Availability of innovative housing from the perspective of sustainable construction

Albina Afanasyeva\textsuperscript{1} [0000-0003-0252-7968], Svetlana Fedorova\textsuperscript{1} [0000-0003-1092-4875] and Guzalia Yulbarisova\textsuperscript{1} [0000-0002-2142-1192]

Kazan State University of Architecture and Engineering, Kazan, 420043, Russia
E-mail: afanaseva.ksaba@mail.ru

Abstract. One of the most pressing socio-economic tasks of modern Russia, on which the prospects for its modernization depend, is the development of sustainable construction as a factor in improving the quality of life of the population. The achievement of this goal is largely mediated by the solution of the housing issue, its comfort, environmental friendliness and innovation. In this regard, the current and future dynamic development of housing construction requires the use of only advanced energy-efficient and innovative technologies and building materials. Socio-economic accessibility is a fundamental factor in the development of ecological construction using innovative technologies. However, the use of expensive technologies, on the one hand, is primarily associated with a long payback period, which means complete rejection of mass construction, and on the other hand, the increase in the cost of housing, which means an increase in the availability coefficient. Indeed, today more Russian citizens have an increasing problem of purchasing housing, while the availability of innovative housing remains a priority only for a select category of citizens. This article analyzes the problems of socio-economic accessibility of innovative housing from the perspective of sustainable construction through the prism of implementation of legislative norms and strategies. Keywords: accessibility, housing, sustainable construction, socio-economic system, concept of sustainable development, innovative housing.

1 Introduction
Considering the social problems of sustainable construction in the system of goals of socio-economic development of the region, it should be noted that the main task is to increase the availability of innovative housing, as well as to create conditions for achieving a balance in the formation of the national and regional economy by reducing the existing inter-territorial differences in the level of criteria for eco-building.

Accordingly, to form the principles of sustainable construction, it is necessary to determine the market for affordable innovative housing from the perspective of the development of the social and economic system of the region. Thus, to increase social accessibility, it is necessary to solve the problem of improving the quality of life of the population and the resulting growth of the country's human potential. Improving the quality of life can be achieved by increasing the level of income, providing jobs, as well as increasing the minimum and rational consumer budget. In this regard, one of the main problems is the insufficient growth rate of sustainable housing construction. This factor can be increased by attracting investment in the construction of affordable innovative housing. Another inhibiting factor is the rapid and uncontrolled growth of prices for such housing. The change in this circumstance is influenced not only by external reasons, but also by internal ones, such as the cost per square meter. This change is difficult to control, but it is possible with the application of legislative regulation, analysis and forecast of evaluation criteria. The inactivity of the population, which can be transformed by the provision of various housing programs, has an undeniable influence. And especially, the state's assistance in purchasing affordable innovative housing on the market is important.

The purpose of this work is to study the problem of economic accessibility of innovative housing from the perspective of sustainable construction and develop recommendations for their solution. The guidelines for the study are targeted programs, reports of ministries and departments in the field of sustainable construction, as well as the works of the following scientists: Klunder G. conducted a
study in search of the most eco-efficient strategies for sustainable housing construction [1], Carvajal-Arango D., Bahamón-Jaramillo S., Aristizábal-Monsalve P., Vásquez-Hernández A., Boterób L. tried to establish a connection between the philosophy of lean and sustainable designs, and to determine how lean construction practices contribute to each dimension of sustainability in stage design for the construction of [2], Tokbolat S., Karaca F., Durdyev S., Calay, R. explored the driving forces and barriers to sustainable construction [3], Kibreab G. reviewed policies of the governments of developed countries and restrictions on sustainable construction [4], Huovila P. explored sustainable construction through the implementation of environmentally friendly projects [5], Bossink B. showed the introduction of innovations in the field of sustainable housing construction through public private partnerships [6].

The scientific novelty of the work is characterized by the identification of the relationship between the income of the population, the legal burden that restricts the implementation of the concept of sustainable construction and development of affordable innovative housing, as well as the purpose and nature of ways to solve the identified problems.

2 Methods

The scientific research is based on modeling situations taking into account the actions of various government strategies and the consequences of their application. For simplicity and brevity of consideration of the complex of many priority areas, their direct and indirect impact on the availability of innovative housing is highlighted only on the examples of the national project "Housing and urban environment" and the Federal project "Formation of a comfortable urban environment", as well as taking into account the nature of the distribution of citizens by income. The impact of other projects is taken into account indirectly or with reference to other author's works (without analyzing their respective strategies).

The main theoretical basis is reflected in a number of scientific studies. For example, Griffith A. considers the concept and principles of IMS, its potential application and contribution to sustainable construction, as well as issues for the future management of construction processes [7], Hecht A. considered a triad of factors and offered recommendations for the development of positive relations between them in the perspective of sustainable development [8], Kibert Ch.J., Sendzimir Ja., Guy B. describe the view of the construction industry based on natural systems and industrial ecology in order to bring the construction industry to sustainable development [9], Shen L.-y., Ji Y.-b., Tam V., Tam L. consider the main problems associated with conducting a feasibility study of the project in accordance with the practice of sustainable construction [10], Dewick, P., Miozzo, M. investigate factors that affect the development and implementation of sustainable technologies in construction [11], Porfiriev B., Dmitriev A., Vladimirov I., Tsygankov A. Consider sustainable development planning and green building for building safe cities in an international perspective [12], Rodriguez-Melo A., Mansouri S. A. have established strategic advantages for sustainable construction [13], Dong N., Fu Y., Xiong F., Li L., Ao Y., Martek I. explore project management processes for sustainable construction [14], Pett J., Vorst R. consider criteria for moving towards sustainable housing [15], Rohracher H. offers a number of social strategies for managing technical changes towards sustainable construction [16].

However, the practical aspects of the development of sustainable construction in modern conditions in relation to Russia have not been actively applied. The need for this kind of research is primarily due to the fact that sustainable construction is a socially significant problem.

3 Results and Discussion

Creating decent and comfortable housing conditions for citizens is characterized by indicators of modern high-quality and, most importantly, affordable housing. In turn, the creation of such housing is possible through the introduction of technological innovations in the construction complex. Indeed, this approach can lead to an increase in the socio-economic quality of life of the population, attracting investment and qualified personnel to the economy. However, the development of innovative housing
construction that meets the indicators of accessibility, comfort and environmental friendliness is impossible without a number of criteria:

1) creation of innovative principles of sustainable architecture that covers all stages of construction, including planning, coordination, development and management of land resources with an innovative sustainable design of the territory;

2) development of technologies and energy-saving building materials;

3) creation and implementation of innovative principles of sustainable housing construction.

It is impossible to build an economic and urban planning base in the absence of a professional innovative approach to housing. It is necessary to improve the efficiency of design solutions aimed at saving resources, creating differentiated housing in terms of comfort and cost to meet the social needs of various segments of the population, as well as increasing the degree of industrialization, reducing labor costs in construction and reducing the time for building houses. A harmonious habitat should include sustainable land-use practices with a circular flow that seeks to create compact cities and reduce the area of new land occupied by urban sprawl. Accordingly, the development of innovative affordable housing requires optimal participation of the state on the basis of programs, the development of the legislative framework, as well as support for construction organizations that use advanced construction materials and energy-efficient technologies.

In our opinion, only a comprehensive approach can achieve the necessary balance in providing the population with affordable innovative housing.

Traditionally, the housing affordability index is used to assess the population's ability to meet housing needs. The most widely used basic indicator, which expresses housing affordability as the ratio of the cost of living space for a household of a certain family composition and the average annual income of such a household. Thus, the affordability indicator allows you to determine how many years it takes for an average family to buy a house of the minimum area allowed by the norms, without taking into account the amount of money needed to meet current needs (food, clothing, education, treatment, recreation, etc.).

According to a sociological survey in 2019, 35 % of the population is not satisfied with their housing conditions, respectively, 54 % - with their financial situation.

The price of 1 sq. m. according to Tatstat is on average 84.8 thousand rubles, which exceeds the value of the same indicator of the previous month by 0.24 %. In the primary housing market, the average price of 1 sq. m. was 83.8 thousand rubles (+3.84 % compared to the previous month) [17]. In the case of innovative housing built in accordance with green standards, the cost exceeds by 30-40 % of the average market value.

According to data from Tatstat, the average per capita income for 2019 in Republic of Tatarstan is 33,371 rubles per month, which is 5.2 % more than in the previous period. An increase in this indicator has a positive impact on the ability of the population to afford more when allocating the budget. Using data on household income and the cost per square meter of housing, you can calculate the housing affordability index (affordability coefficient = KD). If the conditional size of the apartment with a total area of 38 square meters, this coefficient will be equal to 7.95. Accordingly, it takes 8 years to accumulate funds to buy a home.

Of course, the coefficient KD will increase with increasing number of children in the household, and with the rising cost of housing (which is important to calculate the innovation house, which cost 30-40 % above average).

This modeling of situations allows taking into account additional criteria for influencing the availability indicator, which greatly increases the coefficient itself. For example, household expenses for food, housing and utilities, taxes, clothing, and others.

Thus, we can conclude that families with children do not have the opportunity to purchase housing on their own, as confirmed in the work of the authors Romanova A., Zagidullina G., Afanasyeva A., Hkairetdinova R. [18], and even more innovative. With the increase in the number of people in the family, i.e. children, family expenses grow and do not allow forming a savings part for the purchase of affordable housing (including innovative).
The existing incentive methods presented in the works of authors Afanasyeva A., Guseinova A. [19], Guseinova A., Afanasyeva A. [20], as well as laid down in various programs and projects, are unfortunately insufficient for the development of sustainable construction and creation of innovative housing.

However, it is impractical to refuse to implement sustainable construction in the country's economy, since the essence of the idea is to minimize the consumption of natural resources, such as water and electricity, and use recycled, non-toxic raw materials. Eco-building is a unique approach to modern construction, which ensures a harmonious and safe interaction of people with the environment, and also takes care of the lives of future generations.

4 Conclusions
The current situation in the housing sector in Russia allows concluding with a sufficient degree of certainty that the measures currently being taken to create comfortable housing conditions for citizens, using various financial instruments, do not allow creating a decent living environment and improving the quality of life, and therefore the level of socio-economic development of the Russian Federation. It is impossible to solve this group of problems only by clearly implementing national projects on affordable and comfortable housing. It is necessary to review the principles of functioning of the economic systems themselves (such as housing construction), which provide for the formation of environmentally comfortable housing, the intensification and reduction of expenditures on housing and communal services, sustainable development and financial self-sufficiency.

Housing is one of the main, priority needs for every person, every family and largely determines their social and economic behavior. The availability and quality of housing affects a person's health, psychological state, industrial activity, reflects the material well-being of citizens, and the housing stock, its durability and comfort are the real national wealth of the country.

The current situation in the housing sector in Russia allows concluding with a sufficient degree of certainty that the measures currently being taken to provide citizens with comfortable and affordable housing, which are based on artificially maintaining the demand for housing using various financial instruments (certificates, subsidies, mortgages, etc.), do not affect a significant part of the population in need of improving housing conditions. And the strategy of innovative housing, in our opinion, will create an even greater housing problem, reproducing far from affordable housing with high operating costs.

The formation of a market for affordable innovative housing and mechanisms for sustainable construction is currently one of the most significant problems for the whole of Russia.

The main difficulty lies in the lack of tools for effective management of sustainable construction aimed at improving housing affordability and effective participation in the project of all housing construction entities. And only at the initial stage of development of sustainable construction, increasing the regulatory role of the state in activating the market of affordable innovative housing, will allow to establish the optimal vector of development in the interests of all participants in the construction process.

Thus, the idea of sustainable construction can and should become our national idea and play an important role in determining state priorities and prospects for further housing reform.

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