Low-rise housing – a new tool for the development of the rental real estate market

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Abstract. The article deals with the development of such a segment of the residential real estate market as low-rise construction. The study analyzes existing approaches and concepts for implementing investment and construction projects in the low-rise housing segment. According to the results of the analysis, it is concluded that this segment is developing in the direction of "business" and "elite" in most of the Russian territories. The "comfort" segment is allocated only 8% of the total volume of implemented projects. According to the authors, the increase in the volume of low-rise construction in the "comfort" and "economy" class segment can become one of the main tools for solving the housing problem in the country and achieving the benchmarks indicated in the corresponding strategies. The study also considers possible options for building suburban areas by density, and it is determined that high-density low-rise housing can become relevant for "comfort" and "economy" class, and the main method of construction is large-panel housing construction. As a result of studying the collected analytical and technical information, methodological recommendations were developed for organizing mass low-rise construction of high-density low-rise housing in the comfort and economy segments. The potential advantages of the housing under consideration allow us to overcome the factors that hinder the development of rental housing, from which it is concluded that the developed recommendations are applicable not only for projects intended for sale to property, but also for renting to middle-income families.

1. Introduction

Starting around 2011, a new period of active program-targeted support for the low-rise housing market began. In accordance with the concept of long-term socio-economic development of the Russian Federation for the period up to 2020, one of the tasks of which is to stimulate the increase in low-rise development, as well as to ensure the comfort of the housing stock, the formation of a comfortable urban environment and the environment of rural settlements.

However, the ministry of construction has developed a strategy of development of housing sphere of the Russian Federation for the period till 2025, one of the important goals of which are to improve housing and increase the comfort of the urban environment and sustainable development of cities and territories. Despite the fact that the program does not mention the development of such areas as low-rise construction, however, modern concepts of low-rise buildings meet the objectives set in this program. In particular, the development of low-rise construction will make it possible to make the transition from building square meters to creating comfortable housing in the current urban environment, as well as to develop, improve and implement standards for integrated development of territories taking into account...
current trends. Special attention is currently paid to stimulating the use of new technologies in housing construction, which can reduce construction costs and increase its energy efficiency.

Another priority for the development of the residential real estate market is the institutionalization and legalization of the rental housing market. This issue has been raised regularly over the past decade. Pilot projects have been launched in some regions. However, this segment is still difficult to characterize as effectively functioning and solving the socio-economic tasks assigned to it. The importance, expediency and benefits of developing this segment of the housing market are obvious, but there are many barriers that prevent the institutionalization of the rental housing market in the Russian Federation, the main ones being economic and administrative.

In general, the segment of rental housing for investors from the point of view of attractiveness can be described as low-risk, since significant changes in demand and supply can only cause significant demographic changes that can be predicted for the future of 15-20 years. Another important factor is the development of the region's production sector and investment attractiveness, which can also be predicted for medium-sized and large cities, based on the results of the city-forming industries and retrospective information on the outflow and inflow of population.

The yield on such investment and construction projects as rental housing is comparable to the average rate on bank deposits, but the interest is an asset - a real estate object, the value of which, as shown by the analysis of recent decades, will only increase, and the impact of inflation processes will be minimal. This type of commercial activity may be of interest to investors in the "portfolio" approach to investment, when funds are diversified depending on the level of risk of the project.

Among the main constraints to the development of this segment of rental housing, two main factors can be identified: limited land resources of urban areas (high cost of resources, possible restrictions on use and development, requires the implementation of investment and construction projects with the corresponding expected economic results, which are not met by rental housing) and a long payback period for the project.

Despite the significant divergence of the strategy for the development of the Russian housing sector, the measures being developed and implemented should take into account all its main components as much as possible at the same time. In this regard, the rapidly developing market of low-rise construction is of particular interest. Increasing the share of the low-rise housing segment will, in our opinion, increase the availability of housing per inhabitant, make it more affordable, improve the comfort of living conditions, solve the problems of urban planning and regulation, and even create conditions for the development of the rental housing segment. Let's consider the main characteristics of this segment of the residential real estate market.

2. Analysis of the current situation in the low-rise housing segment

The existing approach to developing the concept of modern low-rise cottage settlements is a complex development that includes, in addition to the construction of low-rise houses, the construction of various commercial and social facilities. The growing market of materials encourages developers to use new materials and construction technologies in their projects, which allows reducing the cost of construction without reducing the quality of buildings. And new technologies make it possible to build more energy-efficient buildings, which subsequently reduce operating costs.

Interest in low-rise construction in Russia is growing every year. According to the analytical center under the government of the Russian Federation [1], the total area of low-rise housing in Russia as a whole was 32.9 mln m² in 2017; 32.5 mln m² in 2018; 7.7 mln m² in the first quarter of 2019. As a percentage, the share of individual housing construction in the total area of completed housing construction in Russia as a whole in 2017 - 41.6%; in 2018 - 43.1%; in the 1-3 quarter of 2019 - 51.7%.

If low-rise construction in Russia is only at the beginning of its development, the countries of Europe and the United States already have a wealth of experience in this area. This is reflected in the volume of construction, the structure of supply and demand, the rate of commissioning and energy efficiency of such construction, etc. In this regard, the us experience is indicative: in 2003, more than 250 million square meters of housing were built, of which 230 million are individual cottage – type houses. [12] in
Germany, Canada, the United States, and Finland, housing construction is more focused on low-rise housing, so more than 50% of the population lives in such homes. [10]

If we consider the parameter "availability of square meters per capita", we can say that in European countries and in the United States formed a large area of housing per person. [14] (picture 1)

Picture 1. Number of square meters of living space per capita in Europe and Asia

The formation of a larger area of housing per person is a consequence of the popular in North America, Central and Northern Europe technology of prefabricated individual low-rise houses, at a price per square meter lower than urban. Fast-built low-rise individual houses based on modern technologies in Europe and America include:

- modular;
- panel (large element);
- frame-panel;
- glued beam;
- round timber.

The main construction technologies for low-rise buildings in North America, Central and Northern Europe are frame-panel and modular, as the fastest to build, with the lowest construction and installation costs. Also in Europe and the United States today, an approach to the design and construction of low-rise housing, called MMC - Modern Methods of Construction, (a variant in the United States-factory build housing, prefab housing), based on the design and modular assembly of the main elements of future homes [13]. The leading position in the sector of modular housing construction is occupied by Swedish housing construction companies (today in Sweden about 90% of houses are built using prefab technology). Mass construction of low-rise residential buildings using prefabricated technology is also underway in Canada and Japan [6].

Analyzing international and domestic experience of realization of projects on construction of low-rise housing [15], it becomes obvious that large-scale construction of low-rise country houses and development of surrounding territories is the next stage of development of the real estate market [7].

State support in the form of programs to improve housing conditions and improve the comfort of the environment, as well as recently the interest of people to live in their homes attracted the attention of development companies, which began to massively implement projects of low-rise cottage settlements. To increase competitiveness in the housing market, developers are forced to rely on complex
construction, which includes the construction of various commercial and social infrastructure facilities in addition to the construction of low-rise buildings.

In view of the high competition that exists in the modern suburban real estate market, the creation of a unified concept of a cottage settlement becomes an important task for developers. The concept of development of complex low-rise residential development includes, as a rule:

- analysis of the area,
- marketing analysis,
- development of the architectural and construction concept,
- financial schemes for project implementation.

The concept is based on the analysis of the market—the history of the segment development, the existing image of the district and the price level, the current competition, the potential for the development of the district and the market. During the development of the marketing concept of the village, the target audience of the project is determined, which directly affects the positioning of the village, the development of a marketing and advertising strategy.

Architectural concept responsible for insights on the optimal, most popular sizes houses the town's future, the stylistic choice of project made on the basis of the prevailing market situation. Within the framework of the architectural and construction concept, it is necessary to make a decision on improvement (installation of fences, road construction, landscape, etc.), as well as consideration of various options for maintaining security in the village.

The set of infrastructure objects is determined both by the architectural and construction concept, and based on the conclusions of the marketing concept and the concept of development of the district.

The financial and economic part of the settlement concept clearly shows the financial results of the project, the costs associated with the implementation, and the movement of financial flows. It is on the basis of this item that the investor will make a decision on whether to implement the project.

The objects of a low-rise residential settlement may include several types of houses that differ in different volume and planning characteristics (number of floors, area, layout, etc.), as well as various construction technologies and types of houses (cottages, townhouses, etc.). Also, the object of a low-rise residential settlement can be separated from the surrounding territories and include various social and cultural objects (schools, parks, shopping complexes, etc.) [11] Usually, any modern cottage settlement is referred to a particular class of housing, which is determined already during the development of the marketing concept. Depending on the class, a low-rise village is characterized by its own characteristics according to the main requirements, such as: [11]

- Availability of failed communications. The minimum necessary for a comfortable stay of people should include central water supply, electricity, gas supply and sewerage.
- Availability of infrastructure. It involves placing pharmacies, shopping centers, schools, kindergartens, cafes, restaurants, recreation areas, and service centers in the immediate vicinity.
- Perimeter fencing, checkpoints and video surveillance.
- The presence of a management company. The management company must take over the arrangement and cleaning of the territory.
- Transport accessibility (taxis, trains).
- Concept of village architecture. On the market, you can distinguish three types of settlements: single-style settlements, settlements with housing estates and mixed settlements.
  - Architectural and planning solutions for houses. These include the type of houses, the materials of which the house is built, the area of the house and the plot.
  - Availability of unique structures or special natural areas. These may be non-typical structures (marinas, golf clubs, etc.), as well as special natural areas (nature reserves, sea coast, etc.)

According to the analysis, on the example of Irkutsk and its surrounding territories, approximately the same number of conceptual cottage settlements of elite class and comfort is currently being implemented - 34% and 36%, respectively. Business and economy classes account for 8% each, and premium classes account for 14%. The distribution of residential space in low-rise cottage settlements,
depending on the class, is as follows: elite class accounts for 39% of the built residential area; 24% is comfort class; 25% - premium and business classes and 12% - economy class.

According to the results, it is obvious that little attention is paid to the "economy" segment, while increasing the volume of low-rise construction in this segment can become one of the main tools for solving the housing problem in the country and achieving the targets described at the beginning of this study.

In low-rise projects, it is more profitable to build houses consisting of several apartments than cottages designed for one family, since the effective use of the surrounding area is ensured, and the cost of connecting communications is reduced. In this case, the low-rise typology allows you to achieve a density comparable to a higher-rise building. [4] (picture 2)

**Picture 2.** Plots with the same density of residential units that have different building typologies

High-density low-rise housing is recognized as the missing format in the modern market, which allows to restrain the spread of boundless suburbs, while combining the advantages of suburban and urban, high-rise and low-rise. The shortage of such homes, for example, has already been recognized nationally by the Canadian Association of Home Builders (CAHB), calling them the "missing middle" (picture 3). [2]

**Picture 3.** Missing segment of low-rise high-density housing [9]

In August 2016, canadian experts developed recommendations for the construction of townhouses and multi-family low-rise residential buildings, which include an expanded classification of low-rise housing. According to these recommendations, low-rise buildings are considered to be no higher than four floors, which, in addition to individual (one or two families) and apartment buildings, also include four types of townhouses (picture 4).

**Picture 4.** Canadian classification of low-rise residential buildings
1-an individual house for one family; 2-an individual house for two families; 3-a townhouse; 4-a townhouse with several apartments located above each other and having a separate entrance; 5-a townhouse with several apartments located above each other, having a separate entrance and adjacent
side and rear walls; 6-low-rise buildings that have both apartments with a separate entrance and multi-apartment floors with a common entrance; 7-a multi-apartment low-rise house)

3. **Low-rise high-density housing as one of the directions of development of the rental real estate market**

The development of construction of low-rise apartment buildings in the economy segment is also possible within the framework of the institutionalization of the rental housing market. For this type of commercial housing, low cost is relevant (due to more affordable land resources and building construction technology). The following building concept will meet the main requirements.

In the economy class cottage settlement, it is proposed to provide for an increase in the density of development by adopting more dense typologies-blocked houses (duplexes, townhouses, etc.) and sectional houses. The number of floors of buildings in low-rise cottage settlements is accepted according to the urban planning code of the Russian Federation, and should not exceed three floors. Based on the analysis of cottage settlements in the suburbs of Irkutsk, as well as the recommendations of the set of principles [4], the number of floors of an ordinary building should be 2-3 floors - for a sectional house.

**Table 1. "Recommended characteristics of a sectional house"**

| Name of the indicator                  | Value of indicator |
|----------------------------------------|--------------------|
| Approximate floor area                 | 350–450 m²         |
| Number of apartments per floor         | 2-6                |
| Approximate minimum area of one apartment | 40 m²             |

Architectural and planning decisions of houses in the cottage village of economy class are accepted as standard. It is also recommended that some blocked and sectional houses take into account the free layout of the premises, thereby increasing the competitiveness of the project being implemented. It is proposed to adopt three-layer reinforced concrete wall panels as the wall material for blocked and sectional economy class houses.

The best option for providing settlements with an engineering infrastructure of economy class will be central water supply, drainage and electricity. Heat supply can be provided by individual electric boilers.

One of the technologies that involves reducing the cost of construction is the technology of panel housing construction. The main advantage of using this technology over others is that ready-made construction parts are delivered to the construction site, which the builders can only mount. As a result, labor productivity is very high, since long and labor-intensive processes such as installing rebar, concreting, and laying a brick wall are completely excluded.

If we consider Western countries, precast concrete is the second most popular building material after wood, as well as SIP panels. [5]

One of the main advantages of such buildings is the high speed of construction. It is also important that at the initial stage, you can accurately determine the final cost of the house. Three factors accelerate the construction process: [5]

- high installation readiness of structures (factory-made reinforced concrete structures);
- large panel area (reducing the number of mounted elements);
- effective use of insulation (insulation laid between the skin, several times lightens the weight of the wall and gives it excellent thermal insulation properties).

A special feature of this design is the high quality responsibility of panel joints.

4. **Conclusion**

Today, when the rental housing market is "shadow", which significantly reduces the volume of tax revenues to the budget, prevents increased mobility of labor resources both domestically and internationally, and, in the end, does not make it possible to increase the security of the tenant of housing, the construction of low-rise residential buildings in the complex development of suburban areas using
pre-fabricated technology (large-panel housing construction) can become one of the main tools in the search for solutions to this issue.

The concept of mass development of districts with low-rise housing described in the article makes it possible to eliminate the main restrictions that hinder the development of the rental real estate market:
1. Land resources in remote areas of the city and suburban areas are more accessible, and the cost of their development is comparable to the cost of developing urban areas.
2. Reduced construction costs due to the use of pre-fabricated technology for large-panel housing construction and reduced construction time, as a result, higher economic results in general from the implementation of the investment and construction project.

References
[1] Analytical Center under the Government of the Russian Federation URL: http://ac.gov.ru (26.02.2019 r.)
[2] Canadian Home Builders' Association URL: http://www.chba.ca (01.04.2019 r.)
[3] CasaSicurabyRapidcasa. URL: http://www.rapidcasa.com/ 1.06.2019 r.)
[4] Code of principles for the integrated development of territories. URL: https://дом.рф/wp-content/uploads/2018/04/Svod-prinципов kompleksnogorazvitiya-gorodskih-territorij.pdf (01.04.2019)
[5] Dmitrienko E A 2017 Innovative structural solutions for prefabricated precast buildings Bulletin of the Donbass National Academy of Civil Engineering and Architecture 4 p 108-115
[6] Gifford R 2007 The Consequences of Living in High-Rise Buildings Architectural Science Review 50
[7] Gorbachevskaia E Yu 2019 Gentrification: causes and consequences for the regional housing market in Russia IOP Conf. Ser.: Mater. Sci. Eng. https://iopscience.iop.org/issue/1757-899X/667/1
[8] Madi H 2016 Townhouse and Low-rise Apartment Guidelines Madi H., Bir-chall D. URL: https://www.toronto.ca/wp-content/uploads/2018/01/964c-townhouse-low-rise-guidelines-02-2017.pdf (09.04.2019 r.)
[9] Shapochkin R A 2016 Analysis of the development of the foreign market of low-rise construction Investments, construction, real estate as the material basis for modernization and innovative development of the economy VI International Scientific and Practical Conference 2
[10] Shapochkin R A 2017 Management of the development of low-rise residential settlements (on the example of the suburban zone of the city of Krasnoyarsk Master's dissertation p 62-97
[11] Shapochkin R A 2016 Analysis of the development of the foreign low-rise market Development of the infrastructure of low-rise construction in the city of Krasnoyarsk URL:https://core.ac.uk/download/pdf/84934011.pdf (28.04.2019 r.)
[12] Stadnik E B 2012 Design experience of modern low-rise housing based on the unification of building structures Architecton - University News 38
[13] Trushin G 2019 Low-rise housing: pros and cons. URL: http://realty.vesti.ru/zhile/maloetazhnoe-zhilie-tylyusy-i-minusy (15.04.2019 r.)
[14] Yaroshevich I Yu and Gorbachevskaia E Yu 2019 Investment attractiveness of modern low-rise cottage villages in Russia ISTU Youth Herald 3 pp 80-85