Pre-project assessment of the renovation of five-storey buildings carrying out without demolition with relocation of the residents

Yury Alexeev¹ and Alexey Anufriev²

Moscow State University of Civil Engineering, Yaroslavskoe shosse, 26, Moscow, 129337, Russia

E-mail: ¹alekseev-grado@yandex.ru, ²anyfriev-aleksey@yandex.ru

Abstract. The relevance of the problem is due to the lack of a methodology for assessing the urban-planning and investment potential of the five-storey buildings of a residential quarter during renovation without demolition with the relocation of the residents. The article is aimed to substantiate the consequences of the renovation of the residential quarters, considering the specifics and sequence of the reconstruction of the residential houses without demolition with the relocation of the residents, construction of the starting house(s), landscaping and greenery. The leading method in the study of this problem is the formation of scientific information based on a project experiment that allows setting the possibilities of carrying out renovation without demolition with resettlement of residents. At the same time, various typological characteristics of the territory of the existing buildings and the functional loads are taken into account determined by the number of inhabitants, the availability and capacity of kindergarten and school establishments, social objects, landscaping and greenery, parking garages. The main result of the article is the proposed methodology for the pre-project estimation of the urban-planning and investment potential of the five-storey buildings with its renovation without demolition with resettlement of residents, including: 1) schemes for the successive relocation of residents to the starting houses and outbuildings; 2) the establishment of indicators of the total area and number of floors of the starting houses; objects of social and transport infrastructure; The proposed methodology allows evaluating and choosing a rational solution for the planning of the renovation of the residential quarter. The materials of the article can be useful for architects, urban planners, scientists in the field of urban planning, renovation and reconstruction of residential buildings, in the educational process for students studying in the direction of "Urban planning", as well as administrative bodies of settlements, developers, investors and other interested persons in the investment of renovation of residential buildings.

1. Introduction
An important stage in the development of the project for the planning of the renovation of the territory of a quarter with not demolished residential development with the resettlement of the residents is justification for the future state of its functional and planning parameters. Such rationale is necessary for the guaranteed prediction of the reliability of organizational, urban planning, architectural, construction and investment measures [1, 2]. At the same time, the financial costs and revenues from such activities are established using the calculation methods developed in the NRU MGSU, only
scenarios for renovation of the residential buildings without demolition and resettlement of the residents and with complete demolition [3, 4]. This circumstance requires special study and consideration of the consequences of the transformation of the existing landscape of residential development without demolition and with the resettlement of the residents and the attitude of the residents and investors towards them.

The existing system of restrictions influences on the consequences of the transformation of the existing landscape of the residential development of the quarter during the renovation without demolition and with the resettlement of residents: the types of residential buildings and their construction structures, `figure 1`, landscaping, types of development, `figure 2`, street and driveway system, `figure 3`, territorial-construction resource for the construction of the start-up house (detached and annexes), which provides the beginning of resettlement of the residents, `figure 4`, the capacity of the school and kindergarten. In addition, the consequences of the transformation of the existing landscape under the conditions of renovation are depend on: the costs associated with taking into account the coefficient of resettlement of the residents in accordance with modern indicators of housing provision; organization of the sequence of resettlement of the residents in the new apartments; placing the required number of commercial apartments in the building, necessary to compensate for the costs of construction and reconstruction of social and cultural objects, improvement and landscaping.

**Figure 1.** Constructive types of the five-story residential buildings:

a - a panel house; b – a brick, a block house
Figure 2. Planning types and the existing street and driveway systems of the five-story residential development: a - is a closed one; b - line, keyboard; c - mixed; d - free type

Figure 3. The territorial and construction resource (TCR) of the residential quarter for the construction of the starting house (separately and in the form of an extension)

2. Materials and Methods
In accordance with the above limitations and conditions of the renovation, the design experiment was performed, which made it possible to identify the features and specific features of the transformation of the landscape of the residential areas of the different typological structures, see ‘figure 4’.
Implementation of this experiment is associated with the use of a territorial construction resource that provides a free space for building on the territory of the existing building of start-up residential buildings - the detached house and annexes. In combination with these houses, included in the project of a superstructure and attic, you can get the necessary financial means for modernization of the residential five-storey houses, social welfare institutions, improvement due to a fairly high income from sale of the commercial apartments [5, 6, 9].
Figure 4. Project proposal for the renovation of a residential quarter carried out without demolition with resettlement of the residents: a - variant with the detached starting house; b - variant with the six starting apartment buildings in the form of the extensions

To obtain the necessary financial means, which make the renovation of the quarter break-even, the height of the apartment houses in the project is adopted within the limits of nine to twelve floors, and the parameters of the starting separate house, ‘figure 4 (a)’, starting annex, ‘figure 4 (b)’, reconstructed
five-story apartment houses are adopted based on the resettlement coefficient, which allows to increase the area of the existing apartments by 1.39 times. Placement of the start-up houses stipulates the formation of the sequence of the renovation of the quarter, see ‘figure 5’. Resettlement of the residents in such consistency ensures the preservation of necessary living conditions during the construction period, relatively fast construction times and receipt of the residential development after the completion of the construction of high quality.

**Figure 5.** Schemes of zoning of sequence of the resettlement of the residential quarter: a - variant with the detached starting house; b - variant with six starting apartment houses in the form of the extensions

3. Discussions
Particular importance is the reconstruction of the existing residential buildings, the width and length of which increases by four meters, see ‘figure 6’. This is achieved through the construction of an independent foundation, which receives loads from the four higher floors. In addition, an elevator shaft with a garbage disposal is attached to the house from the side opposite from the stairs. This allows to exit from the elevator on the storey, and not on the intermediate staircase, as is the case with the location of the elevator shaft from the staircase side, ‘figure 6 (a)’. Such a planning solution provides the possibility of entering the house, both from the staircase side and from the elevator shaft. Also, when a new input group is installed on the side of the elevator shaft, it is possible to close and re-equip the existing entrance group from the opposite side on the first floor to an auxiliary, non-residential premise for the residents of the house ‘figure 6 (b)’ [7].
Figure 6. Reconstruction with the expansion of the house:

a - the installation of the elevator shaft from the side of the existing staircase;
b - the installation of the elevator shaft on the opposite side of the existing staircase;
c - the installation of the elevator shaft and the entrance to the house from the opposite side of the existing staircase; d - scheme of the cut (fragment of Figure 7. c)

Changes in planning decisions of the existing residential buildings stipulate the modernization of the system of the intra-quarter thoroughfares, improvement and gardening, as it is necessary to provide a circular detour of fire trucks ‘figure 4’. Moreover, to improve organization of the movement of personal vehicles provided a one-way traffic that eliminates the oncoming traffic [8].

The increase in the area of residential buildings and due to this number of the residents in the quarter that bought commercial housing, required planning activities for the placement of new institutions of trade and public catering, communal facilities, parking garages, expansion of existing education facilities in accordance with regulatory requirements [10, 11, 12].
Considered in the design experiment conditions, peculiarities, specificity of organizational and construction measures for the renovation without demolition of the residential houses with resettlement of the residents, require evaluation of the urban planning and investment potential of the quarter at the pre-project stage and its justification to provide investors with a guarantee of reliability of investment of the financial assets. In turn, such a guarantee should be accompanied by a reliable technical task for the development of a planning design for the renovation of the quarter's territory, the content of which depends on the results of calculating scenarios for the transformation of the landscape, carried out according to a special procedure. The reliability of the guarantee is attached to the variety of completed design experiments for various types of the development, types of the houses, the number of storeys of new and reconstructed houses, the number of inhabitants, the capacity of educational institutions, the street-road network, the improvement and landscaping, the social and cultural facilities.

4. Conclusions
Based on the results of completed design experiments, including information about architectural and planning solutions of the territory of the quarters, volume-planning solutions of the residential buildings and calculations of financial costs and incomes from renovation without demolition of the residential buildings with resettlement of the residents, the actions of the urban planner consistently include:

1. Systematization of information about the existing state of the quarter, consisting of: source urban planning documentation; basic data for the implementation of pre-design calculations (the total area of the projected area, the boundaries of the sanitary protection zones, if they exist, the boundaries of the residential buildings, the existing condition of the residential buildings and their architectural and constructive solution, number of the residents of the resettled houses, the area of existing and preserved social facilities infrastructure, the boundaries of existing improvement and landscaping, the boundaries of the land plots not demolished residential houses.

2. Fulfillment of markings not demolished and demolished (if such are in accordance with technical requirements) of the residential buildings, demolished and not demolished objects of uninhabited fund.

3. Fulfillment of the priority scheme for the construction of the start (s) house (s), resettlement of the residents and reconstruction of not demolished dwelling houses.

4. Preparation of the information about the capacity of the kindergarten and the school.

5. Calculation of the cost of the reconstruction of the resettled residential building, construction of the starting house (s) and the construction or reconstruction of non-residential buildings.

6. Establishment of the quarter renovation indicators (calculation of the variants of the total projected number of the residents of the quarter, calculation of the area of the residential houses for resettlement and commercial apartments, calculation of the area of new educational establishments, calculation of parking garages, calculation of the total useful area of new social and cultural facilities.

7. Calculation of external engineering networks, improvement and gardening.

8. Calculation of the technical and economic efficiency of the renovation of a quarter.

9. Determination of the cost of demolition, resettlement, reconstruction and new construction in the transformation of the landscape in various renovation scenarios.

10. Definition of incomes under various scenarios of the renovation.

Fulfillment of these operations at the pre-project stage of the drafting of the quarter renovation planning for different scenarios ensures the selection of the most effective variant for the first cost of work and expected income and on this basis it is reasonable in the investor's interest to search for the scheme of the territorial-spatial organization of the projected territory of a quarter.

5. References
[1] Alekseev Y V and Somov G Y 2016 Pre-project assessment of the urban-planning and investment potential of the existing residential development 2nd edition (Moscow: The library of scientific developments of NRU MGSU) p 152
[2] Alekseev Y V and Anufriev A A 2017 Conditions, features, specificity of the transformation of the landscape of residential development of the 1950s - 1960s with mass renovation in Moscow Arch. and Constr. of Russia vol 3 (223) pp 76-83

[3] Alekseev Y V 2009 Urban-planning bases for the development and reconstruction of residential buildings (Moscow: ASV Publ.) p 640

[4] Alekseev Y V and Trofimova T E 2005 The complex development of the five-story buildings of the 1950s-60s Organizational-methodical aspects Arch. Build. Design. vol 38 no 1 pp 7-9

[5] Alekseev Y V and Strashnova Y G 2002 Reconstruction of five-story buildings – for all Zhilishchnoe Stroitel’stvo vol 10 pp 20-21

[6] Alekseev Y V, Starostina N G, Filipenko Y A 2011 Tendencies and problems of development of the construction sites of the 1950s-1960s Industrial and Civil Engineering vol 12 pp 20-22

[7] Alekseev Y V and Koptyaev D L 2011 Urban planning conditions and peculiarities of the use of the first floors of the five-storey residential buildings of the 1950-1960s Zhilishchnoe Stroitel’stvo vol 5 pp 29-33

[8] Alekseev Y V and Leontiev B V 2014 Calculation of car places in residential buildings under above-ground territories Zhilishchnoe Stroitel’stvo vol 4 pp 21-25

[9] Alekseev Y V and Dunichkin I V 2004 Aerodynamic features of five-storey buildings Zhilishchnoe Stroitel’stvo vol 12 pp 5-7

[10] Alekseev Y V 1997 Features of the reconstruction of residential buildings in the developed areas of Moscow Industrial and Civil Engineering vol 8 pp 33-35

[11] Alekseev Y V, Somov G Y 2016 The objects of the cultural heritage (Moscow: Prospekt Publ.) p 560 Russian Federation. Decree of the Government of Moscow No. 497-PP of August 1 2017 «About the program of renovation of the housing stock in the city of Moscow»