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Improving the mechanisms of renovation projects for dilapidated and emergency housing

During operation, each building is influenced by two groups of factors: external (natural) and internal, related to the technological or functional process taking place in the building. External or natural factors include: the impact of wind, snow, rain, solar radioactivity and temperature on structures. Internal or technological factors include: damage to structures from mechanical influences, overload of coating structures, corrosion of steel and reinforced concrete structures, damage to wooden structures by fungus as a result of violation of the temperature and humidity conditions of premises, etc. Damage to structures may occur from atmospheric influences as a result of overloading of coatings with snow load, wetting of walls due to small removal of the roof overhang or cornice and penetration of moisture through the roof, due to its unsatisfactory condition, especially in places of height difference, parapets and downspouts. Snow loads, especially in places of elevation differences, quite often create overloads on coatings, leading to deformations of load-bearing and enclosing structures, and in some cases lead to accidents. Wind loads are not dangerous for buildings made according to the project. However, given the insufficient overhang of roof overhangs and the low frost resistance of brick walls, they systematically get wet, freeze, resulting in weathering and destruction of brickwork. Quality control of work in the process of operation and repair of buildings, as well as planning and organizational preparation of building repairs is carried out by the administrative and economic department of the managing organization or the chief engineer.

Keywords: *dilapidated and emergency housing, share of emergency housing, the programme of resettlement of emergency housing, problems of dilapidated and emergency housing*

ANALYSIS OF DILAPIDATED AND EMERGENCY HOUSING ABROAD

In foreign countries, unlike the CIS countries, where there are state and municipal programmes for the elimination of emergency housing, in developed countries of Western Europe and the United States there is no concept of "emergency housing". Instead, municipal authorities, architectural authorities, social services, insurance companies and law enforcement agencies ensure that residential buildings and areas around them comply with the architectural requirements of the municipality and are in a regulated condition. In case of violation of the requirements, the municipal authorities may impose penalties on the homeowner, which may be significant and do not depend on the social status of the violator.

These measures of suppression of violations encourage homeowners to keep their property in the necessary condition and prevent the transition of housing to a state of disrepair. This approach helps to ensure the safety of citizens and keep the housing stock intact. In addition, there are social

support mechanisms in foreign countries that allow people with low incomes to receive subsidies to pay for housing or access cheap housing [1, 2].

Today, we can say that this practice is of little use for Russia due to the low involvement of citizens in solving issues of quality maintenance of the urban environment, but it can be partially applied in the future after the relevant laws and reforms.

In other countries, such as Japan, Slovakia, Lithuania and Armenia, the State and municipalities also provide significant support to residential renovation projects, including improving their energy efficiency.

In the USA, urban planning policy is used, which includes the participation of local residents and the delegation of architectural authority to the local level, as well as the replacement of outdated buildings with new ones. In general, there is a developed housing services market in Western countries and the United States, where organizations specialize in certain types of work (for example, engineering communications or heat supply systems).

To effectively manage all processes, homeowners need a manager who has knowledge of

Table 1. Solving the problem of dilapidated and emergency housing stock in foreign countries

Country	Problem solution
European countries (Germany, Great Britain, France, Sweden, etc.)	The method of reconstruction of the housing stock is used, which is based on innovative solutions in spatial planning design, which is aimed at preserving the historical appearance of the city and improving the quality of housing. Project financing is carried out jointly by the state, local governments and residents (50/50 ratio)
Japan, Slovakia, Lithuania	Plans are being developed to modernize residential buildings, taking into account the introduction of measures aimed at improving the energy efficiency of housing. Homeowners are stimulated by subsidizing and obtaining preferential loans from state funds for the development of the housing sector
Western countries, USA	Involvement of the population and local governments in urban planning policy, priority development of new territories and reconstruction of existing buildings

the secondary construction market, prices, financing tools and acts as a consultant [3].

Summarizing the above, the problem of dilapidated and emergency housing abroad is solved by reconstructing existing buildings, and not by demolition and new construction, except in the most extreme cases (Table 1).

ANALYSIS OF THE PROBLEM OF DILAPIDATED AND EMERGENCY HOUSING IN RUSSIA

In Russia, the housing stock has a low level of improvement, there are problems with major repairs, and a significant part of the population lives in cramped and unsettled housing. Living in dilapidated and emergency housing becomes life-threatening [4].

Over the past 20 years, the size of the emergency housing stock has increased significantly due to low rates of demolition or decommissioning, as well as insufficient capital repairs.

Today, solving demographic problems, as well as improving social stability, are among the key tasks facing the Russian government. An extensive number of different measures are used for this, but it is impossible to imagine improving the quality of life of the country's population without solving the housing issue.

According to VTSIOM surveys, more than two thirds of Russians expressed a desire to live in houses built after 2000. However, at the moment about 46 % of the total living area consists of dilapidated houses built between 1971 and 1995, which are gradually losing their original appearance [5–7].

In mid-2018, Decree of the President¹ was signed, which stipulated the improvement of housing conditions for five million families annually.

Within the framework of this national project, one of its goals is to sustainably reduce the uninhabitable housing stock, which means that at least 50 % of emergency housing will be settled in the reporting period.

But in the process of studying statistical data on this issue (dynamics of changes in the volume of emergency and dilapidated stock by country and region, distribution of emergency buildings by number of storeys and years of construction of buildings, etc.), we have to observe some trends that may negatively affect the results of solving this issue (Fig. 1).

Based on Fig. 1, we can note a clear negative trend towards an increase in the volume of dilapidated and emergency housing stock in recent years.

At the same time, the total cost of the dilapidated and emergency fund has already exceeded 93 billion rubles.

Taking into account the steady increase in the worn-out housing stock, capital repairs of 4 % of the total housing volume (about 100 million square metres) per year are required.

According to preliminary estimates, the cost of a comprehensive overhaul of all facilities in need is about 4.6 trillion rubles.

Statistics on the share of dilapidated and emergency funds in the Russian regions are shown in Fig. 2.

The regions were ranked according to the level of deterioration of the housing stock, including both dilapidated and emergency housing in the general housing stock. If the indicators were equal, then the regions with a smaller share of the emergency fund occupied higher places in the rating. If the share of dilapidated and emergency housing was the same, then the regions with the best dynamics of the share of dilapidated and emergency housing

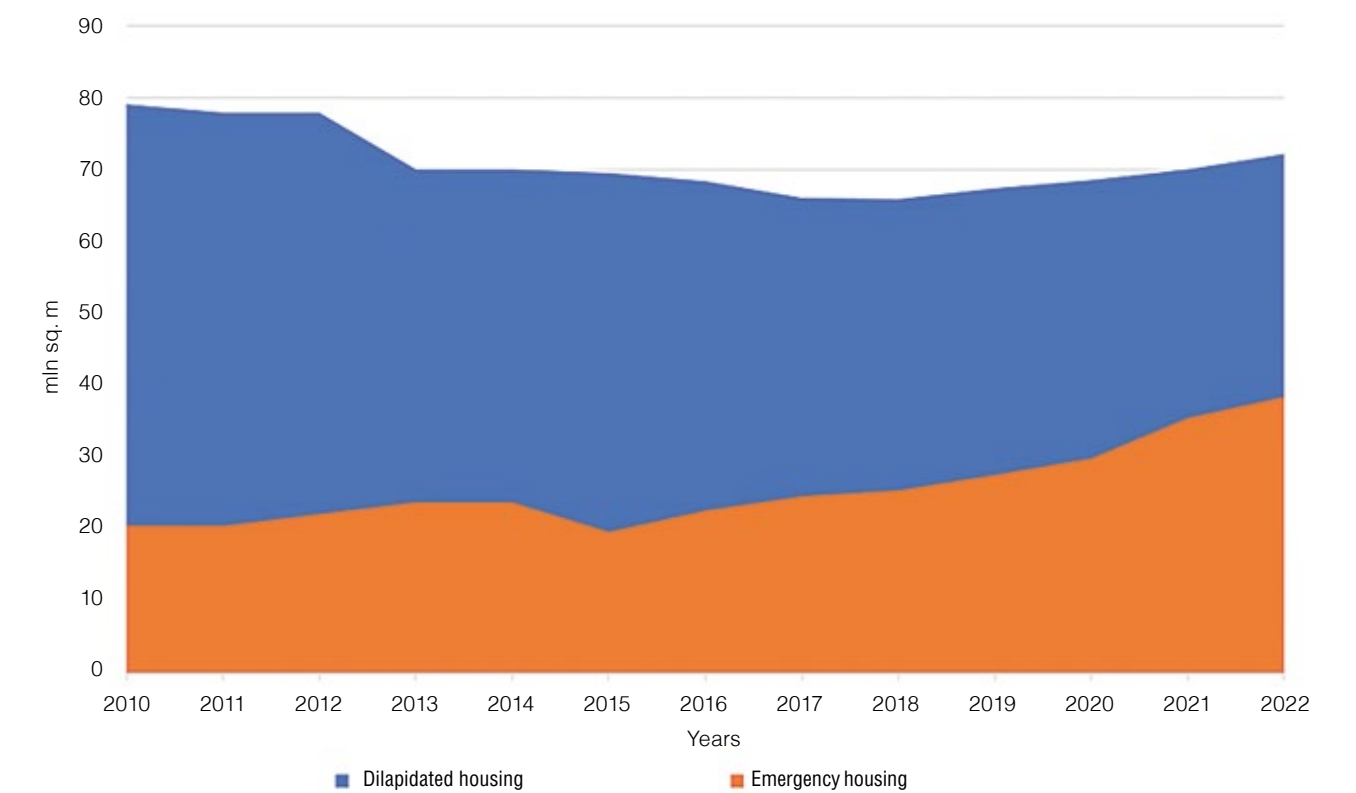


Fig. 1. Structure and dynamics of dilapidated and emergency housing stock in the Russian Federation, million square metres

¹ National Goals and Strategic Objectives for the Development of the Russian Federation for the period up to 2024 : Decree of the President of the Russian Federation No. 204; dated 05.07.2018.

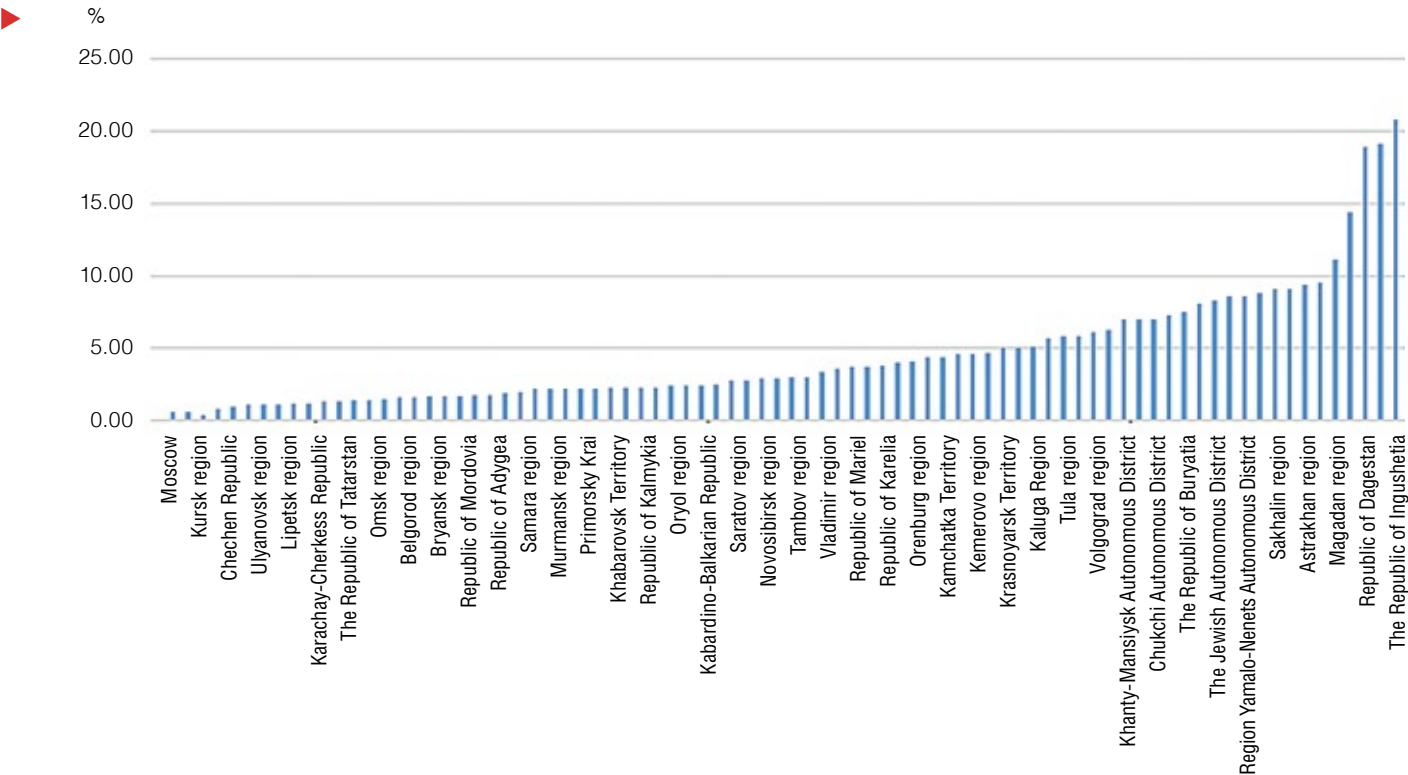


Fig. 2. Statistical information on the share of dilapidated and emergency housing stock in Russian regions

occupied higher places in the rating. At the end of the rating are the Republic of Ingushetia (20.8 % of the housing stock), the Republic of Tyva (19.1 %), the Republic of Dagestan (18.9 %), the Republic of Sakha (Yakutia) (14.4 %) and the Magadan Region (11.1 %), as well as other regions that, as a rule, are characterized by a low level of socio-economic development. They are located in the northern regions, where high deterioration of the housing stock is caused by climatic conditions and the peculiarities of the construction of settlements during the Soviet period [8–10].

Based on these statistics, we can say that there are a number of regions for which solving the problem of dilapidated and emergency housing is vital.

It can also be noted that the housing stock of Russia began to age noticeably in the late 20th – early 21st century due to the low

pace of housing construction, and today continues to age due to the deteriorating apartment buildings built from 1950 to 1970, which were a standard solution in housing construction during the reign of N.S. Khrushchev (Fig. 3, 4).

Today, Khrushchevki accounts for 46 % of the living area of all apartment buildings classified as emergency, which suggests that in the near future the problem of dilapidated and emergency housing may affect even more Russian families [11].

To solve the problem of dilapidated and emergency housing at the present stage, resettlement programmes are being implemented, which have been developed in all regions and municipalities of the Russian Federation. The state programme for the resettlement of citizens from emergency housing is based on the Decree of

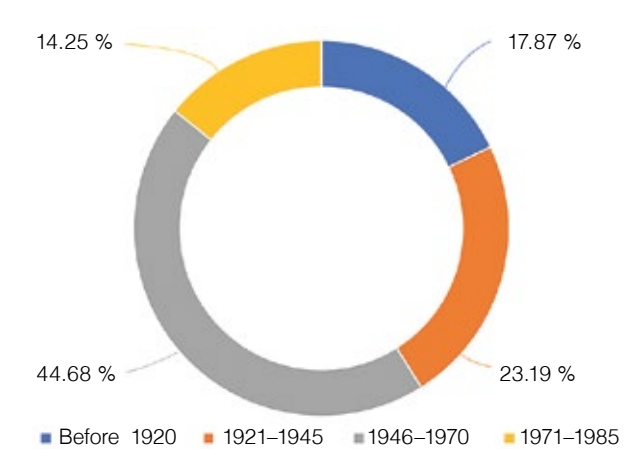


Fig. 3. The structure of the emergency housing stock in Russia (by year of construction of buildings) for 2023

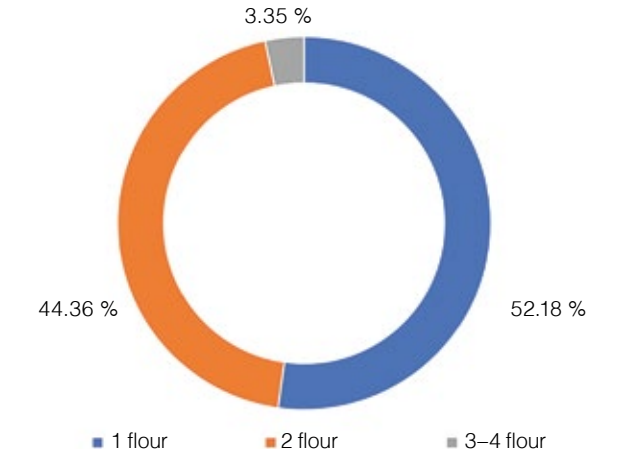


Fig. 4. The structure of the emergency housing stock of Russia (by number of storeys of buildings) for 2023

Financing of a new resettlement programme of emergency housing, billions of rubles

Source: Housing and Communal Services Reform Assistance Fund

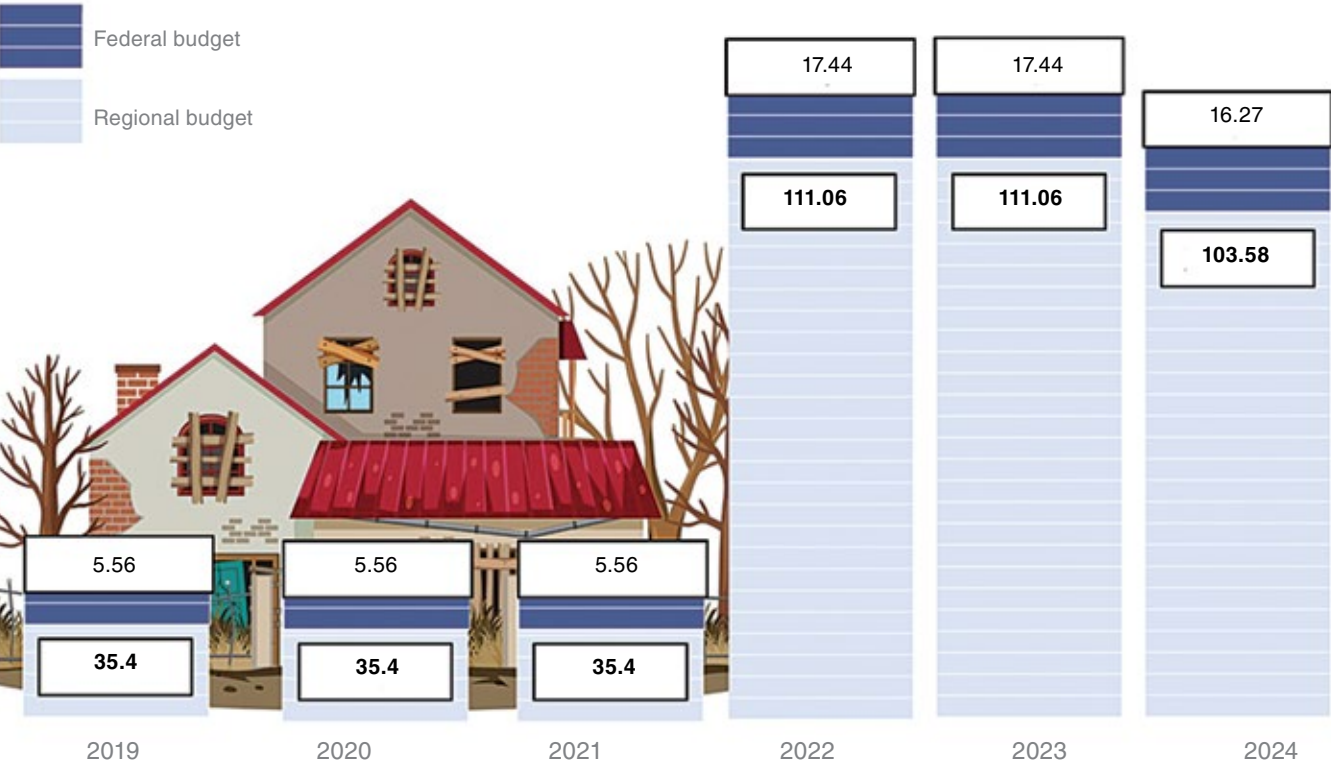


Fig. 5. Schedule of financing of the state programme for the resettlement of emergency housing

the President of the Russian Federation¹ and is included in the national project “Housing and Urban Environment” [12].

According to this project, it is planned to relocate 530.9 thousand people from 9.54 million square metres of emergency housing in the period from 2019 to 2024, as well as another 133.3 thousand people from 2.4 million square metres in 2025 using funds allocated in 2024.

As a result, 664.2 thousand people from almost 12 million square metres of emergency housing will be settled within the framework of the project. The total budget for the implementation of this federal project “Ensuring sustainable reduction of uninhabitable housing stock” is 507.17 billion rubles, including 431.94 billion rubles from the federal budget, 67.84 billion rubles from the consolidated budgets of the subjects of the Russian Federation and 7.39 billion rubles from extra-budgetary sources (Fig. 5).

More than 86 % of the total financial support for the fulfillment of this task is made up of federal budget funds [13].

A study of the dilapidated and emergency housing stock, resettlement programmes and major repairs revealed the following problems in this industry (Table 2).

EXISTING APPROACHES TO PROBLEM SOLVING

In Fig. 6 is presented a conceptual five-process model of the life cycle of accelerated and effective implementation of investment and construction projects for the resettlement of dilapidated and emergency housing. In addition to the proposed measures outlined in Fig. 1, the authors believe that some of the following ways to improve the work of these programmes may be possible, namely:

the introduction of additive technologies into construction, which can help speed up the repair and reconstruction process, as well as reduce labor costs and the cost of work [14, 15].

Additive technologies in construction are technologies that are used to create three-dimensional objects using layered application of material, for example, using a 3D printer.

Let’s take a closer look at the most common and promising additive technologies in construction:

- core production: this method is used to produce metal structures by heating the rod and stirring it with a laser;
- fusible casting: this method allows you to create three-dimensional objects from plastic by applying layers of material using a laser or a melting head;
- selective laser welding: this method is used to create three-dimensional metal objects using a laser that welds metal layers together;
- photopolymerization: this method is used to create three-dimensional plastic objects using light;
- photopolymerization with suppression of surface shadows (SLA): this method is used to create three-dimensional objects from epoxy polymers using light. At the same time, special equipment is used that suppresses shadows, which allows you to create thinner layers of material;
- metal 3D printing: this method is used to create three-dimensional objects made of metal using special equipment that applies layers of metal to the surface.

Table 2. Identified problems in the field of dilapidated and emergency housing

Problem category	Problem	Significance	How is it being solved now	Result	Offers
Regulatory documents	1. At the legislative level, there is no concept of dilapidated housing	Average	Related regulatory documents have been adopted	The concept of dilapidated housing is not legalized	To amend the legislation to clearly separate controversial issues and interpretations
Financing	1. Insufficient funding	High	Implementation of federal programmes, attracting investors	Execution of programmes at the expense of budgetary funds, the difficulty of attracting investors	Modernize the programme financing scheme
	2. Funds cannot be mastered	Average	Withdrawal of surpluses, bringing to justice	Strict control over the disbursement of funds within the framework of the programme	–
The condition of the housing stock	1. Increase in emergency housing stock	High	Development of federal resettlement programmes, maintenance of dilapidated housing stock	The level of unsuitable housing is not increasing, but the housing stock continues to become obsolete	The offer of accelerated settlement at a low interest rate within the framework of the proposed financing scheme
	2. Increase in dilapidated housing stock	High	Development of major repair programmes	Due to the lack of an effective financing model, it is not possible to include in the programme the entire housing stock in need of repair	To increase the volume of work carried out through the introduction of modern additive technologies
The quality of the housing being introduced	1. Low quality of building materials, low qualification of contractors	High	Increased control over the involvement of third-party organizations, as well as over the progress of construction	Improving the quality of newly commissioned homes	Introduction of additive technologies
Official information	1. Insufficient degree of openness of information, underestimation of indicators	Average	Control over the provision of reliable information, bringing to justice	Expert assessment and statistics provided in official sources may differ	Creation of an open and complete database in the field of dilapidated and emergency funds of the Russian Federation
	2. Misrepresentation of data for illegal activities	High	The control bodies carry out checks on the legality of certain actions on the part of local governments	There may be cases of misrepresentation of information in order to obtain additional funding	Creation of an open and complete database in the field of dilapidated and emergency funds of the Russian Federation, bringing those responsible to justice

EXPECTED RESULTS FROM THE INTRODUCTION OF MECHANISMS FOR THE RESETTLEMENT OF DILAPIDATED, EMERGENCY HOUSING

The expected results from the implementation of the proposed mechanisms for the resettlement of dilapidated and emergency housing for the state and citizens:

1. Improving living conditions for people living in dilapidated or emergency housing: the repair and reconstruction of existing housing and the construction of new residential premises will improve the quality of life of people living in such conditions.
2. Reducing the risk of accidents and accidents. Dilapidated and emergency housing is often associated with a high risk of accidents and accidents, such as fires, electrical incidents, etc. Repair and reconstruction of existing housing using additive technologies and the construction of new residential premises will reduce the risk of such accidents.

3. Improving social integration and living standards. People living in dilapidated or emergency housing often experience social isolation and a low standard of living. The proposed measures will help to improve the social integration and standard of living of such people.
4. Reducing the cost of housing: the use of additive technologies will make it possible to reduce the cost of repairs, increase the energy efficiency of buildings and reduce the costs of the population and the municipality for the operation of premises.
5. Improvement of the environmental situation. Dilapidated and emergency housing is often associated with low energy efficiency. The use of new materials in combination with the use of energy-efficient technologies will improve the environmental situation in the area.
6. Improvement of the economic situation. The renovation and reconstruction of existing housing and the construction of new residential premises will create jobs and improve the economic

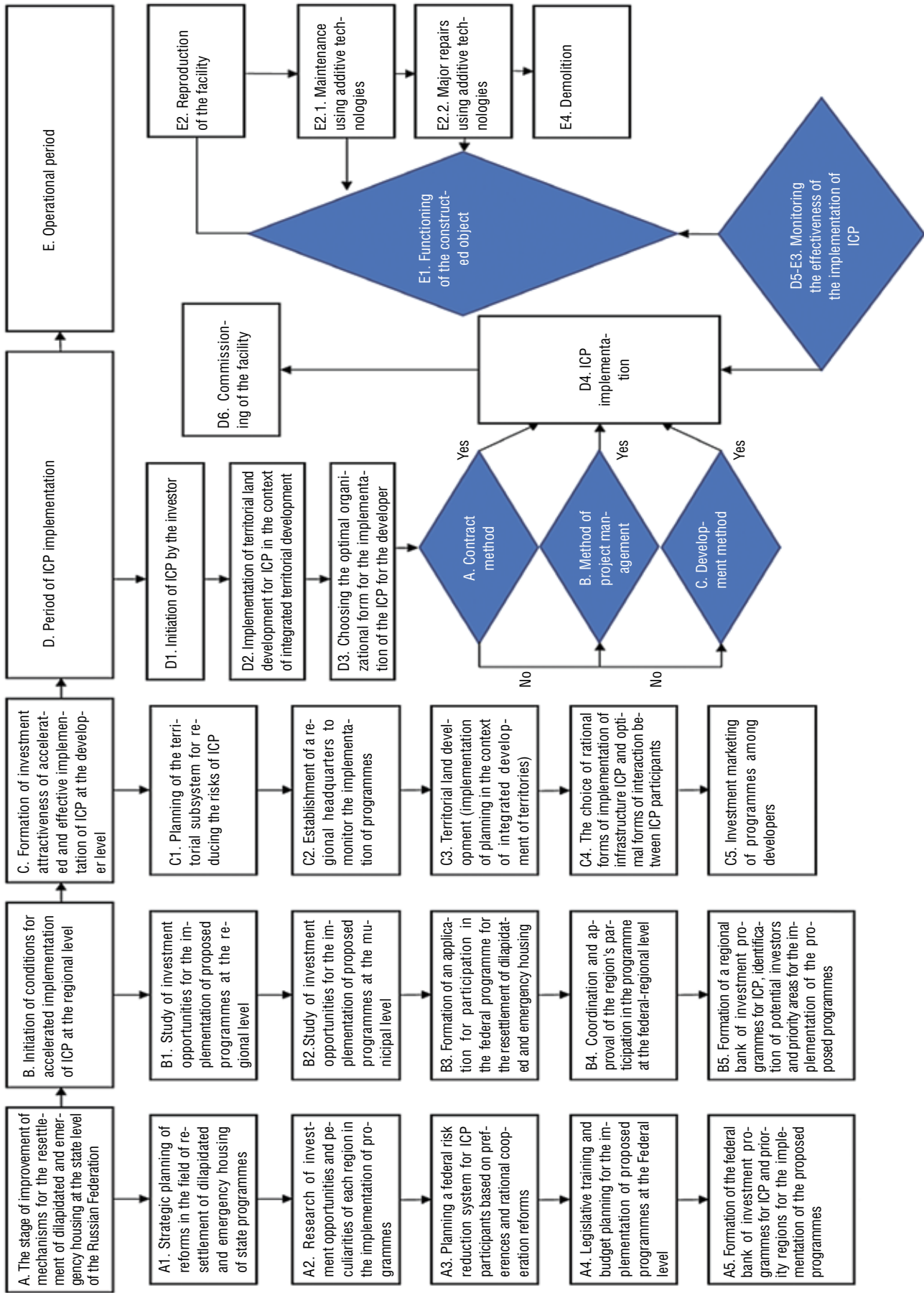


Fig. 6. A conceptual five-process life cycle model for accelerated and effective implementation of investment and construction projects for the resettlement of dilapidated and emergency housing

► situation in the city/district. This can be especially important in areas with high unemployment and low living standards.

7. Risk reduction: the resettlement of dilapidated and emergency housing reduces the risks associated with illegal buildings and illegal use of land.

It is important to note that mechanisms for the resettlement of dilapidated and emergency housing should be developed and implemented taking into account local conditions and needs, as well as taking into account the social, economic and environmental situation.

CONCLUSIONS

The expected results from the implementation of the proposed mechanisms for the resettlement of dilapidated and emergency funds for developers allows for:

1. Income increase: the resettlement of dilapidated and emergency housing can become a new source of income for developers who will be able to profit from the reconstruction and repair of such facilities.

2. Improving reputation: the introduction of mechanisms for the resettlement of dilapidated and emergency housing can help improve the reputation of the developer in the eyes of society and authorities.

3. Increasing competitiveness: a new scheme for financing the resettlement of dilapidated and emergency housing can improve the position of the developer in the market, as he will be able to compete more effectively with other companies.

4. Attracting additional investments for business expansion for the implementation of projects for the repair and reconstruction of dilapidated housing and the resettlement of the emergency fund.

However, it should taken into account that the resettlement of dilapidated and emergency housing also brings a number of difficulties for developers. For example, the reconstruction and repair of such facilities can be complex and time-consuming, requiring large financial and time costs. In addition, there may be problems with attracting investments and reducing profits for a while.

That is why it is important to select companies carefully for the implementation of these projects.

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Совершенствование механизмов проектов реновации ветхого и аварийного жилья

В процессе эксплуатации каждое здание находится под воздействием двух групп факторов: внешних (природных) и внутренних, связанных с происходящим в здании технологическим или функциональным процессом. К внешним или природным факторам относятся: воздействие на конструкции ветра, снега, дождя, солнечной радиоактивности и температуры. К внутренним или технологическим факторам относятся: повреждения конструкций от механических воздействий, перегрузка конструкций покрытия, коррозия стальных и железобетонных конструкций, поражение деревянных конструкций грибом в результате нарушения температурно-влажностного режима помещений и т.д.

От атмосферных воздействий могут возникнуть повреждения в конструкциях в результате перегрузки покрытий снеговой нагрузкой, намокания стен из-за малого выноса кровельного свеса или карниза и проникновения влаги через кровлю в связи с неудовлетворительным ее состоянием, особенно в местах перепада высот, парапетов и водосточных воронок. Сне-

говые нагрузки, особенно в местах перепада высот, довольно часто создают перегрузки на покрытия, приводящие к деформациям несущих и ограждающих конструкций, а в некоторых случаях приводят к авариям. Ветровые нагрузки не являются опасными для зданий, выполненных по проекту. Однако, учитывая недостаточный вылет кровельных свесов и низкую морозостойкость кирпичных стен, они систематически намокают, промерзают, в результате чего происходит выветривание и разрушение кирпичной кладки.

Контроль качества выполнения работ по эксплуатации и ремонту зданий, а также планирование и организационная подготовка ремонта зданий осуществляется административно-хозяйственным отделом управляющей организации или главным инженером.

Ключевые слова: ветхое и аварийное жилье, доля аварийного жилья, программа расселения аварийного жилья, проблемы ветхого и аварийного жилья

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