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POSSIBILITY OF RENOVATING THE TERRITORY OF RESIDENTIAL BUILDINGS DATING FROM 1958 TO 1970

Abstract: *By 2020, the majority of residential buildings built in the period from 1950 to 1970 will be more than 50 years old and their lifetime will be exhausted. Buildings demand modernization, as well as the territory itself. The subject of building renovation of the considered period becomes more and more relevant in Russia. Housing that was built in the considered period, has become outdated morally and physically. Development strategy of inhabited units renovation is necessary. In the article, researches of the building territory of 1958-1970 with identification of planning schemes for the micro districts in Yekaterinburg which are not deformed by the infill construction are described.Based on the comparison of modern standards withthe standards of the period under review, the calculation of "the renovation potential" (the number of living space, which is possible and reasonable to integrate into the existing development) is given, in general, around the city and in particular, on remained complete formations of micro district scale. Assessment of micro districts of the developed territories suitability to transformation to modern blocks is given.*
Keywords*, residential planning unit, city block, micro district, planning scheme, renovation.*

Introduction

Panel housing construction is considered to have started inthe 1950s, but historically, the first experimental buildings had been built in the 20s of the last century. The first house made of large reinforced concrete panels in Russia was built in Berezovsky town (20 km from Yekaterinburg) in 1945 (Moscow Architectural Council, 2014). In Berezovsky, one of the first plants that produce concrete panels for buildings and constructions was built and it is still functioning. A bit later, during the era of Khrushchev governance (1953-1964), the era of industrial housing constructioncame. Due to the housing policy carried out during those years, people were settled from ramshackle housing, barracks, dug-outs and communal flats to more comfortable and private housing. In total, during the period from 1959 to 1985 about 290 million $m^2$of total area of houses of the first mass series – "khrushchevka"were built that makes about 10% of all housing stock of the country (Khmelnitsky, 2017). In Sverdlovsk (the name of Yekaterinburg till 1991), from 1952 to 1961 2,426 thousand m^2 of living space (Berdnikov& Rabinovich, 1983), wasbuilt,of which more than 1,120 thousand m^2 were pre-fabricated block and panel buildings (Database of the State Corporation). Proceeding from the standard of living space per the person in those years (9 m^2/person), 124 thousand people were provided with housing successfully.

In 1950-1970 rather high standard of living was provided in comparison with the previous years (Meerovich, 2017). Large sites of territories, mainly in suburbs of the city, were developed with pre-fabricated panel, block and rare – brick buildings. The main unit of the housing estate during the considered period was the micro district. Micro districts were social and planning units: besides residential buildings they included the separate or attached buildings of schools, kindergartens, hospitals, shops.

As it is analyzed by Meerovich M.G. (Meerovich, 2016), Kanter M.M., Karpenko M.H. Kanter&Karpenko, 2013), Zhdanova I.V. (Zhdanova, 2011), Chazova O.L. (Chazova, 2015) and others, physicaldeterioration and the obsolescence of buildings and territories of the period of 1958-1970 is extremely big. All scientists agree on one position: design of the development

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strategy for the built-up territories is necessary, because the micro districts that were built during the considered period are situatedthroughout the territory of Russia, and the residential buildings and the system of public service have ceased to satisfy to the current needs of the population(Kustikova & Matushkina, 2017).

Nowadays, the theory of micro district construction has become obsolete, but the question of an opportunity and expediency of transformation of microdistricts into blocks, which are more comfortable for life, is little studied. In Russian urban-planning practice there are no examples of complex revitalization of territories without full demolition of buildings.

In Moscow in 2017, the large-scale project of renovation was launched, during which demolition of a large number of buildings with resettlement of inhabitants was held. This project has caused a big controversy, both among architectural community, and inhabitants of the demolished buildings. In Yekaterinburg, as well as in many other Russian cities, there is no opportunity for implementation of the project of renovation that is similar to the one launched in Moscow. The reasons are the lack of regional programs of renovation, insufficient financing from the federal budget and low interest of investors in development of the developed territories.

Methodology

In this article, the main attention is paid not to internal lay-out and structures of buildings, but to the established planning schemes of micro districts.

The first investigation stage was the analysis of historical evolution of urban planning design standards in the territory of modern Russia since 1930 up to now. It was revealed that standards changed 3 times in 1958, 1962 and 1975. Their careful comparison and also processing of statistical data of population and input of living spaces has allowed calculating “the renovation potential”.

During the analysis of archival and bibliographic sources (Polyakov, 1964; Belousov, 1978) the following types of planning schemes of micro districts were revealed: group, perimeter, line, free and combined (Figure 1). Perimeter building scheme is characterized by an arrangement of buildings along red lines (street boundaries). Group scheme is a combination of several groups of buildings in the territory of the micro district. Line scheme is characterized by identical orientation of all buildingsoften not in parallel and not perpendicular to streets. Such types of development were recommended for town-planners and architects to be implemented in project design of micro districts.

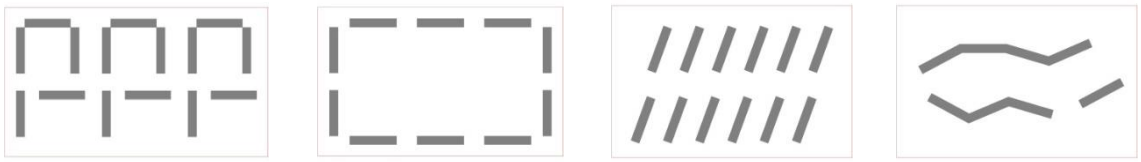


Figure 1. Types of planning scheme: group, perimeter, line, free

The retrospective analysis of maps, masterplans and references of the beginning and the end of the researched period allowed tofind the territories where development was performed during the considered period. The cartographical analysis, graphic-analytical and computer modelling were used in order to detect types of building schemes of micro districts in Yekaterinburg. Identification and assignment to planning schemes of a certain type is made by method of comparing and analogies. Years of buildings construction, their structures and number of floors are revealed by using the database of the Fund for Assistance in Reforming Housing and Communal Serviceswebsite (Database of the State Corporation).

As a result, the most widespread planning schemes in development of Sverdlovsk in 1958-1970 are defined. Assessment of suitability of micro districts planning schemes for conversion to blocks is made and living space (“the renovation potential”) which is possible for entering into the established building proceeding from the changed standards of density of living space is calculated.

Measurement and analysis

Evolution of standards of urban planning design

In order to conduct the comparison, norms and standards of development from 1930 to 2016 (Rules and standards…, 1930; Building Norms 41-58, 1958; Building Norms and RulesII-K. 2-62, 1962; Building Norms and Rules II-60-75, 1975; Set of rules 42.13330, 2016)were studied. In this period, standards had completely changed five times. It is important to note the increase of the standard of living space per person and the increase of density of living space (the ratio of the area of living space to the area of the territory of building). Besides, the optimum number of floors of the housing estate was changed (from 4 floors in standards of 1930 up to 9 floors in 1975). The most interesting change is an optimum residential planning unit – a block in 1930, micro district in 1958-2016, and now again a block in the newest standards of 2016. The comparative Table 1 is given below.

Table 1

Comparison of the norms of urban planning

Index	1930	1958	1962	1975	2016
residential planning unit	block	micro district block	micro district	micro district	micro district block
standard of living space per person, ŋ,[m^2/person]	no standard	9	9	14.5	20-30
population density [person/ha]	200-300	330-400	-	-	max 450
optimum number of floors	4	4-5	5	5-9	no standard
optimum planning scheme	tape	free	no standard	no standard	no standard
densityof building [%]	25, max 40	max 24*	max 21*	no standard	-
density of living space, ρ,[m^2/ha]	no standard	2,400-3,000*	2,800-3,200*	5,300-5,900*	-
coefficient of building	-	-	-	-	0.4**
coefficient of living space	-	-	-	-	0.8**

* - for five-floor building
** - for building of small and average number of floors
***- for Yekaterinburg for 2017

Population and dynamics of input of housing

In order to conduct the assessment of scales of housing reform of Khrushchev, data of the Russian statistical yearbook was studied (Russian Statistical Yearbook, 2007). Data of input of living spaces in the cities of the Soviet Union located in the territory of modern Russia was found. Even excluding the living space built in villages, the number of the built housing and number of people whose living conditions have been improved, is enormously big. The integrated calculation of the population provided with housing during 1950-1960 is presented in Table 2.

Table 2

Input of housing in the cities in the territory of modern Russia

Year	Population*, million people	City living space, million m²*	Input of living space, millionm²per 10 years*	Provided with housing, million people**
1950	102,067.0	316.0		
1960	119.045.8	570.8	254.8	28.3
1970	130.079.2	913.7	342.9	38.1

* in the territory of modern Russia

** with norm of living space per person 9 m²/person

Being based on the official data of the Fund for Assistance in Reforming Housing and Communal Services (Database of the State Corporation) website, the volume of input of living space in Sverdlovsk for the considered period is revealed. Data of input of housing and also density of living space which is most allowed by norms and standards of that time are provided in Figure2.

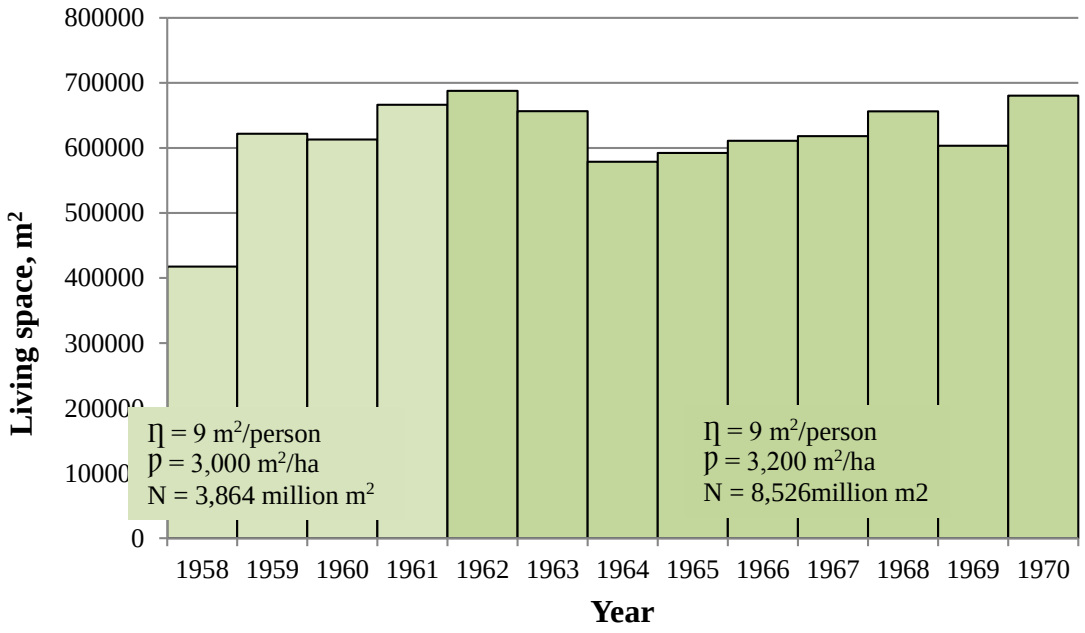


Figure 2. Input of housing in Sverdlovsk and urban planning standards

"The renovation potential"

Sites where micro districts were being built during the period from 1958 to 1970 are reflected in the Figure 3. Today,infill construction appears in many micro districts and it is conducted without any strategy and out of a micro district context. At the same time, transport and pedestrian communications are broken, there is a shortage of parking spaces and places for children at schools and kindergartens and also there are problems with a microclimate in territories. All this speaks about need of regulation of consolidation of micro districts.

Figure 3. Micro districts built in 1958-1970

In order to assess investment attractiveness of sites of the established building it is necessary to know how many living spaces can be entered in addition. The statistics given on Figure2 has allowed calculating in a first approximation living space, potentially possible for consolidation in micro districts.

The integrated calculation of renovationpotential is presented in Table 3.

Table 3

Calculation of potential of development for the city in general

	Input of housing, N, m^2	Density of living space, *p*, m^2/ha	Busy by building land plots, S=N/*p*, ha	Possible general living space in modern norms, Ng.=S×8,000, m^2	Renovation potential, Np=Ng-N, m^2
1958-1961	2,318,389	3,000	772.8	6,182,370.7	3,863,981.7
1962-1970	5,684,223	3,200	1,776.3	14,210,557.5	8,526,334.5
∑	8,002,612		2,549.1	20,392,928.2	12,390,316.2

Proceeding from the increased admissible density of living space it is possible to conclude that construction in the considered period existing in the territory of Yekaterinburg can be condensed (to increase living space by construction of new buildings or bysuperstructure) for 155% on average. This figure is received excluding already introduced in the considered micro districts of infill construction – in micro districts with modern infill construction, the density of living space is higher, than it was allowed during the considered period.

Typology of building of micro districts in 1958-1970.

In Sverdlovsk both infill construction and development of integral micro districts was conducted, many of them have remained without any urban planning interventions. For more exact assessment of renovation potential the integral (without modern urban intervention) micro districts set by buildings of 1958-1970 were chosen (Figure 4).

Proceeding from the analyzed schemes of building(Polyakov, 1964), for each micro district the prevailing type of planning scheme was defined. The summary graphic-analytical table which contains data of urban planning indexes (Ss – area of site, Sl – area of living space, p - density of living space) of each micro district (Table 4) was made.

Total area of not deformed micro districts is 348.8 hectares. Total area of living space – 1.74 million m^2. The average density of living space is 5,021 m^2/ha that is above standard for the considered period. Renovation potential for these micro districts is:

$$N_p = N/\rho \times 8{,}000 - N,$$

N_p – renovation potential,

N – total area of living space of the considered micro districts,

ρ – average density of living space,

8,000 m^2/ha – admissible density of living space according to modern standards (Set of rules 42.13330, 2016).

$$N_p = 1.74 / 5{,}021 \times 8{,}000 - 1.74$$

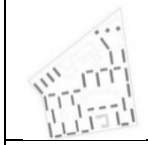
N_p= 1.03million m^2

In percentage expression the renovationpotential of the considered micro districts will be 1.03/1.74 = 0.59 = 59%.

The prevalence of such building planning scheme as group is obvious. The second popular type is perimeter planning scheme. These schemes are of interest in terms of creating therenovation strategy. From the urban planning point of view these types of development schemes are the easiest to transform to blocks because their planning solutions have the following properties: the majority of buildings are focused by facades along streets, there is more obvious division of private and public space, there is a possibility of incorporation of buildings for locking blocks.

Figure 4. Integral micro districts

e 4. The analysis of the chosen micro districts.

Type of planning scheme															
Group				Perimeter				Line				Free			
Plan	Ss, ha	Sl, m2	*p*, m2/ha	Plan	Ss, ha	Sl, m2	*p*, m2/ha	Plan	Ss, ha	Sl, m2	*p*, m2/ha	Plan	Ss, ha	Sl, m2	*p*, m2/ha
	22.0	105,409	4,791		19.5	82,279	4,219		30.6	133,074	4,349		19.3	107,436	5,567
	26.5	106,809	4,031		10.5	48,886	4,656		20.1	95,041	4,728				
	20.9	105,279	5,037		7.5	43,063	5,742		23.6	141,048	5,977				
	19.9	95,620	4,805		54.1	266,389	4,924								
	24.0	125,579	5,232												
	24.0	134,705	5,613												
	26.3	148,301	5,639												
Total	163.6	821,702			91.6	440,617			74.3	369,163			19.3	107,436	

Conclusion

The results of the research of development in 1958-1970 in Yekaterinburg defined that the considered living space makes 22% of the general housing in the city. Taking into account the increased limit of density of living space, construction in the considered period in general around the city can be condensed for 155%.

It is revealed that in the city there are complete micro districts which are not broken by infill construction. The prevailing typesof planning scheme in them are group and perimeter.

The renovation potential for these micro districts is calculated (1.03 mln m^2).

Considering tendencies of complex sustainable development of territories, shortage of free lands for building in the city and the renovation processes started in Moscow it is possible to assume the investors interest in development of these micro districts. Cumulative renovation potential of the studied micro districts is 59%.

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