The development of methodological approaches to the residential real estate segmentation by the affordability criterion

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Abstract. The article proposes to consider the issues of the residential real estate objects affordability from the position of differentiation by market segments, taking into account differences in the parameters of objects, as well as differences in the cost of objects. The issues of housing affordability are considered both in terms of improving housing conditions through the acquisition and the rent. When calculating affordability coefficients, it is proposed to differentially take into account the difference in the income of the population different groups. The matrix of housing affordability in the Krasnoyarsk market was formed from the point of view of the purchasing and renting possibility. The presented methodological approaches to determining the affordability of the residential real estate objects based on segmentation allow to improve the understanding of the processes taking place in the market, and adjust the main directions of the state’s housing policy. This is an opportunity for the construction business and residential rental sector to implement their offers with a clear focus on the target audience, taking into account the specificity of the local market.

1 Introduction

In the residential real estate market, the interests of various stakeholders (investors, construction organizations, real estate agencies, insurance companies, banking structures, law offices, and other participants) intersect.

A distinctive feature of the Russian residential real estate market is its social orientation which is expressed in meeting the need for housing and increasing its affordability, as well as economic orientation [1], determined by purchase and sale transactions.

The functioning of the market in the conditions of various factors of consumer behavior leads to the emergence of complex and hidden relationships between supply and demand and requires the search for optimal methods for analyzing the situation in the market, as well as effective methods for predicting its development. In this regard, the issue of finding new methodological approaches to the residential real estate segmentation by the affordability criterion is the most acute in the socio-economic sphere of any region [2, 3].
The purpose of the research is to develop methodological approaches to the residential real estate market segmentation based on the affordability criterion.

The object of research is the residential real estate market in Krasnoyarsk.

The subject of the research is methodological approaches to segmentation of the residential real estate market based on the affordability criterion.

The methodological basis of the research is the methods of statistical and system analysis, dialectical and logical methods of studying socio-economic reality.

2 Materials and Methods

According to the internationally recognized methodology of the United Nations human settlements development programme (UN Habitat), there is a generally accepted classification of housing markets based on the affordability criterion (Table 1).

| Market category                                      | HAC (Housing Affordability Criterion) Value, years |
|------------------------------------------------------|---------------------------------------------------|
| Housing is affordable                                | < 3                                               |
| Housing is moderately unaffordable                   | 3-4                                               |
| Acquisition of housing is seriously unaffordable     | 4-5                                               |
| Housing is severely unaffordable                     | > 5                                               |

In 2018 The Institute of Urban Economics [4] assessed housing affordability for the central cities of 17 major agglomerations.

According to the generally accepted international classification of UN-Habitat, 12 out of 17 agglomerations can be attributed to affordable housing markets. In less than 3 years, a family can buy housing habituation by saving all their income.

In the third quarter of 2018 the Krasnodar agglomeration became the leader in terms of housing affordability (2 years) [4]. The group of agglomerations with affordable housing also includes the Yekaterinburg, Voronezh, Samara-Tolyatti and other agglomerations [4]. Then there are 3 agglomerations in the rating, the housing market of which is characterized as a market with not very affordable housing [4]. Among them are the Krasnoyarsk, Vladivostok, and Kazan agglomerations [4].

The concept of housing affordability is closely linked to improving housing conditions. At the same time, the analyzed approaches take into account only one way to improve housing conditions – the purchase of housing [5, 6]. However, living conditions can be improved not only by housing purchase. Purchasing your own housing may lead to the deterioration in the living conditions of the entire household, increasing the share of mandatory housing maintenance expenses in the household budget [7, 8].

To form a new approach to the concept of housing affordability, we will consider housing affordability based on the ways to acquire and finance housing if there is an actual (within one year) necessity to improve housing conditions.

For a household consisting of several people, there are three options for purchasing housing:

1. The purchase of an apartment by parents, or the ownership obtaining in the inheritance.

2. The purchase of own housing; the implementation of this option is possible in two ways: either save up money to buy an apartment, or take out a mortgage. From a financial point of view, savings are required for the initial payment.
3. The rental of housing, the family becoming tenants. Renting an apartment in all countries of the world is one of the most affordable ways to get a roof over your head. It is hiring, rather than buying your own housing, that is sometimes the only possible solution to the housing issue [8].

It should be noted that the issue of housing affordability is also relevant to consider from the point of view of the housing stock affordability (the sufficiency of the offer in terms of the level of objects comfort).

Thus, the analysis shows that the development of new approaches to assessing the residential real estate affordability should occur both in terms of income and the ability to purchase housing using various mechanisms (rent, purchase), and in terms of physical affordability of residential properties with quality characteristics that are in demand by the population.

3 Results and Discussion

To calculate the coefficients of housing affordability in various segments, we consider it appropriate to adjust the existing methodology for determining the total area of housing and its average cost in accordance with the actual average cost of 1 sq. m. of housing and the average area of a two-room apartment, depending on the segment under consideration. We propose to allocate several stages for calculating the housing affordability index for a certain segment of the market for the corresponding group of citizens depending on the monthly average per capita income level:

Stage 1. Based on statistical data, we determine the average area of a conditional two-room apartment for each of the selected market segments. The city’s residential real estate market can be divided into 4 segments: standard, comfort, business and elite (luxury) housing [9].

Stage 2. Based on the study of the housing market, we determine the average cost of 1 sq. m., and for each of the selected market segments.

Stage 3. We calculate the housing affordability index for each market segment, as well as for each group of citizens, depending on the monthly average per capita income level in accordance with the formula (1):

$$AI' = \frac{C_{seg} \times S_{seg}}{I_{pc} \times 3 \times 12}, \quad (1)$$

where $AI'$ (affordability index) is the affordability index of a certain market segment for the corresponding group of citizens, depending on the monthly average per capita income level;

$C_{seg}$ (cost of segment) is the cost of 1 sq. m. of housing in the corresponding market segment, rub.;

$I_{pc}$ (income per capita) is an average per capita monthly income for each population group taken at the lower limit, rub.;

$S_{seg}$ (square of segment) is the average area of a two-room apartment in the corresponding market segment, sq. m.

3 – number of household members, people.

12 – number of months in the year.

Stage 4. Based on the calculations, to interpret the results, it is necessary to form a matrix of the residential real estate objects affordability in various market segments.

In addition, we consider it appropriate to propose a method for calculating the affordability of rental housing in selected market segments for citizens with different monthly average per capita income levels. As the basis of this method, it is necessary to adopt the method proposed above.
The index of the rental housing affordability in different market segments for citizens with different monthly average per capita income is calculated using the following formula (2):

\[ IRA' = (Agi - Msm) \times 3 / (Arc \times Sqseg), \]  

where \( IRA' \) (index of rental affordability) is the index of affordability of rental housing for a certain segment of the market for the corresponding group of citizens, depending on the monthly average per capita income level;

\( Arc \) (average rental cost) is monthly cost of 1 sq. m. of rental housing for the corresponding market segment, rub.;

\( Sqseg \) (square of segment) is the average area of a two-room apartment in the corresponding market segment, sq. m.

\( Agi \) (average group income) is an average per capita monthly income for each population group taken at the lower limit, rub.;

\( Msm \) is monthly subsistence minimum in the region, rub.;

3 – number of household members, pers.

The methodology for calculating this indicator can be presented in several stages:

Stage 1. Based on statistical data, we determine the average area of a conditional two-room apartment for each of the selected market segments.

Stage 2. Based on the study of the housing market, we determine the average cost of monthly rent of 1 sq. m., and for each of the selected market segments.

Stage 3. We calculate the housing rental affordability index for each market segment, as well as for each group of citizens, depending on the monthly average per capita income level in accordance with the formula (2).

Stage 4. Based on the calculations, to interpret the results obtained, it is necessary to form a matrix of rental availability of residential real estate objects in various market segments.

If the \( IRA' \) is greater than 1, then the rental of objects in this segment of residential real estate is affordable to citizens with the corresponding monthly average per capita income.

Let’s calculate the degree of the residential real estate affordability in Krasnoyarsk based on the proposed methods (Table 2, 3).

**Table 2. Coefficients of housing affordability in Krasnoyarsk, depending on the market segment and income level of the population in 2018.**

| Monthly average per capita income level, rub. | Standard | Comfort | Business | Elite (Luxury) |
|---------------------------------------------|---------|---------|----------|---------------|
| 7000.1 to 10000.0                           | 7.20    | 11.12   | 14.84    | 24.05         |
| from 10000.1 to 14000.0                      | 5.04    | 7.78    | 10.39    | 16.83         |
| from 14000.1 to 19000.0                      | 3.60    | 5.56    | 7.42     | 12.02         |
| from 19000.1 to 27000.0                      | 2.65    | 4.10    | 5.47     | 8.86          |
| from 27000.1 to 45000.0                      | 1.87    | 2.88    | 3.85     | 6.23          |
| from 45000.1 to 60000.0                      | 1.12    | 1.73    | 2.31     | 3.74          |
| over 60000.0                                 | 0.84    | 1.30    | 1.73     | 2.81          |

Based on the data obtained, we will build a matrix of housing affordability in the Krasnoyarsk market depending on the market segment and the level of income of the population in 2018 (Table 3).
Next, we will analyze the possibility of improving the housing conditions of residents of Krasnoyarsk at the expense of rent (Table 4, 5).

**Table 3.** Matrix of housing affordability in the Krasnoyarsk market depending on the market segment and income level of the population in 2018.

| Monthly average per capita income level, rub. | Proportion of the total population, % | Purchasing possibility Residential real estate market segments |
|---------------------------------------------|----------------------------------------|---------------------------------------------------------------|
|                                             |                                        | Standard | Comfort | Business | Elite (Luxury) |
| 7000.1 to 10000.0                          | 8.7                                    | Unaffordable | Unaffordable | Unaffordable | Unaffordable |
| from 10000.1 to 14000.0                     | 13.2                                   | Unaffordable | Unaffordable | Unaffordable | Unaffordable |
| from 14000.1 to 19000.0                     | 15.3                                   | Complicated | Unaffordable | Unaffordable | Unaffordable |
| from 19000.1 to 27000.0                     | 18.7                                   | Possible    | Seriously complicated | Unaffordable | Unaffordable |
| from 27000.1 to 45000.0                     | 21.9                                   | Possible    | Possible    | Complicated | Unaffordable |
| from 45000.1 to 60000.0                     | 7.5                                    | Possible    | Possible    | Possible    | Complicated |
| over 60000.0                               | 8.1                                    | Possible    | Possible    | Possible    | Possible    |

**Table 4.** Indices of housing rental affordability in Krasnoyarsk depending on the market segment and the level of income of the population in 2018.

| Monthly average per capita income level, rub. | The proportion of the total population, % | Residential real estate market segments |
|---------------------------------------------|------------------------------------------|----------------------------------------|
|                                             |                                          | Standard | Comfort | Business | Elite (Luxury) |
| 7000.1 to 10000.0                          | 8.7                                      | -1.06    | -0.81   | -0.40    | -0.18         |
| from 10000.1 to 14000.0                    | 13.2                                     | -0.41    | -0.31   | -0.16    | -0.07         |
| from 14000.1 to 19000.0                    | 15.3                                     | 0.46     | 0.35    | 0.17     | 0.08          |
| from 19000.1 to 27000.0                    | 18.7                                     | 1.54     | -0.31   | -0.16    | -0.07         |
| from 27000.1 to 45000.0                    | 21.9                                     | 3.28     | 2.51    | 1.24     | 0.55          |
| from 45000.1 to 60000.0                    | 7.5                                      | 7.19     | 5.51    | 2.73     | 1.21          |
| over 60000.0                               | 8.1                                      | 10.44    | 8.00    | 3.96     | 1.76          |

**Table 5.** Matrix of housing affordability in the Krasnoyarsk market depending on the market segment and the level of income of the population in 2018.

| Monthly average per capita income level, rub. | The proportion of the total population, % | Possibility of housing renting by segments of residential real estate market |
|---------------------------------------------|------------------------------------------|---------------------------------|
|                                             |                                          | Standard | Comfort | Business | Elite (Luxury) |
| 7000.1 to 10000.0                          | 8.7                                      | Unaffordable | Unaffordable | Unaffordable | Unaffordable |
| from 10000.1 to 14000.0                    | 13.2                                     | Unaffordable | Unaffordable | Unaffordable | Unaffordable |
| from 14000.1 to 19000.0                    | 15.3                                     | Unaffordable | Unaffordable | Unaffordable | Unaffordable |
| Interval         | 18.7 | Possible | Unaffordable | Unaffordable | Unaffordable |
|------------------|------|----------|--------------|--------------|--------------|
| from 19000.1 to 27000.0 |      |          |              |              |              |
| from 27000.1 to 45000.0 | 21.9 | Possible | Possible     | Possible     | Unaffordable |
| from 45000.1 to 60000.0 | 7.5 | Possible | Possible     | Possible     | Possible     |
| over 60000.0     | 8.1 | Possible | Possible     | Possible     | Possible     |

As of 2018, the value of the housing affordability coefficient for Krasnoyarsk averaged 2.74, on the basis of which it could be concluded that the situation in the residential real estate market in Krasnoyarsk is favorable and the degree of housing affordability for Krasnoyarsk residents is satisfactory.

### 4 Conclusions

The market analysis by the affordability criterion, both for housing purchasing and renting shows that for 43.8% and 37.2% of residents of Krasnoyarsk, housing is practically not affordable, due to the low income. In addition, 18.7% of residents can only afford standard-class housing, and 21.9% of residents can rent comfort-class housing.

The use of the proposed methods for determining the residential real estate affordability based on segmentation will improve understanding of the processes taking place in the market, adjust the main directions of the state’s housing policy, and develop a set of measures and mechanisms aimed at the successful development of the residential real estate market as a whole.

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