Comfort of affordable housing in Russia. Analysis of current approaches in architectural theory

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Abstract. The differentiation of Russian society, which was a consequence of the market relations development, served as a driver for diversification of approaches to housing design. The segment of affordable housing occupies a particular place. The paper is devoted to the analysis of researches, which were carry out in the Russian Federation during the last decades. Modern approaches to the design of residential buildings considered in them. The task of the paper is to systematize the scientist’s proposed interrelated sociological, economic, architectural and engineering methods to improve the comfort of affordable housing. The following conclusions are made: large resources of interdisciplinary expansion of the research field are available; conducting applied laboratory studies adapted to regional socio-demographic and climatic conditions is appropriate and desirable; the introduction of social-oriented design methods is necessary.

1. Introduction

The provision of housing is one of the most important indicators of the socio-economic well-being of each country. In the Russian Federation, the solution of the housing problem is included in the list of priority socio-economic tasks. Currently, the minimum standards of comfort that appear in the current design standards are associated with the area of the apartment and the number of rooms in it. These parameters apply to state and municipal rental housing (table 1).

Table 1. Minimum area of apartments intended for social use in Russia (body of rules SP 54.13330.2016 - Multicompartment residential buildings)

| Number of rooms | 1     | 2     | 3     | 4     | 5     | 6     |
|-----------------|-------|-------|-------|-------|-------|-------|
| Recommended area of apartments, m² | 28-38 | 44-53 | 56-65 | 70-77 | 84-96 | 103-109 |

The transition to a market economy has significantly increased the ability of the population to build and acquire property. For comparison: in the year 1990, the total area of apartments built by the population at the expense of own and borrowed funds was 6.0 million m² and in 2017 – 33.0 million m². The maximum value recorded in 2014 – 36.2 million m² [1]. Thus, the new stage distinguished by the transition from the stage of mass construction of residential buildings, which comply with the minimum standards, to the stage of construction of housing that meets the needs of a particular consumer. These facts confirmed by some other data. In particular, the total area of residential
premises per inhabitant is gradually increasing: in the year 2000 it was 19.2 m², and in 2017 – 25.2 m² [1]. Also, the structure of the set of apartments changes in new housing under construction [2].

2. Materials and Methods
This article presents the results of the study, analysis and systematization of more than 200 works. They are dedicated to the search for dwelling comfortable criteria. In Russia, the issues of ensuring a balance between the needs of people to housing comfortable and their financial capabilities had closely study over the past fifty years in numerous articles, monographs and dissertations on sociology, economics, architecture and construction. The main attention focused on the works performed by Russian scientists in the XXI century.

3. Results
3.1. The most important aspects for improving the living conditions of the population in the works of Russian sociologists
The scientific approach to the systematization of the principles of formation of a comfortable habitat began to take shape in Russia in the XX century. Already in 1970-s the development of national sociological schools in the USSR allowed to pay attention to revealing of laws of demographic parameters influence on the properties of housing (Yu. Vanagas, O. Jabbar, A. Sikachev, G. Platonov, O. Smirnov).

On a boundary of the XX and XXI the range of problems, which are at the intersection of sociology and urban planning has expanded. Proceedings by N. Ustyantseva (1998), O. Konina (2003), N. Dulina (2007), A. Agafonova (2016), D. Goloukhova (2017), etc. were devoted to the issues of Russian social and spatial specifics of the urban environment and its infrastructure. A. Popkova (2007) considered the strategy and tactics of using participatory technologies to manage the development of the city. The transformation of social policy and the need to reform housing and communal services have become an incentive to study the factors affecting the changing mechanisms for solving the housing problem (A. Malyshev, 2000; I. Martynyuk, 2009, etc.). Gradually the results of sociological research to become as indicators of the level and quality of life, social well-being of the population (V. Bochkarev, 2002; A. Lukyanov, 2003; G. Emelyanov, 2004; S. Dagbaeva, 2011, etc.). The increase in the number of dissertations, which study the demographic metamorphoses of Russian society, indicates the direct connection of social processes with the need to regulate the real estate market.

Many years the attention of sociologists is focused on the identification of household factors and family well-being (A. Taradanov, 2004; A. Nesterenko, 2006; E. Schneider, 2007), on differences of urban and rural lifestyle (I. Sedykh, 2007; G. Gabidullina, 2008), on the solution of housing problems of young people (A. Del’beeva, 2007; K. Moroz, 2012; E. Nazarov, 2015), of elderly citizens (A. Dergayeva, 2013; L. Sementsova, 2014, etc.) and of persons with disabilities (Yu. Shestopalov, 2011).

In a number of thorough works, the monograph of Russian sociologist M. Vil’kovsky "Sociology of architecture" (2010) stands out. The book the connection of sociology of architecture with systemic problems and sociology of the city is analyzed [3]. The author studied the history of the main Western schools of sociology of architecture – German and American, and gave a detailed description of the directions of their research. Some sections of the publication are devoted to the theoretical heritage of outstanding Western scientists (L. Mumford, K. Lynch, J. Jacobs, E.N. Bacon, G. Hans, A. Rappoport, S. Kostof, J. Frug, J. Request). Features of the sociological areas of the Russian architecture theory analyzed in other parts of the monograph (A. Khan-Magomedov, A. Ikonnikov, Y. Lotman, V. Glazychev, O. Yanitskiy, L. Kogan).

3.2. Issues for improving consumer properties of housing in economic research
In the Soviet time, directly or indirectly some of the studies related to the methods of improvement of living conditions and improvement of consumer properties of housing (E. Abramovich, 1983; E. Akhobadze, 1984; A. Rasskazov, 1984). In market conditions there were pilot and subsequent studies
focused on housing pricing optimization problems and on the synchronization of marketing techniques with needs of apartment’s buyers (I. Mehtiyev, 2001; L. Kaverzina, 2008; N. Ushanova, 2012, etc.). Features of development of the residential real estate market were considered taking into account the following factors: investment policy (M. Bazhanov, 2011), the need to optimize the structure of the housing stock (L. Selyutina, 2002), improvement of social infrastructure (A. Semenyachenko, 2008) and the possibility of construction of multifunctional residential complexes (S. Marchenkova, 2012). Improving the quality of residential building design has become one of the most important tasks of the social-oriented Russian economy. In terms of market attention to methods of estimation of efficiency of design decisions and their competitiveness increased (E. Kim, 1998; I. Tsvigun, 1999; I. Caribova, 2012; S. Veselov, 2013; E. Nezhnikova, 2017). Scientists have been able to prove that the housing stock and utilities must be diversified. The concept of sustainable development has had a significant impact on the identification of benchmarks and the formalization of housing quality criteria. Firstly, its popularization reflected in the works that focus on economic mechanisms of environmental problems and the methodology of introduction of resource-saving innovation (O. Sidorkin, 2005; I. Nasyrov, 2009; K. Grabovy, 2010; I. Malyshev, 2011, etc.). Secondly, interest to the problems of normative regulation of the parameters of the living environment began to revive, including rental housing (I. Kanaev, 2006; A. Chaikin, 2006).

The most significant result of economic research is the "Unified method of classification of residential buildings by consumer quality (class)", which was approved by the National Council of the Russian Guild of Realtors in 2012. There is the experience of real estate agencies in different Russian cities, which provided information on consumer preferences of housing’s buyers, summarized. According to this method, two groups of housing is allocated – mass (classes "economy" and "comfort") and high quality ("business" and "elite"). To identify the compliance of residential buildings and compounds to a particular class, the authors proposed to use an integral assessment of their parameters. It includes a scorecard of comparison for features of architectural solutions, bearing and enclosing structures, glazing, space-planning parameters, the total area of apartments, kitchen area, the characteristics of entrance groups, engineering support, the area of the yard, the social infrastructure in the neighbourhood and in buildings, the external environment, the presence and capacity of parking, etc. [4].

### 3.3. The challenge of affordable housing comfort in the Russian architectural science

Initial dissertation researches, which were devoted to the problems of housing design, conducted in the USSR in 60-70th years of XX century (V. Kutuzov, 1962; O. Rzhekhina, 1975; I. Anisimova, 1972; A. Radchenko, 1972; T. Tukanova, 1972, etc.). The publication of the monograph "Dwelling unit in the future" (B. Rubanenko, K. Kartashova, D. Tonsky, etc. – 1982) had the strongest influence on the subsequent formation of the methodological foundations of the design of residential buildings. In this scientific treatise, the principles of accounting for differentiated consumer housing requirements were proposed. The authors used the results of large-scale sociological research. A separate chapter was devoted to the issues of comfort. The proposed forecasts became the basis for further transition to a detailed consideration of various aspects related to the category of comfort in its modern interpretation.

The end of the XX century coincided with the time of Russia's adaptation to market relations. This time was associated with the search for special approaches to the design of specialized types of housing (G. Dubovitskaya, 1982), with the analysis and understanding of foreign achievements (V. Pshennikov, 1985), with the study of the effectiveness of the system method for the design of the living environment (G. Lavrik, 1979, A. Krasheninnikov, 1985).

Gradually the importance of the topic, which is associated with the natural-climatic factors (A. Pogonin, 2010; N. Timyantseva, 2010; N. Tinyaeva, 2013) and with urban conditions (E. Prokofyeva, 2010; Z. Petrova, 2016; Yu. Moiseev, 2017, etc.), increased. Questions of the improvements of sanitary and hygienic properties of housing have become an actualized (A. Voronin, 2012). Some studies were devoted to the search for patterns of changes in the properties of housing under the
influence of the transformation of socio-economic factors (M. Meerovich, 2015, S. Rybakov, 2016, I. Fedchenko, 2016, etc.). In this regard, the result of a pecuniary differentiation of society in the market conditions of the work appeared (E. Kaidalova, 2005; T. Asafova, 2010; R. Arakelian, 2011; K. Grebenschchikov, 2012, etc.). As result of the development of market relations, at the beginning of the XXI century, the empowerment of the population has served as a driver of diversification of methods of designing affordable housing. Based on the study of best foreign practices E. Eschina (2004), K. Kiyaneenko (2005, 2015), I. Hegay (2013) and M. Blagova (2016) identified and analyzed the original social-oriented design methods that allow to adapt the properties of housing to the needs of people. The issues of formation of service infrastructure of residential buildings and compounds considered in a number of proceedings (O. Maksimenko, 2013; Yu. Skoblitskaya, 2013; L. Voropaev, 2015; V. Kolgashkina, 2015). Understanding social problems led to the elaboration of the issues of the formation the typology for specialized housing (N. Potiyenko, 2002; S. Korotova, 2010; A. Rodimov, 2013; A. Shavalieva, 2013). The formation of foreign systems ekologicheski certification of buildings and limits of resource requirements were preconditions for actualization of the search for sustainable housing design methods (P. Pipunyrov, 2011; A. Ryabov, 2012; A. Gridyushko, 2013; Ya. Usov, 2013; E. Kuptsova, 2014; P. Semikin, 2014; E. Sukhinina, 2014).

The most detailed consideration of cause-and-effect relationships between various factors of housing comfort we can see in the dissertation by I. Zhdanova (2013). It is devoted to reconstructive methods of improving consumer properties of widespread housing. The main objectives of the work were the following: analysis of the previous scientific and theoretical base, identification of current trends and directions to improve the quality of urban conditions and planning of the living environment, analysis of theoretical and practical experience in the design and construction of housing with different consumer properties. The factors, which determine the comfort level of the living environment, identified. Private quality criteria for a comprehensive assessment of urban and local planning decisions systematized. Complex target methods of architectural and planning improvement of the mass dwelling environment. The proposed system of assessing the quality of architectural and spatial solutions of housing is universal and can be use in practice [5, 6].

Nevertheless, in architectural science, despite the presence of a certain scientific reserve, the question of the presence of a holistic methodology for regulating consumer properties of affordable housing remains open.

3.4. The main directions of improving the quality of housing in engineering research

In the industrial Russia, the private aspects of housing were scrutinize. In postindustrial Russia, the direction of research that was devoted to the evolution of ideas about the problems of the modern stage of construction appeared. The range of the studied problems is very wide: from development of criteria of ecological safety of buildings (A. Shvets, 1996) to modeling of their life cycle on the basis of "green" technologies (A. Benuzh, 2013). At the heart of this direction are the fundamental works on the account of climate in the design of housing. They been doing in the second half of the XX century in foreign countries and in the USSR (N. Bylinkin, 1949, V. Litskevich, 1969, 1984, A. Gerburt-Geybovich, 1971, J. Kononovich, 1992). In the changed socio-economic conditions, heightened interest have caused following issues: thermal comfort improving, resource conservation (A. Sintsov, 2003), energy efficiency (S. Esengabulov, 2009; M. Nizovtsev, 2009) and extending of facility’s life cycle (S. Vavrenyuk, 2006; E. Evseev, 2006; V. Shcherba, 2010). The attempt to substantiate the integration of solar water supply systems into planning and design solutions was make also (A. Dudinov, 1999).

The emergence of a large number of studies that contribute to the reduction of resource consumption is associated with the influence of global economic processes, and above all, with the concept of sustainable development. These ideas correspond to the need to reduce the cost of affordable housing as the most common type of real estate. There is large group of works on the methods of application in the construction of local materials and secondary raw materials (N. Komarova, 2006; A. Yashkunov, 2006; E. Saksonova, 2008; T. Pechenkina, 2009; R. Lesovik, 2009;
M. Naryshkina, 2010; A. Titunin, 2011; N. Chernysheva, 2015; A. Kasumov, 2016, etc.). The research subject of some works in which rational and improved technologies of construction of residential buildings are justified, associated with economic reasons similarly (F.-M. Adam, 2005; A. Sysoev, 2006; G. Ryazanova, 2008; A. Kharitonov, 2012). Several Russian research in the field of technical sciences are directly related to the optimization of operating conditions of buildings (D. Bocharnikov, 2013; N. Zapashikova, 2015; V. Kuzin, 2016), to improve sanitary and hygienic characteristics of affordable housing (M. Narkevich, 2007; A. Sayfutdinova, 2014) and to improvement of yard areas (L. Manukhina, 2012).

In distinct works, the issues of improving the quality of residential buildings erected by industrial methods (M. Leontiev, 2018), as well as mechanisms for managing the quality of affordable housing during construction (A. Zelentsov, 2013) are considered.

4. Discussion
A review of Russian approaches to the theory of affordable housing design shows that the goals and objectives of researches are mainly consistent with global trends.

Let's pay attention to the most visible areas of scientific interests of modern foreign scientists. The study of current scientific works shows that physiological comfort is currently recognized as the leading criterion for the quality of affordable housing. In a generous of works, the thermal management methods continue to be considered from the standpoint of maintaining people's health [7, 8]. Studies devoted to socio-demographic factors also do not lose relevance [9, 10]. However, the most noticeable direction is connected with the need to transition to environmental-oriented, resource-saving technologies, which allow reducing the impact of buildings on the environment and reducing the costs of its maintenance [11-17]. Their application extends both to new facilities and to the sector of low-cost housing requiring renovation [18]. It should be noted that many studies use arguments obtained by various medical, sociological, engineering, economic, and other methods. Their development and distribution is a private topic. Today, laboratory tests, simulation modeling and monitoring, which are used to optimize engineering and management decisions, have become the most common types of scientific procedures [19-22]. In many countries, close attention paid to the enhancement of engineering and construction methods. For example, in the paper of Swiss scientists, the conclusions about the feasibility of combining decisions had made as a result of 75 technologies consideration and following factor assessment of 45 of them [23]. Identifying the specifics of consumer properties of affordable housing is logically associated with the search for rational approaches to its design and construction. Therefore, studies that consider the prospects for improving the quality of buildings constructed using industrial technologies carried out regularly [24].

Affordable housing design and construction approaches are significant and effective results of scientific research. Currently the proposals for the diversification of criteria for the dwelling quality taking into account the evolution of resident’s needs submitted [25]. The necessity of modern materials and equipment application is proving [26]. As well as the feasibility of regulatory standards, which define the characteristics of dwelling spaces in accordance with various market factors, credit culture and planning is being studied [27].

5. Conclusions
The analysis of the theoretical basis of Russian research on improving the comfort of the living environment showed that at present the trajectory of the search of comfort criteria now depends on the consumer’s opinion. In the works of sociologists and economists, mechanisms that have a direct or indirect impact on the regulation of design and construction activities are forming. The gradual development of socio-economic relations affects the change of Federal and regional regulations for the design of affordable housing, and the generalization of achievements and failures allows us to see new directions for improving its consumer properties. In the result the comprehension of the functional and the visual comfort of flats, residential buildings and compounds are evolving. Systematization of modern scientific and technical results allows us to note that the greening of processes and
technologies that used in the construction of affordable housing is the most striking trend. This process extends to improving the quality of structural and finishing materials, as well as engineering equipment, which provides not only the physiological comfort of residents, but also the viability of buildings.

The study of many articles, monographs and dissertations showed that there are a number of problems in the Russian sphere of research of affordable housing comfort. They can be solve only in the case of the introduction of new, innovative approaches to research. These may contain, firstly, interdisciplinary interaction, allowing to expand and deepen the research field, secondly, applied laboratory research, creating the prerequisites for the adaptation of project development to regional socio-demographic and climatic conditions, and, thirdly, socially-oriented methods, including participatory, if an objective image of customer’s contentment necessary to discover, and strategies or tactics of residential real estate development to schedule.

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