On modernization of capital construction projects in the context of sustainable development of social sphere

Tatiana Ya. Vavilova a *, Natalia D. Potienko a, Irina V. Zhdanova a

a Samara State University of Architecture and Civil Engineering, Molodogvardeyskaya St 194, Samara, 443001, Russia

Abstract

The paper presents the results of the research on identifying architectural methods for improving social facilities in the Russian Federation. There have been defined basic typological groups of institutions, which consumer qualities are improved according to the criteria of the sustainable development concept. Based on the analysis of the situation in the country, the authors focus on the key areas of capital construction that is infrastructure spatial optimization, ecologization and humanization of the living environment. Using the example of the Samara region the most vital problem – the extension of the project life cycle and improvement of their functional and spatial characteristics has been considered. Close attention is paid to mass-scale residential buildings and orphanage institutions. It has been concluded that in the new design and construction, as well as modernization of projects, there is need for mandatory instead of voluntary regulations of their environmental characteristics.

Keywords: architecture; sustainable development; social problems; residential buildings; public buildings.

1. Introduction

Since the mid-1970-ies, the awareness of globalization threats has made the issues of environmental protection, improvement of technogenic processes safety and balanced development of the social sphere urgent [1]. At the beginning of 2016, implementation of the Agenda for sustainable development till 2030 started. It was adopted at

* Corresponding author. Tel.: +7-846-339-14-42.
E-mail address: vatatyant63@yandex.ru
the UN Summit in the autumn of the previous year. The document identified 17 sustainable development goals, which aim to improve the quality of life. A special place is given to poverty reduction and support to socially vulnerable groups of population. It is noted that in the era of globalization the rate of urban growth has accelerated, and cities are places where one of the negative manifestations of social inequality, segregation, is evident. One of the benchmarks of balanced town-planning activity is the overcoming of social conflicts and observance of the principles of fairness [2]-[4].

2. Social projects: types and architectural problems

In the Russian Federation the most important sustainable development components of the living environment are optimization of architectural solutions and improvement of consumer qualities in residential buildings of different types and in institutions of the social infrastructure. Their design and construction is an illustrative implementation of a tolerant approach [5]. The nomenclature of residential buildings consists, before everything else, of state and municipal rental housing and privately-owned commercial housing affordable to a large part of population, as well as residential buildings with office premises, dormitories, temporary public housing, public housing of social services and social protection for the disabled, the elderly, etc., houses for internally displaced people and recognized refugees. Main types of public buildings of the social sphere include projects of healthcare, education, leisure (culture, art, physical education, sport, tourism), social assistance and social protection.

It should be noted that certain specific architectural and typological groups of projects, for example, designed to accommodate institutions of social assistance and support, have been beyond regulatory control for a long time. Only in 2003 several important documents defining the typological diversity and the rules of architectural design of several types of institutions, in particular intended for social services for the elderly (SP 35-106-2003 and SP 35-114-2003), and for the temporary stay of persons with no fixed abode (SP 35-107-2003) were published. A bit later, design standards for rehabilitation centers for children and adolescents with disabilities were established (SP 35-116-2006), and repeated adjustment of standards in the best interests of people with limited mobility was carried out (SNiP 35-01-2001, SP and SP 59.13330.2010 59.13330.2012).

3. Renovation of housing in Russian megapolis as the main trend in sustainable development of the living environment

According to the Federal State Statistics Service in 2014 11.2% of the population in Russia (16.1 million people) had financial income below the minimum cost of living. It should be mentioned that in 2000 this figure was equal to 29.0% (42.3 million people). Currently, the majority of poor households, 75.4% to be exact, are located in urban areas, where only 86% of buildings have water supply system, 84% – sewerage system, 88% – heating, 78% – bathrooms (shower), 62% – natural gas and 77% – hot water supply. Despite the new housing development in the cities, the share of slum and failing housing stock is 2.7%, and of housing stock built before the beginning of the XXI century - 80.1 %.

The experience of mass-scale housing development in foreign countries shows that housing stock, which is not renovated in accordance with the changing needs of people, is a source of slum formation and subsequent irreversible degradation of the territory [2]. Therefore, one of the most important questions in Russia is the improvement of consumer qualities of buildings erected in the 1960-80-ies, that is, in the era of mass industrial construction. In Russia and other countries there has been best practice of renovation of five-story typical buildings, which were constructed from 1959 to 1985. However, much more houses were built upon the projects of typical multi-stored buildings, the first of which were designed in CNIIEP (Moscow) in the 1960-ies and in 1970-1980-ies they became the most common. For example, in 1971-1975 in the cities there were built more than 540 million m2 of housing, and in rural areas – 165 million m2. The most popular houses were series 464 and 90 (Fig. 1).
On a free market, the tendency of the population increasing demands to the comfort of living has formed [6, 7]. In this regard, at present, the main criteria of obsolescence of capital funds are not only functional, but also environmental and aesthetic compliance with regulations [8, 9]. The main problem is low energy efficiency of buildings, which can be overcome with the help of reconstructive methods. Advanced Russian and foreign experience confirms that targeted renovation of housing leads to reduction of heat losses, improvement of the functional performance of the housing stock and reduction of housing maintenance costs [10, 11, 12]. In Germany, for example, this is confirmed by documentation: reconstructed residential buildings receive energy passports [13]. In the course of renovation it is possible to take into account the needs of certain social groups of residents with different financial means, to overcome the motivation for intolerance and to create the environment of good-neighborly relations [14, 15].

One of the characteristic examples of the introduction of mass-scale housing development in the structure of the city with a population of over 1.0 million residents is the adjustment of houses of series 90 to the conditions of Kuibyshev (Samara). There are several variants for incorporating multi-storey residential buildings of mass series of the 70-80-ies of the XX century into urban environment: firstly, it's infill development – in the historic center, and secondly, the local-group development in the middle zone and, thirdly, the new housing developments in the peripheral zone. Now separate houses, local groups and entire new housing developments need to be improved. A thorough analysis of the local situation, made with the use of a sociological survey showed that people living in these houses belong to different social groups and have different financial means and different requirements for comfort. Therefore, it was concluded that it is necessary to focus on a specific category of users [16, 17].

4. The problems of improving the quality of architectural solutions for projects of social custody and guardianship over minors

The initial step in the development of the standard design of children's residential care homes in our country can be considered the years 1970-1991, when the basic design standards were formed: "Recommendations on design of
orphanages and children's homes" (1988), "Recommendations on design of boarding schools for orphans and children left without parental care" (1989) and "Recommendations on design of family-type orphanages" (1991). The most significant changes in the system of orphans care in our country has undergone over the last twenty years: there has been the reform of the institutional system and implementation of new educative forms. The main directions of this reform were the following: a) improving the comfort of the pupils' living environment, which involves the creation of optimal living conditions and children development in both existing and newly projected budget residential care homes; b) development of new types of institutions, where created conditions are of the family type. For this purpose, the experience of other countries for orphans’ education in family type orphanages began to be implemented in Russian practice.

Since the mid 90-ies in Russia the tendency to the experimental target-focused design of social institutions for children-orphans has emerged. One example is the boarding school in Kozhuhovo located on the free territory of the South-Eastern outskirts of Moscow. The main objective of this project was to create fully functional, highly informative, diverse environment for children, which combined a landscaped environment and internal space.

According to Russian Federal State Statistics Service in 2014, in Russia the total number of children-orphans and children left without parental care and brought up out of families, in various specialized institutions, exceeded 73.1 thousand people [18]. The peak of family-type children's homes has passed, for example, in 2000, 459 children were being brought up there, while in 2014 only 67. Currently, main types of facilities are baby homes (176 institutions), orphanages (819 institutions), children's homes-schools (33 institutions), residential care homes for children (133 institutions), boarding schools of general type (522 institutions), including boarding schools for children-orphans and children left without parental care (57 institutions), as well as boarding schools for children with disabilities (1151 institutions), including boarding schools for children-orphans (181 institutions).

As a typical example for Russia, let us consider the situation with children's orphanages and correctional institutions operating on the territory of the Samara city and its suburbs. Today there are 13 institutions. All institutions are located in adapted buildings constructed before the 90-ies of the XX century. Initially they were not designed for these purposes [19]. For example, the first institution that now accommodates 69 children aged from one month to 4 years – the children's care home "Solnyshko" was organized in the Soviet period.

The specialized children's care home "Malyutka" (60 beds), the children's care home № 3 "Ivola", the social orphanage "Rovesnik" (30 beds), the social shelter "Raduga" and the social-rehabilitation center "Radonezh" are working in buildings dating back to the 50-60-ies of the XX century. The orphanage "Rovesnik" functions as an institutional care, where there are offices of lawyers and notaries, there is a center of social aid to families and children of the Kirovsky district. Since February 2009 it has added the function of a temporary home for women with children, pregnant women and other citizens who found themselves in a difficult life situation. In the building of the center "Radonezh" there is the parish in honor of St. Joseph the Betrothed and the territory improvements are limited to landscaping.

Buildings constructed in the 70-80-ies of the XX century locate the center for helping children without parental care named after B.P. Frolov, the rehabilitation center "Zhuravushka" for children and adolescents with disabilities, the specialized baby home "Malyshe", the social rehabilitation center "Podrostok" and the regional social orphanage "Nadezhda". The first of these is the most complicated project from the viewpoint of integrating functions, which occupies a three-storey building connected by a passage with the nearby secondary school. There are 24 bedrooms, a dining room with 50 seats, an assembly hall, medical and sports blocks, a library and a media library, a computer room, and rooms for study, group work and cookery, an art studio, a laundry and a sewing workshop. The center "Podrostok" and the orphanage "Nadezhda " are located in a typical two-storey panel buildings of kindergartens. The first institution provides services to people in difficult life situations and/or in socially dangerous situation: minors, pregnant women and women with children. In the second building, besides a shelter for 50 persons, there is a diagnostics and consulting center of the Samara region.

A number of institutions not having their own buildings, are located on the ground floors of residential houses: the city center of social assistance to family and children "Semya", the social orphanage for children and adolescents "Rovesnik", the rehabilitation center for children and adolescents with disabilities "Varrel".

Summarizing the description of projects of social assistance to children-orphans and children left without parental care on the territory of Samara, it can be stated that the majority of the institutions are situated in a two or three-storey buildings with a pitched roof. All of them, despite some typological differences, have the similar
planning structure – linear or blocked – with the rigid corridor-type or cellular scheme of rooms grouping [18, 19]. The rigid space-planning structure constrains the expansion of the functional composition of services. Decorative elements are used only in buildings constructed in the 50-60-ies. Buildings of the 70-80-ies are distinguished by asceticism in the facade decoration, which greatly reduces the educational effect. In the majority of examined cases the width of the building block is approximately 12 m. These parameters indicate a low potential of energy saving. In some buildings, insulation of enclosing structures and subsequent siding was made to improve their thermal properties [20, 21]. In some cases, the sizes of plots are minimized. The landscape design of territories was usually made by employees, without hiring professional designers.

5. The main architectural methods of modernizing social projects

The study of social projects in the city of Samara – mass housing and public buildings - has shown that with the aim of sustainable development of living environment it is necessary to improve their consumer properties through integration of methods of functional, ergonomic, technical and environmental improvement. The authors developed several alternative programs for modernization of buildings: a) for budget projects – the program "standard", and b) for raising charity funds or for residents with average income – the program "improvement" c) if possible, for intensification of the entrepreneurial initiative and raising money of citizens with higher level of income – the program "comfort" [8, 16].

Functional improvement is associated with extending the life cycle of buildings. The main methods are the improvement of functional properties by replanning and redevelopment, as well as by changing the combination of functions in buildings. Currently, replanning provides an opportunity not only to consider economic factors, but also to adapt to demographic fluctuations. For example, when modernizing mass housing development, potential capacity of the listed programs increases either the area in apartments (for financially secure residents), or the number of rooms (for families having lots of children). If we consider a public building, for example designed to support orphans, during their reconstruction the following can be done: changing the functional areas, buildup and use of special layouts on upper floors, development of underground levels, adding summer (unheated) premises, etc. Modernization aimed at improving the functional comfort, allows architects to develop several alternative options for layout, designed for stage-to-stage implementation.

The ergonomic method of improvement includes, first of all, the use of architectural techniques to meet the needs of people’s groups with limited mobility, and also furthering personal safety of people – residents or clients of social projects. In the era of industrial construction, in residential and public buildings of mass series there were no basic modern facilities – access ramps, lifting and opening devices, visual, tactile and audible cues and the informing system. They are particularly necessary in institutions for children with disabilities.

Engineering improvement is provided by replacing traditional engineering systems with resource-efficient ones, as well as by improving the reliability of single elements of buildings, including restoration of weight-bearing capacity of structures, etc.

The method of environmental improvement is based on principles of sustainable urban development and criteria of "green standards". It is connected with the increase in utilization capacity of natural elements in the structure of buildings, location of spaces for installation of systems for reusing resources and recycling materials. As at the turn of the XX and XXI centuries in the context of resource scarcity, adherence to bioclimatic principles is a necessary condition of modernization of both housing stock and old public buildings constructed during the industrial era.

6. Conclusions

Currently modern methods of erecting and reconstruction of projects of capital construction should be based on the system of ecological certification of buildings. The use of "green" technologies contributes to the maintenance of social justice in the living environment [10]. In the context of sustainable development the most important and promising architectural and town-planning approach is modernization of residential and public buildings of the social sphere. The extension of the life cycle of housing resulting from the use of modern technologies allows ensuring its operational reliability and durability. It should be understood that in connection with the increase in the
rate of environmental degradation in areas of urbanization, the strategy of both new construction, and reconstruction of real estate projects should be already aimed at a gradual transition from voluntary to mandatory regulation of their environmental characteristics at all stages of the life cycle.

References