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Prognosis of yard area landscaping condition due to reconstruction by the example of Krasnoufimsk city

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Annotation. At the present time the federal program of improvement of yard areas in Sverdlovsk region is coming into effect. Therefore, a compound landscape analysis of project areas was held and the consequences of their reconstruction were assessed. The main attention was paid to the parameters which reflect the balance of the territory: the area of roads, driveways, sidewalks, children's playgrounds, landscaping, including separately taken into account area under the lawn. Results of the research confirm that the reconstruction will reduce the area of green territories. Due to reconstruction, the share occupied by green areas, is reduced three times in two out of three of investigated yards. And only in one yard the reduction is not so significant – only by 15 %. The positive aspect implemented in all yards is a specific separation of the children's playground. The project also includes complete removal of large trees and their replacement with a few shrubs. Eventually the research of yard area landscaping projects proves that tree-and-shrub's planting is not prioritized and, unfortunately, due to reconstruction will be presented in a much more simplified version compared to the existing one, thus it will negatively affect the environmental situation of the city.

1. Introduction

One of the main issues of modern urban construction is to solve the problems of improvement of yard areas [1-3]. It is the yard of the house that provides facilities for a healthy, convenient, comfortable life, both for an individual and for all residents of the city [4-6]. Properly arranged yard area helps to strengthen social communications between neighbors, improves safety and ecological well-being of the living environment [7-11].

At the present time the federal program of improvement of yard areas in Sverdlovsk region became effective in accordance with the following Government Resolution of the Russian Federation dated 10.02.2017: "Statement of regulation of providing and distribution of subsidies from the federal budget to the budgets of Russian Federation subjects aimed to support the state programs of the Russian Federation subjects and municipal programs of the modern city environment creation" [12].

One of the cities where the program is actively implemented is Krasnoyfimsk. Krasnoufimsk is situated in Sverdlovsk region, it is an administrative and economic center of the region, it is located 224 km to the west of Yekaterinburg on the right bank of Ufa river. It was founded in 1736 in the Red Yar tract famous for its beautiful precipitous bank.

The total area of the city is 9 875 ha, out of which 1 394 ha are residential areas, including only 10% occupied by multistory residential buildings. According to the "Program ..." three yards were selected for reconstruction. All of them are typical Krasnoufimsk buildings. One of the yards,



situated on 98 Mizerov Street, is bounded by five-storey residential buildings from three sides and a kindergarten fence from 4th side, local driveways with unauthorized parkings are located along the buildings, an uncomfortable children's playground is located in the center of the yard on a lawn with few individual plants, the most of plants grow between buildings and roads.

Yard on the 5 Sadovaya Street is typical for the 70-80 years. It is quite closed, surrounded by residential five-storey buildings, local driveways and parking are located around the perimeter of the yard, there are children's and sports grounds inside with quite bushy greenery

In contrast, the yard on 67 Sukhobsky Street is adjoined to three-and two-storey buildings and doesn't possess a precise border. It is divided by local driveways and household buildings. The green area is not located inside the yard area, but is adjoined to the street. Children's and sports grounds are situated inside there.

The common construction problems of all yards are: - transit driveways along the entrances of the houses and the small size of the territory.

2. Methods and Materials

The purpose of the research is to investigate the actual condition of the yard areas and the modifications that will follow after the implementation of the projects.

Thus, the compound landscape analysis of the designed objects was carried out. The inventory was executed in accordance with traditional methods of assessing the condition of landscape architecture, taking into account the clarifying regulations developed by Landscape Construction Department [12-14].

The main attention was paid to the following parameters which reflect the balance of the territory: the area of roads, driveways, sidewalks, children's playgrounds, landscaping, separately including area under the lawn.

Then the actual parameters were compared with the project ones, stated in the explanatory note and engineering documentation.

3. Results and Discussion

Table 1 shows the data which reflect the project changes that will follow as a result of the reconstruction of the yard.

Table 1. The main parameters of balance of the investigated yard areas: actual and project ones according to project documentation (1-square m², 2-share, %).

Yard area	Square								
	Yard area, m ²	Roads, driveways, sidewalks		Children's playground		Green area		Including lawn	
		1	2	1	2	1	2	1	2
98 Mizerov Street									
Actual	3850	2090	54	-	-	1760	46	1320	75
Project	3850	2703	70	648	17	499.3	13	499.3	100
5 Sadovaya Street									
Actual	3150	1585	50	-	-	1565	50	780	50
Project t	3150	2128	68	495	16	527	18	527	100
67 Sukhobsky Street									
Actual	3826	1230	32	-	-	2596	68	580	22
Project	3826	1395	37	376	10	2055	53	1558	76

Obtained results prove that the reconstruction will decrease the area of greenery. The existing share of landscaping occupies about a half, or even main part of the total territory. Due to reconstruction, the percentage of green areas is reduced three times in two out of three of

investigated yards. And only in one yard the reduction is not so significant – only by 15 %. The reason is that territory has a small forest area near the roadway of the street, which is not included in actual layout. The positive aspect implemented in all yards is a specific separation of the children's playground.

Eight species of trees and four species of shrubs grow on the territory of objects (table 2). Several years ago the felling of *Acer negundo* L was executed in the yard on 67 Sukhobskogo Street, a curtain of young trees of this species about two meters height currently formed at this place.

Table 2. Characteristics of yard plantings before the reconstruction in Krasnoufimsk.

№	Name	Average diameter on height 1.3 m, cm	Average height, m	Average score of sanitary condition
98 Mizerov Street				
1	<i>Malus baccata</i> (L.) Borkh	16	9	3
2	<i>Syringa josikaea</i> J. Jacq. ex Rchb	-	2	4
3	<i>Populus balsamifera</i> L	28	15	3
4	<i>Betula pendula</i> Roth	20	10	2
5 Sadovaya Street				
1	<i>Acer negundo</i> L	24	10	4
2	<i>Malus baccata</i> (L.) Borkh	16	8	2
3	<i>Malus baccata</i> (L.) Borkh	10	4	2
4	<i>Sorbus aucuparia</i> L.	14	7	3
5	<i>Larix sibirica</i> Ledeb.	16	8	1
6	<i>Pinus sylvestris</i> L.	6	2	1
7	<i>Syringa vulgaris</i> L	-	3	3
8	<i>Syringa josikaea</i> J. Jacq. ex Rchb	-	4	3
9	<i>Caragana arborescens</i> Lam	-	2	4
10	<i>Rosa</i> L	-	1.5	2
67 Sukhobsky Street				
1	<i>Populus balsamifera</i> L	44	18	4
2	<i>Malus baccata</i> (L.) Borkh	18	5	3
3	<i>Tilia cordata</i> Mill	12	5	2
4	<i>Acer negundo</i> L	22	8	3
5	The growth of the <i>Acer negundo</i> L 800 m ²	-	-	-

Morphometric parameters of plants confirm that the age of planting is significant. There are only few young plants – *Pinus sylvestris* L and *Malus baccata* (L) Borkh in the yard on Sadovaya Street.

The sanitary score of tree-and-shrubs' plantings varies from 1 to 4 points (figure 1). Almost half of trees *Acer negundo* L, *Sorbus aucuparia* L, *Malus baccata*, *Syringa vulgaris* L, *Syringa josikaea* J Jacq ex Rchb have third sanitary score, that characterizes their condition as weak. Excellent condition is presented by young plants of pine and larch. The share of plants with the second sanitary score condition is about 20% (*Malus baccata*, *Tilia cordata* Mill, *Betula pendula* Roth, *Rosa* L).

The condition of third part of all plantings is not satisfactory – with forth score, these are such species as *Populus balsamifera* L, *Acer negundo* L, *Syringa josikaea* J. Jacq. ex Rchb, *Caragana arborescens* Lam. Currently, they dry up, damages of the trunk by pests are visible, tinder mushrooms are presented

Results of trees' condition research confirm that almost 70% of plants need sanitary measures.

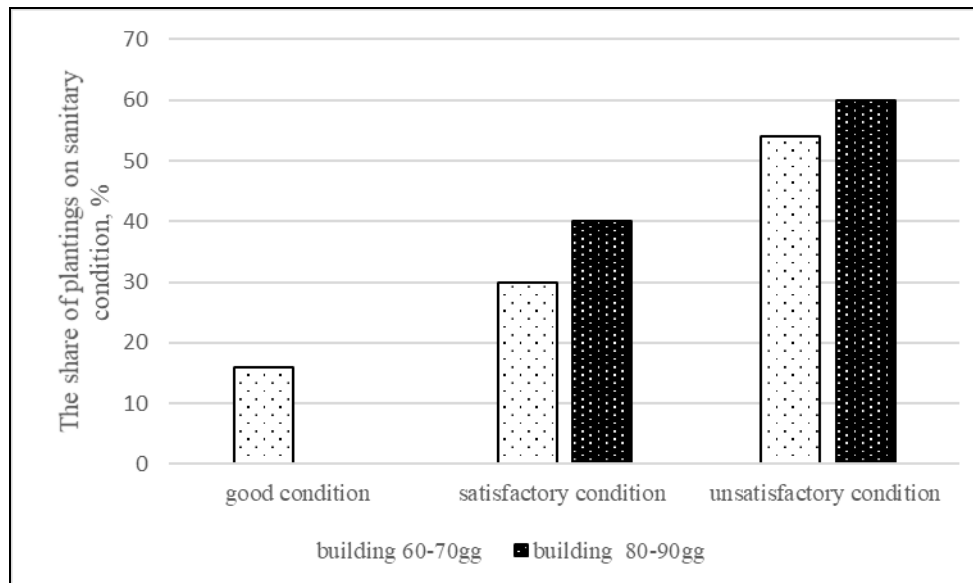


Figure 1. The sanitary condition of tree-and-shrub's plantings in the yards of Krasnoufimsk city.

The special structure of the territories will change dramatically after the reconstruction. The felling of large trees is planned, while replanting will be executed only by shrubs such as *Philadelphus coronaries*, *Forsythia intermedia* (figure 2).

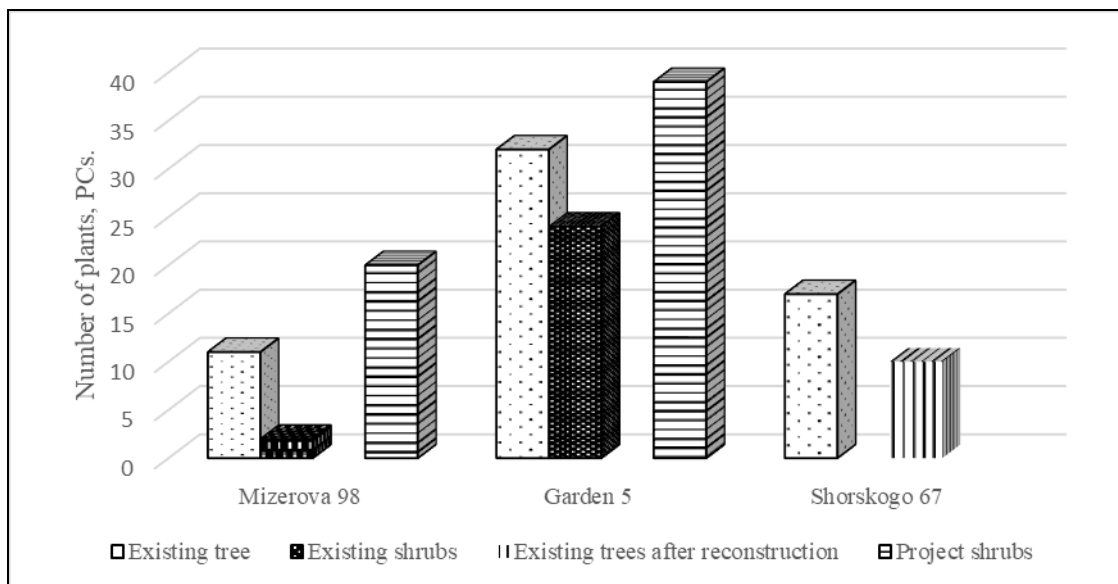


Figure 2. Number of tree-and-shrub's plantings before and after reconstruction.

This is particularly conspicuous in the yard areas on the 98 Mizerova Street, 5 Sadovaya Street, it is not designed to leave there a single tree after the reconstruction. There is no plan to replace trees on 67 Sukhobsky Street, only felling them down.

Previously, the yards of another city in the Sverdlovsk region — Polevskoy, which can be related to the same size category, were investigated after reconstruction. Figure 3 shows the average parameters of balance in yards.

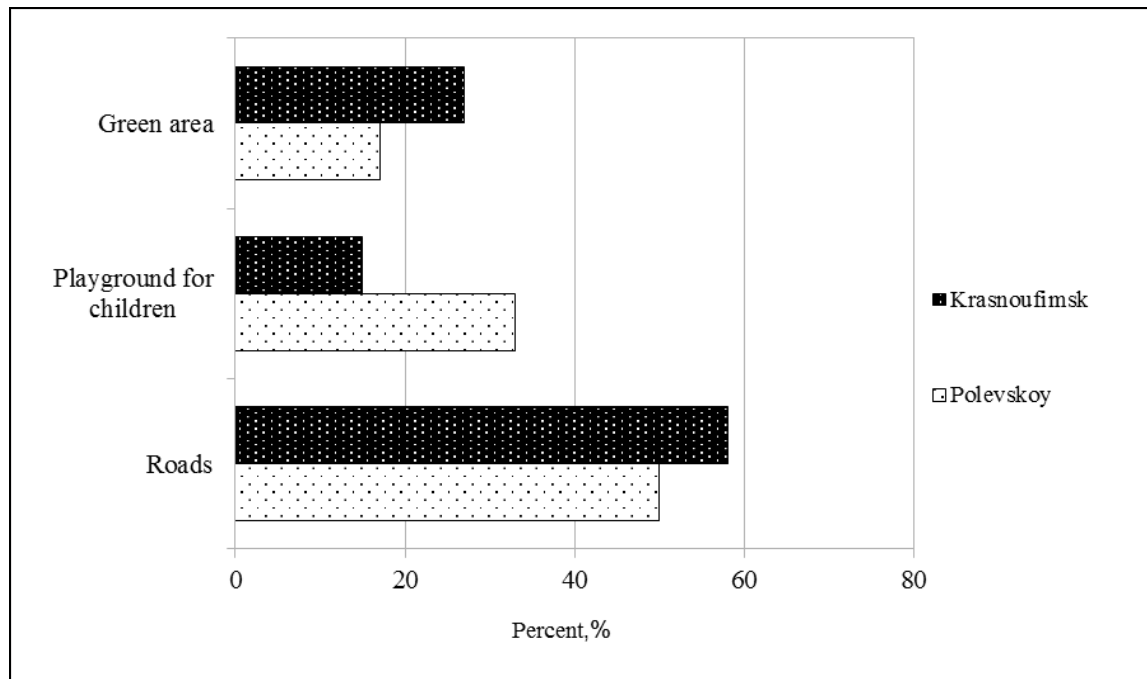


Figure 3. Balance of average parameters of yard areas in Polevskoy and Krasnoufimsk cities after reconstruction.

Despite the differences in the balance of the reconstructed objects, there are also general trends. The particular characteristic is the high percentage of the area occupied by the driveways and parkings. It accounts to a half of the entire yard area, being in the range of 46-58%. The main feature of the newly established yard in Polevskoy is a large share of children's playgrounds areas compared to Krasnoufimsk. Landscaping part of the yard is much smaller than the area of planar elements in both cities. A specificity of the yards of the city of Polevskoy — is saving trees,

From 1970 till 2013 years, according to the analytical center "AlfaStrakhovanie", the number of vehicles in the Sverdlovsk region has increased almost 40 times. This factor had the greatest impact on the planning structure of yard areas. Small and medium-sized cities of the Sverdlovsk region are dominated by buildings of early 70-80 years. That time there were only 7 cars per 100 citizens, so the yard parkings were not something significant. Currently, personal vehicles for residents of small towns are a priority, thus the convenience of driving and storage of cars determine the quality of living from the citizens' point of view.

4. Conclusion

Research of yard area landscaping condition identifies that partial reconstruction is quite sufficient, because every yard has trees in good sanitary condition. The proposed reconstruction projects do not take this factor into account, suggesting complete removal of all plantings and their replacement with shrubs. At the same time, no attention is paid to their adaptation to local climate conditions. For example, suggested *Forsythia intermedia* is not a zoned species for the Middle Urals and is extremely poorly tolerate to frost.

Comparison of the main balance parameters of the actual and project areas proves that there is no compound approach in creating a comfortable environment while design of yard area. The main attention is paid to the economic and operational role of the yard (parkings, playgrounds, etc.). At the same time, landscaping is not prioritized and does not contribute to improving of the environmental situation in the city.

Acknowledgments

Research of yards' landscaping projects allows to make the conclusion that tree-and-shrub's vegetation is not a priority in the design, and unfortunately, after the reconstruction will be in even worse condition.

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