

Housing construction as a driver of improving the quality of life of the population in conditions of sustainable development

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Abstract. In modern conditions of sustainable development of society, the problems of improving the quality of life of the population come to the fore, the solution of which is a priority when developing programs for the socio-economic development of the country. The housing construction industry plays one of the most important roles in solving this problem. The article defines the essence of sustainable development in relation to the housing construction industry, discusses in detail the social and environmental aspects of sustainable development of the industry. Using statistical tools, the authors determined the relationship between the indicators "GRP per capita" and "Commissioning of residential buildings per capita".

1 Introduction

This study is devoted to determining the role of housing construction in ensuring the quality of life of the population in conditions of sustainable development and is due to the transformation processes taking place in the economy, connected, on the one hand, with the transition to the digital economy, and, on the other, with institutional changes in the housing construction industry.

Further development of the economy implies the rejection of the absolutization of economic growth to the detriment of solving social and environmental problems [1]. In accordance with the goals of sustainable development of society, there is an interest in the creative capabilities of man in economics, which is especially clearly seen in economic research on the housing construction industry. At the same time, the analysis of the research carried out in recent years allows us to conclude that the problem of the quality of life of the population is becoming not a by-product, but the main target of the economic development of society. Having established improving the quality of life of the population as the main goal of the policy, the state develops and implements many different national projects, strategies and programs, for the effective implementation of which it is necessary, firstly, to clearly identify the components of the quality of life of the population, and secondly, to determine the relationship between these projects, strategies and programs to achieve the goal of improving the quality of life population. When assessing the quality of life of the population in the country as a whole and in its individual regions, it is necessary to determine the relationship of the socio-economic situation of the region with the quality of life of its population and the development of human capital.

The Decree of the President of the Russian Federation "On the national goals and strategic

objectives of the development of the Russian Federation for the period up to 2024" dated May 7, 2018 No. 204 defines targets for improving the quality of life. The Government of the Russian Federation, noting the existence of the problem of housing affordability for citizens, determines the provision of affordable housing for citizens as one of its main tasks when forming the directions of socio-economic policy. In turn, the construction of social infrastructure facilities is necessary to create conditions for ensuring sustainable development of territories. The main directions of housing construction development in the country are reflected in the Strategy for the Development of the Construction industry and Housing and Communal Services of the Russian Federation until 2030 with a forecast for the period up to 2035 (Decree of the Government of the Russian Federation No. 3268-r dated October 31, 2022), which is focused on increasing the competitiveness of the housing construction industry and the use of modern innovative technologies in it (economic aspect), improving the quality and standard of living of citizens (social aspect), as well as reducing the negative impact on the environment (environmental aspect).

2 Materials and Methods

The relevance of the research topic is confirmed by the increased interest, on the one hand, in the problems of housing construction development, on the other hand, in the problems of the quality of life of the population, as well as the sustainable development of society as a whole. This is especially true for issues affecting the ongoing institutional changes in the housing construction industry, social changes in society, the digitalization of the economy, various social and environmental aspects of sustainable development, as well as the impact of these phenomena on each other.

The purpose of the study is to determine the role of housing construction in ensuring the quality of life of the population in conditions of sustainable development.

To achieve this goal, it is necessary to solve the following tasks, which determined the logic of the presentation of the material: 1) to define the essence of sustainable development in relation to the housing construction industry, highlighting the social and environmental aspects; 2) to characterize the social aspect of sustainable housing development, highlighting the main indicators of the quality of life of the population and determining the role of the construction industry in achieving them; 3) to identify the relationship between the indicators "GRP per capita" and "Commissioning of residential buildings per capita"; 4) to consider the environmental aspect of sustainable housing development.

The methodological basis of the study was the provisions of economic theory, the concept of sustainable development, as well as the theory of the quality of life of the population.

In accordance with the set goal and formulated tasks, general scientific (systemic, dialectical, analysis and synthesis, etc.) and special scientific methods (correlation and regression, comparison) were used in the implementation of the study.

The concept of "quality of life" was introduced into scientific circulation in the 60s of the twentieth century by J. K. Galbraith, who characterized the quality of life as a set of all kinds of public goods received by a person with the growth of the intellectual needs [2]. S.A. Ayvazyan, M.Yu. Afanasyev and A.V. Kudrov proposed the use of an integral indicator of the quality of life of the population, the formation of which was based on an expert method and a simulation model [3]. The works of E.Y. Legchilina are devoted to the study of interregional inequality in the quality of life of the population and the development of methodological tools for its assessment [4]. M.V. Postnova, E.A. Smirnova and N.R. Alexandrova propose a methodology for assessing the quality of life of the population of the region [5]. In turn, L.A. Kovalerova, E.A. Savinova and I.V. Shapovalova consider the level of quality of life of the population as a factor of successful development of the country as a whole [6]. A. Campbell, R. Converse, and W. Rogers developed the concept of social well-

being of the quality of life [7]. J. K. Galbraith researched the issues of obtaining public goods and meeting the intellectual needs of the individual. In addition, many theoretical problems and practical aspects of studying the quality of life of the population are considered in the works of Russian scientists V.N. Bobkov, A.A. Gulyugina, V.M. Zherebin, M.N. Makarova, A.N. Romanov, E.H. Tukhtarova, as well as foreign authors J. Attali, R. Giannoccaro, D. Meadows, P. Rodriguez, P. Zeithaml, and others.

The works of many Russian authors are devoted to the problems of the development of the housing construction industry. So, T.Yu. Ovsyannikova and M.N. Nikolaenko investigate the issues of assessing the quality of the urban environment [8], E.A. Avdeeva, T.A. Averina, L.V. Kochetova – quality and standard of living in large cities in the context of the development of high-rise construction [9], E.V. Voskresenskaya, L.G. Vorona-Slivinskaya, L.V. Achba – strategic priorities for the development of the housing construction sector [10], A.P. Samodolov, O.A. Samodolova, E.V. Nikolaenko – features of the development of Smart Homes [11], V.M. Tushina – problems of the development of low-rise housing construction in Russia [12]. Also, the works of domestic researchers A.N. Asaul, A.G. Gryaznova, A.N. Larionov, Yu.P. Panibratov, V.V. Peshkov, I.V. Fedoseyev, as well as foreign scientists G. Arku, B. Boyce, G. Garrison, I. Johnson, D. Cooper, G. Polyakovsky, A. Ringa, U. Shepkel and others are devoted to the sectoral aspects of housing construction development.

3 Findings and Discussion

3.1 The Essence of Sustainable Housing Development

The main priority of the socio-economic development of the Russian Federation at present is to improve the quality of life of the population and ensure favorable living conditions. At the same time, it is the large cities in which housing construction is developed that are the leaders of regional and national development [9]. The priorities for the development of the housing construction industry should be based on the principle of ensuring the quality of life by improving the living conditions of citizens, as well as the principle of affordable housing as an indicator of sustainable development [10]

The construction industry is a flagship in the development of industry, it is in it that the environmental, social and economic aspects of sustainable development are particularly manifested. Unfortunately, there are various kinds of problems in this area, they not only slow down development, but also complicate the transition to a stable state of the industry.

In turn, the practical application of the principles of the concept of sustainable construction by various participants in the construction activity contributes to the search for directions to solve many problems of the housing construction industry – environmental (reducing negative environmental impact), social (meeting the demand of the population for affordable comfortable housing), economic (the formation of modern business models and the use of innovative technologies in industries). In the construction industry, the main problem of applying the sustainable development strategy is the lack of a regulatory framework that defines and controls the standards for evaluating companies to comply with these principles.

It should be noted that in the modern world it is already impossible to do without the introduction of residential ecological real estate created on the basis of social partnership to achieve sustainable development of housing construction. Without exception, all participants are involved in this process – from investors to management companies. Increasingly, enterprises in the construction industry are choosing priority green technologies. The choice is more based on making a profit, because it is eco-directed technologies that arouse great interest among investors.

Unfortunately, the processes taking place in the economy today are hindering the widespread use of green technologies in the field of housing construction. As a result, there is a depreciation of fixed assets, a shortage of working capital and, as a result, a decline in business activity in the industry as a whole. In addition, the issue of transition to eco-technologies in the social sphere is very acute. Due to the lack of a common opinion and form of thinking, decision-making, recognition and, as a result, the desired transition to green technology may be outside the legal sphere among various social groups. The process of introducing green technologies into the construction sector is the creation of joint projects by engineers, developers, designers, planners and politicians and interaction with citizens through discussion and participation processes.

Social and environmental problems associated with traditional construction, in turn, generate climatic, nature protection and environmental hazards, since all these areas are inextricably linked with each other. Interdisciplinary synergy will help to develop, apply and evaluate the impact of jointly developed techniques, which, in turn, will be a lever stimulating the development of sustainable technological changes. In the future, they will contribute to the formation of various forms of production and consumption that reduce the negative impact on the environment.

Due to the above-mentioned features of the introduction and use of innovative technologies in the construction sector, the principles of sustainable development are applicable and widespread at the moment only in the segment of business class and elite class housing. This is due to the fact that prices per square meter of economy housing are already quite high today, and compliance with additional development principles, for the most part, leads to an increase in the cost of the construction process. At the same time, it is these characteristics that determine the quality of housing today, and ultimately affect the quality of life of the population.

3.2 The social aspect of sustainable development of housing construction and the role of the industry in improving the quality of life of the population

The quality of life of the population should be understood as the degree of satisfaction of the needs of the population in certain social conditions relative to the accepted norms. A narrower concept is the standard of living, derived from indicators of economic development and reflecting the well-being of the population. An important indicator of the quality of life of the population is the level of housing provision, which determines the comfort for the normal life of the population.

An extensive system of indicators characterizing various socio-economic and environmental aspects is used to assess the quality of life of the population [13]. The main indicators for assessing the quality of life include housing conditions and the provision of consumer goods for long-term use [14]. Thus, the development of the construction industry in general (and housing construction in particular) should contribute to improving the quality of life of the population.

It should be noted that the main priorities of the state program of the Russian Federation "Providing affordable and comfortable housing and utilities to citizens of the Russian Federation" (approved by Government Decree No. 1710 of December 30, 2017) are to ensure the availability of the purchase, construction or rental of housing for at least 2/3 of the country's citizens. Information on the achievement of a number of program indicators is presented in Table 1.

Table 1. Information on the achievement of the indicators of the state program "Providing affordable and comfortable housing and communal services to citizens of the Russian Federation" at the end of 2022

Indicator	Plan	Fact	Plan execution, %
The number of square meters of the resettled uninhabitable housing stock, thousand.	5692,54	7815,45	137,29
The number of citizens resettled from the housing stock unsuitable for living (cumulative total), thousand people.	320,425	464,51	144,97
Volume of housing construction, mln m ²	80	102,713	128,39
The number of families who have improved their living conditions, million rubles.	3,6	3,7	102,78
Percentage of the population satisfied with housing conditions and services, %	50	68,3	136,60
The share of the population of the Russian Federation provided with high-quality drinking water from central water supply systems	87,6	87,8	100,23

The planned targets for the end of 2022 have been exceeded. Thus, the number of citizens resettled from the housing stock unsuitable for habitation at the end of 2022 amounted to 464.51 thousand people by 44.97% more than expected, and the number of square meters of housing in this category is 37.29% more. In general, the volume of housing construction has already exceeded the target of the 2024 program (90 million m²). At the same time, according to the Russian Ministry of Economic Development, the degree of effectiveness of the state program in 2020-2021 is below average.

Despite all the measures implemented by the state, the problem of extremely uneven commissioning of residential premises remains in Russia, as evidenced by the data in Table 2.

Table 2. Assessment of the unevenness of GRP indicators and the volume of commissioning of residential buildings in the Russian Federation in 2020

Territory	Coefficient of variation, %			
	GRP, billion rubles.	GRP per capita	Commissioning of residential buildings	Commissioning of residential buildings per capita
Russian Federation	199,33	125,10	132,03	46,39
Central Federal District	240,82	50,94	152,52	31,51
Central Federal District (without Moscow)	140,16	48,42	160,89	32,15
Northwestern Federal District	233,61	210,44	431,86	80,73
Southern Federal District	71,29	22,90	85,36	37,76
North Caucasian Federal District	87,08	23,97	69,95	30,83
Volga Federal District	70,85	24,80	65,23	17,56
Ural Federal District	53,99	184,28	73,76	42,64
Siberian Federal District	84,92	38,76	70,18	28,51
Far Eastern Federal District	69,38	105,96	93,84	70,89

Based on the data presented in Table 2, it can be concluded that the gross regional product is formed extremely unevenly in the Russian Federation. At the same time, the most significant fluctuations are observed in the Central and Northwestern Federal Districts, which is due to the GRP of these districts taking into account the indicators of Moscow and St.

Petersburg. If the city of Moscow is excluded from the calculations, the scope of deviations from the average GRP in the federal district decreases.

A similar situation is observed in the uneven distribution of the volume of commissioning of residential buildings in the regions. But in the Central Federal District, the Moscow Region has become the main leader in housing construction. In the Northwestern Federal District, the volume of residential buildings commissioning was almost equal in the city of St. Petersburg and the Leningrad Region and exceeded 3.3 million m². At the same time, only 17.8 thousand m² of residential buildings were commissioned in the Nenets Autonomous Okrug.

Within the framework of this study, the uneven indicators of GRP and commissioning of residential buildings per capita were analyzed. There is also a strong difference in indicators both within the country and in the federal districts. The largest scale of GRP per capita is observed in the Ural Federal District, where in the Yamalo-Nenets Autonomous Okrug it is 5 million rubles per person, and in the Kurgan Region – 0.3 million rubles. In the Northwestern Federal District, the Nenets Autonomous Okrug is in the lead – 5.19 million rubles per capita, provided that in the city of St. Petersburg this value is 0.97 million rubles. According to the indicator "Commissioning of residential buildings per capita", the largest scale is observed in the Far Eastern Federal District. But in these regions, the indicator under consideration remains quite low. For example, in the Chukotka Autonomous Okrug there is only 0.06 m² per capita, in the Magadan Region – 0.08 m². Only in the Sakhalin Region the indicator exceeded 1.04 m² per capita. In the Northwestern District, the difference between the maximum indicator of 1.77 m² in the Leningrad Region and the minimum indicator of 0.07 m² in the Murmansk Region is 1.7 m² per capita. In other districts, deviations of indicators from the average level for the region can be considered acceptable.

At the same time, an interesting fact is observed that if the volume of GRP depends on the volume of commissioning of residential buildings, then there is no such dependence between the same indicators per capita, as evidenced by the values of the correlation coefficients presented in Table 3.

Table 3. Estimation of correlation coefficients between GRP and the volume of commissioning of residential buildings in the Russian Federation in 2020

Region	GRP and volume of commissioning of residential buildings		GRP per capita and volume of commissioning of residential buildings per capita		t-critical with a probability of 95%
	Pearson correlation	t-statistics	Pearson correlation	t-statistics	
Russia	0,9812	46,318	-0,0742	0,678	2,639
Central Federal District	0,6184	3,148	0,0552	0,221	2,12
Central Federal District (without Moscow)	0,9956	42,405	0,7634	4,577	2,131
Northwestern Federal District	0,7622	3,532	-0,1926	0,589	2,262
Southern Federal District	0,9613	8,547	-0,2512	0,636	2,447
North Caucasian Federal District	0,9255	5,465	-0,0424	0,095	2,571
Volga Federal District	0,9242	8,385	0,1264	0,441	2,179
Ural Federal District	0,1200	0,242	-0,4171	0,918	2,776
Siberian Federal District	0,7702	3,415	0,3664	1,114	2,306
Far Eastern Federal District	0,9101	6,587	0,1854	0,566	2,262

The only federal district in which it is possible to talk about a significant relationship between GRP per capita and the commissioning of residential buildings per capita is the Central Federal District, subject to the exclusion of data on the city of Moscow. At the same time, there is also no need to talk about the identification of a connection between GRP and the commissioning of residential buildings in the Ural Federal District.

In general, we can say that in some regions people receive income, and in others they buy housing. For example, in the Siberian Federal District, the maximum value of GRP per capita is formed in the Krasnoyarsk Territory, the Irkutsk Region is in second place, and the Republic of Khakassia is in third place. The Novosibirsk Region is among the leaders in terms of the volume of residential buildings commissioned per capita (Figure 1).

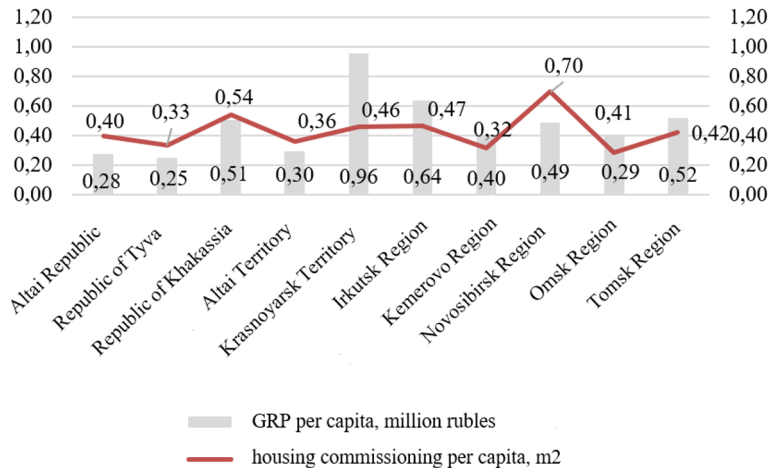


Fig. 1. Dynamics of GRP per capita and commissioning of residential buildings per capita in the Siberian Federal District in 2020.

Such a situation may be with a low level of quality of life in a number of regions, in difficult climatic conditions. This once again confirms the need to implement a comprehensive state policy to ensure and equalize the level of quality in the regions.

3.3 Environmental Aspect of Sustainable Housing Development

In the modern world, the role of environmental indicators in various industries causes large-scale discussions, ranging from the complicated process of extraction and consumption of energy resources to the global process of environmental pollution. Experts dealing with these issues agree that household waste makes up a small percentage of the total anthropogenic impact on environmental pollution, while industrial enterprises and companies cause much more serious damage to the ecology of the planet. This is due to the lack of a proper level of responsibility for natural resources, as well as their inappropriate use in the enterprise.

This problem is being addressed, including in the form of state support, expressed in a number of environmental protection programs. The state and industrial giants are aware that it is the rational consumption of environmental, natural, energy and material-saving resources that will lead in the strategic perspective to the possibility of increasing the added value of manufactured products by gradually reducing the level of costs. Among the enterprises that have a negative impact on the environmental situation in the world, it is usually customary to distinguish not only such industries as: chemical industry, ferrous and non-ferrous metallurgy, oil refining, but also the production of building materials.

With an eco-sustainable approach, residential buildings become an integrated part of the

habitat, which makes it possible to improve the quality of human life and nature. An eco-sustainable approach forces the formation of various innovative technological and financial solutions. The obvious advantages of an eco-sustainable approach in housing construction are primarily associated with improving the quality of housing and the level of comfort (which contributes not only to increasing efficiency, but also to improving people's health), with reducing construction and maintenance costs (due to resource savings), as well as with reducing the negative impact on the environment (reducing waste and emissions).

Taking into account the level of negative impact on the environment in green construction, buildings are ranked, according to which energy-efficient buildings can be distinguished (they consume less energy during operation), "passive" houses (have a negligible impact on nature) and "CO₂-neutral" houses (do not have a negative impact on the environment at all).

As you know, everything in general consists of particulars. Similarly, the eco-sustainable approach is based on the concept of green construction, and the concept of "green house" is the basis of green construction. In housing construction, a "green house" should be understood as a residential building that complies with the basic principles of sustainable development – economy, environmental friendliness, and social orientation. At the same time, the construction of a "green house" requires the interaction of all the parties concerned (stakeholders) at all stages of the project life cycle [11]. The application of an eco-sustainable approach in practice ensures the achievement of the required parameters of efficiency, reliability, functionality and rationality. The main focus is on achieving and maintaining high quality at all stages, from the construction of buildings under construction to the management and control system.

In order to reduce the negative impact on the environment in almost all subjects of the Russian Federation, within the framework of state construction supervision conducted by Rostekhnadzor and executive authorities, the requirements of environmental supervision at all stages of construction are formulated. At the stage of forming project documentation for the object, housing construction organizations are required to carry out engineering and environmental surveys, assess the level of environmental impact, and develop a list of environmental protection measures. All these measures are aimed at maximizing the impact of the implementation of the construction industry on the environment. At the same time, eco-development in Russia is at the stage of formation, and the green code of building construction is mandatory only for environmentally literate entrepreneurs [15].

The rapid development of various kinds of technologies have an impact on all stages of construction, which leads to the automation of processes in modern homes, contributes to the organization and development of a comfortable sphere of residence, where technological devices take on more and more functions to ensure life. This complex of technologies is implemented in the Smart Home system. Smart Home is able to perform certain functions related to reducing the load on a person, analyzing various situations and making decisions on their elimination, using previously prescribed algorithms.

The result of the activity of the Smart Home system is the automation of the working processes of the house, its functioning without the investment of human resources. The Smart Home controller can perform and monitor the execution of tasks previously programmed by the user. An extremely important aspect at this stage is the feedback between the person managing the house and the controller.

The most important part of the management of the Smart Home system is communication. There are several basic types of communication:

- wireless local area network (data transmission is carried out via radio on the basis of wireless technologies; access is possible throughout the territory connected to the Smart Home, but is limited by the range of the radio signal);
- remote wireless communication (data transfer takes place between the Smart Home and

the mobile Internet on additional equipment – phone, tablet or laptop);

- wired local communication (this type of communication is rarely used, due to the obsolescence of technologies and the speed of the system's response to user requests; this type of communication is quite extensive in terms of implementation, requires the installation of additional systems for operation – various push-button or touch control panels. Such a Smart Home system is limited as a result of the lack of remote access. Of the positive aspects of its functioning, it is worth noting the high reliability);

- wired remote communication (an expensive way to implement functionality due to the use of a special type of cable for a Smart Home, while the problems of the interconnection of system components with the main controller are not completely solved, and their availability depends on the location of the control unit. This type of communication is rarely used in private homes or apartments, it is used in enterprises).

Smart Home technologies are actively developing today and are becoming more widespread in practice. This positive dynamics is influenced by the active development of low-rise construction and the construction of cottage settlements. At the same time, in practice there are many problems of low-rise construction [12]. Restraining factors in the development of the Smart Home market in Russia are: firstly, the high cost of the system, secondly, the shortage of components for its construction, and thirdly, the almost complete absence of domestic companies in the Smart Home technology market. As a result, in modern conditions, for most citizens, a Smart Home is not a means of a comfortable life and a way to save energy resources, but an indicator of luxury and prosperity.

4 Conclusions

At the present stage, the most important goal and priority of socio-economic development of any state is to improve the quality of life of the population. At the same time, the strengthening of territorial differentiation of the quality of life is a threat to modern regional development. The study attempted to determine the role of housing construction in ensuring the quality of life of the population in conditions of sustainable development.

The author's position after the conducted research is as follows:

- further development of the housing construction industry should be based on the principles of the concept of sustainable development;

- the social aspect of the sustainable development of housing construction is primarily due to the significant role of this industry in achieving the values of many indicators of the quality of life of the population;

- the development of the housing construction industry should also take into account the environmental aspect of sustainable development – the concept of green construction is at the heart of the eco-sustainable approach, and the development of modern technical technologies contributes to the widespread use of the Smart Home system.

Further research on this issue, according to the authors, should be carried out in the following directions:

- it is necessary to analyze and determine the impact of the development of the housing construction industry on the quality of life of the population not only at the level of the Russian Federation and its subjects, but also at the level of municipalities, which, however, is difficult due to the lack of methods for assessing the quality of life of the population of municipalities;

- at the enterprise level, it is necessary for housing construction organizations to form integrated reporting, including reports on sustainable development, reflecting social and environmental aspects.

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