: www.theguardian.com.

MAIN DEPARTMENT OF STATISTICS IN KYIV (2020), *Housing stock (1995-2018)*, Retrieved from: www.kiev.ukrstat.gov.ua

MANDIČ S. (2010), *The changing role of housing assets in post-socialist countries*, Journal of Housing and the Built Environment 25, 213-226.

MARIQUE A.-F., ROSSI B. (2018), *Cradle-to-grave life-cycle assessment within the built environment: Comparison between the refurbishment and the complete reconstruction of an office building in Belgium*, Journal of Environmental Management 224, 396-405.

MARIN V., CHELCEA L. (2018), *The Many (Still) Functional Housing Estates of Bucharest, Romania: A Viable Housing Provider in Europe's Densest Capital City*, in: Hess D. B., Tammaru T., van Ham M. (eds.), Housing Estates in Europe, Springer, Cham, pp. 167-190.

MOGZOEV A. M., KUZMICHEVA K. I. (2017), *Renovation of Housing Fund of Moscow City*, Moscow Witte University Bulletin. Series 1: Economics and Management 4 (23), 70-74.

OLIYNYK O., MURGUL V. A. (2016), *Strategy for energy efficient reconstruction of residential low-rise buildings*, Construction of Unique Buildings and Structures 1 (40), 112-124.

PLESHKANOVSKA A. M. (2019), *City Master Plan: Forecasting Methodology Problems (on the example of the Master Plans of Kyiv)*, Transfer of Innovative Technologies 2 (1), 39-50.

PLESHKANOVSKA A., SAVCHENKO O. (2019), *Epochs and Cities*, 2-nd ed., Logos, Kyiv.

PLESHKANOVSKA A. M., SAVCHENKO E. D. (2020), *«Building booms»: an urban planning phenomenon of large city development*, Colloquium-journal 4, 10-13.

REGULSKA J. (1987), *Urban development under socialism: the Polish experience*, Urban Geography 8 (4), 321-339

SERDIUK T. V. (2016), *Organization and economic activities financing thermal modernization obsolete housing*, Modern Technology, Materials and Design in Construction 2 (21), 80-87.

SHAROV O. M. (2014), *Out of the Crisis: the "Marshall Plan" - Lessons and Prospects for Ukraine*, Economy of Ukraine 12 (637), 20-28.

SHCHERBYNA L. V., VALIASHCHUK V. V. (2013), *Reconstruction and redevelopment of morally outdated residential buildings*, Mistobuduvannia ta terytorialne planuvannia 48, 509-513.

STATE BUILDING STANDARDS OF UKRAINE (2009), *Rules for determining the physical deterioration of residential buildings*, SOU ZKH 75.11-35077234.0015:2009, Retrieved from: www.dbn.co.ua.

STATE STATISTICS SERVICE OF UKRAINE (2018a), *Children, women and family in Ukraine*, Retrived from: www.ukrstat.org.

STATE STATISTICS SERVICE OF UKRAINE (2018b), *Social and demographic characteristics of households of Ukraine*, Retrived from: www.ukrstat.org.

STATE STATISTICS SERVICE OF UKRAINE (2020), *Housing stock (1990-2018)*, Retrieved from: Retrived from: www.ukrstat.org.

SUNAK P. O., MELNYK Y. A., MELNYK O. V., SYNII S. V., SUNAK O. P., LYNNYK I. E. (2014), *Analysis of measures for reconstruction of housing stock abroad*, Mistobuduvannia ta terytorialne planuvannia 54, 397-410.

TOFILUK A., KNYZIAK P., KRENTOWSKI J. (2019), *Revitalization of Twentieth-Century Prefabricated Housing Estates as Interdisciplinary Issue*, IOP Conference Series: Materials Science and Engineering 471 (11), 112096.

TZONEV T. (2013), *Seismic Retrofit of Precast Panel Buildings in Eastern Europe*, Massachusetts Institute of Technology, Cambridge.

VAN DER HEIJDEN H. (2002), *Social rented housing in Western Europe: Developments and expectations*, Urban Studies 39 (2), 327-340.

VOLYNSKOV V. E. (2016), *On the Need for Modernization of the Five-Storey Typical Residential Fund of the Russian Federation*, Academia. Architecture and Construction 4, 71-75.

ZAKHAROV Y., SANKOV P., TRIFONOV I., TKACH N., TOSHYNA L. (2019), *The content and specific features of reconstructing the residential houses of various configurations*, Science and Innovation 15 (3), 79-90.

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