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METHODS OF STANDARD RATES OF FINANCIAL EXPENSES CALCULATION ON LANDSCAPED AREAS MAINTENANCE (ON THE EXAMPLE OF ST. PETERSBURG, RUSSIA)

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Abstract: *Relevance of research is caused by need of optimization of the expenditure of budgetary funds of St. Petersburg in the field of gardening. The article is devoted to development of system of indicators for identification of volumes of works per unit of measurement, necessary to form costs for works on maintenance of objects and the territories of green plantings of St. Petersburg. Main methods to research of the matter were natural and analytical methods which have allowed revealing the main problems of management of the territories and objects of green plantings of the megalopolis. Also the method of the statistical analysis was applied to sample some 123 objects of green plantings of St. Petersburg. The system of indicators to calculate objectively and reasonably standard rates of finance costs on maintenance of objects and the territories of green plantings of St. Petersburg has been identified. To control results the method of the comparative analysis was used. Problems of management of the territories and objects of green plantings of megalopolises are revealed; the unique system of indicators for the purposes of forming of standard rates of finance costs for works on maintenance of objects and the territories of green plantings of megalopolises is provided; recommendations about enhancement of system of certification of green plantings are proved. The developed system of indicators has been used by Committee for economic policy and strategic planning of St. Petersburg.*

Keywords: *green plantings, maintenance, finance costs, accounting, certification*

JEL Classifications: *M41, Q10*

1. INTRODUCTION

St. Petersburg – one of the largest cities of Russia. Its sustainable development is a significant task of the national security of the Russian Federation ("On Strategy of the national security of the Russian Federation", 2015). The scenario of a sustainable development is the avowed strategic element of city planning. The triune concept which is the basis for sustainable development includes three aspects: social, economic

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and ecological (Skachkova, 2014). All specified components are interconnected and require equivalent attention. However the ecological aspect is often immolated for economic or social benefits.

Green plantings of the large cities being the aggregate of wood, shrubby, grassy plants and flower-gardens ("On green plantings in St. Petersburg", 2010) are major factor of ecological wellbeing of the urbanized territories and quality of urban population life (Loures & Costa, 2010, Deneva et al., 2008, Husqvarna Group, 2012). The most significant functions are carried out by them such as sanitary and hygienic, decorative and planning, esthetic, environmental and others (Ilchenko, 2014). Thereafter, carrying out competent policy in the field of maintenance and repair of green plantings is one of paramount tasks of municipal level.

In that field many domestic and foreign scientists researched (Moshchenikova, 2011, Loures & Costa, 2010, Morita, 2012, Skachkova, 2007, Kovyazin, 2008, Podgornaya, 2008, Mensah, 2014). However the main problem – insufficient and inefficient financing of area of green plantings – is still not solved (Etim et al., 2012).

2. METHOD

The problem of rational and effective management of areas and objects of green plantings of megalopolises remains actual. However, there is still a quantity of unresolved questions concerning St. Petersburg, in particular:

1. uneven arrangement of the territories of green plantings within the borders of St. Petersburg, owing to which the indicator of green plantings security, for example, for general use, may vary from 3.5 to 82.0 sq.m per capita depending on the administrative area. Information about green plantings for general use (GUGP) security is provided in tab. 1. ("On green plantings for general use", 2007).

Changes in the problem of GUGP are connected with annual modification of the law of St. Petersburg ("On green plantings for general use", 2007) in connection with refining of the areas or new objects of GUGP identification.

It is obvious that security of GUGP satisfies to standard rates not everywhere. In the central districts of St. Petersburg the gardening problem is particularly acute.

The problem connected with planted trees and shrubs territory security applies not only for St. Petersburg. It is also possible to add other numerous regions of the Russian Federation (Dubinin, 2007).

2. Low variety of wood and shrubby vegetation and unsatisfactory condition of green plantings due to inadequate organization, technologies and qualities of their creation, maintenance and repair. According to N. B. Moshchenikova (2011) the results of green plantings for general use inventory of St. Petersburg in 2006 detected that only 18% of trees were not weak, the maximum percent was constituted weakened (46%) and strongly weakened (23%), 3% – dead wood. Further researches have shown a bigger decrease in stability of green plantings.

Table 1
Indicators of the area and security of GUGP on the administrative districts of St. Petersburg

Administrative districts of St. Petersburg	*Population ("Population of the Russian Federation on municipalities for January 1,*	*Area, hectares*	*Area of GUGP, hectares* 2014	2015	*Security of GUGP, sq.m per person in 2015*	*Share of planted trees and shrubs territory, %*
Central (historical center) districts (GUGP security for central districts must be over 12.8 sq.m per person ("On the urban development plan of St. Petersburg", 2005)						
Admiralteysky District	170,361	1,382	94.56	94.56	5.6	6.8
Vasileostrovsky District	211,132	2,147	76.52	75.16	3.6	3.5
Petrogradsky District	139,107	2,400	225.47	225.47	16.2	9.4
Tsentralny District	226,674	1,712	–	79.09	3.5	4.6
IN TOTAL (central districts)	747,274	7,641		474.28		
Off-center districts (GUGP security for off-center districts must be over 16 sq.m per person ("On the urban development plan of St. Petersburg", 2005)						
Vyborgsky District	482,450	11,550	609.87	611.59	12.7	5.3
Kalininsky District	526,876	4,012	–	439.26	8.2	10.7
Kirovsky District	338,593	4,700	239.78	239.78	7.1	5.1
Kolpinsky District	186,973	10,560	227.08	227.08	12.1	2.2
Krasnogvardeysky District	347,545	5,680	162.24	178.03	5.1	3.1
Krasnoselsky District	357,091	11,400	524.38	524.38	14.7	4.6
Kronshtadsky District	44,074	1,935	47.13	48.77	11.1	2.5
Kurortny District	73,846	26,792	239.74	239.74	32.5	0.9
Moskovsky District	332,596	7,107	280.10	286.27	8.6	4.0
Nevsky District	497,509	6,177	–	251.26	5.1	4.1
Petrodvortsovy District District	133,668	10,900	1,095.75	1,095.75	82.0	10.1
Primorsky District	544,032	10,987	277.28	530.60[1]	9.8	4.8
Pushkinsky District	171,593	24,033	590.85	590.40	34.4	2.5
Frunzensky District	407,570	3,747	240.85	240.85	5.9	6.4
TOTAL (off-center districts)	4,444,416	139,580		5,503.76		
GRAND TOTAL	5,191,690	147,221				

3. Inefficient financing of green plantings management in St. Petersburg. In the open memorandum of the Center of examinations of the St. Petersburg society of scientists ("Principles of legislative regulation of protection of green plantings in St. Petersburg", n.d.) it was noted that one of the main threats is incompliance of financing with the norms, the underestimated standard rates of green construction and maintenance of green plantings financing that was a consequence of underestimation of their economic and social value.

[1] Increase in the area in comparison with 2014 has happened due to the Yuntolovsky forest park inclusion in the list of GUGP, and also increase in total area of parks and squares.

4. Unstable legal status of the planted lands which leads to numerous allotments of block green belts for construction and to destruction of local green plantings as a result of densification. According to data of the public cadastral map only 23% of such land parcels are registered in the State immovable cadastre and have accurate legal status.

The provided list of problems is not complete and relates to inefficient green plantings management in St. Petersburg.

There are various facilities for management of real estate objects: inventory, accounting, monitoring, information resources, etc. In particular, financial mechanisms are also referred to them. If we consider activities for maintenance and repair of objects and the territories of green plantings, the implementation is impossible without financing from appropriate authority. In St. Petersburg, these expenses are financed from budget funds of St. Petersburg ("On green plantings in St. Petersburg", 2010). At the same time forming of expenses of the budget for the next financial year is performed in compliance with rules of calculation of the budget assignments of St. Petersburg based on standard rates of the financial expenses approved by the Government of St. Petersburg (Government of St. Petersburg, 2014, Committee on economic policy and strategic planning of St. Petersburg, 2015).

According to the Technique (Committee of economic development, industrial policy and trade of the Government of St. Petersburg, 2012) when calculating financial expenses for works on maintenance of the territories of green plantings and repair of green plantings located on them the "basic and index" method is applied. It is based on the system of current indexes of changing value of works in relation to direct costs on works and maintenance determined in basic price level.

Financial expenses on the specified work type are calculated by formula:

$$C = (C_{basl} \cdot I_{cur1} + C_{mat1}) + ... + (C_{basn} \cdot I_{curn} + C_{matn}) + O + EP + C_{cont} \quad (1)$$

Where:

C_{basn} – costs for works on maintenance of the territories of green plantings and to repair of objects of green plantings as per regional unit prices (RUP) determined in a basic level of the prices;

I_{curn} – current index of work cost change;

C_{matn} – the amount of unaccounted TSQ costs for materials, determined in the current price level;

O – standard rate of overheads;

EP – standard rate of estimate profit;

C_{cont} – the costs of works (services) which are not considered in RUP, considered in addition and determined by results of monitoring of the

cost of accomplishment of the corresponding works (services) in the current financial year.

For costs on maintenance of the territories of green plantings and repair of green plantings of calculation it is necessary to know volume of works per unit of measurement, and also frequency of accomplishment of a specific work type. Complex of works is approved by the Committee on improvement of St. Petersburg within Production schedules (Committee on improvement of the Government of St. Petersburg, 2012). In the document, frequency of carrying out each work type is also specified.

Thus, identification of volume of works per unit of measurement and the system of the indicators needed to calculate costs of works on maintenance and repair of objects and territories of green plantings became an objective of research. In this article, the system of indicators within works on maintenance is offered. Final indicators on repair will be provided in further publications of authors.

Objects of research are the territories and green plantings for general use, which require special attention and care ("On green plantings for general use", 2007).

Except work types and their frequency, finance costs on works on maintenance and repair of objects and the territories of green plantings depend on the category of green planting. According to the production schedules (Committee on improvement of the Government of St. Petersburg, 2012) and the order of the Committee on improvement of the Government of St. Petersburg dated 8/12/2014 No. 134-r (2014) green plantings are divided into four categories depending on appointment, placement in urban development and intensity of handling.

Determination of volumes of works per unit of measurement was carried out within examination of Production schedules (Committee on improvement of the Government of St. Petersburg, 2012) according to the Public contract dated 2/11/2015 No. 0172200002014000126_160837 of the Committee on economic policy and strategic planning of St. Petersburg.

For identification of volumes of works per unit of measurement the analysis of plant types growing in St. Petersburg was initially done. The database containing data on 123 objects of green plantings (gardens, parks, squares, boulevards) has been created. The analysis was done separately by trees, bushes and plants taking into account their quantity, age, and also the categories of objects of green plantings (Committee on improvement of the Government of St. Petersburg, 2012).

The total quantity of the considered trees has constituted 391,810, including 180,586 coniferous and 211,224 deciduous trees (tab. 2).

The general ratio of shrubby breeds depending on category of green planting and age is presented in tab. 3.

Table 2
Ratio of trees depending on the age and category

Age, years	*Quantity of coniferous trees*	*Quantity of deciduous trees*	*Quantity of poplars*	*Quantity of willow*	*Total quantity of trees*
		1st category			
Less than 10	731	1,999	0	196	2,730
From 10 to 20	302	6,388	60	463	6,690
More than 20	2,034	17,149	695	1172	19,183
total:	3,067	25,536	755	1,831	28,603
		2nd category			
Less than 10	1,053	3,953	172	386	5,006
From 10 to 20	1,443	5,554	114	618	6,997
More than 20	5,888	36,986	2,196	3,066	42,874
total:	8,384	46,493	2,482	4,070	54,877
		3rd category			
Less than 10	413	1,263	23	309	1,676
From 10 to 20	1,463	5,001	979	861	6,464
More than 20	12,063	13,414	2,042	938	25,477
total:	13,939	19,678	3,044	2,108	33,617
		4th category			
Less than 10	1,287	3,537	0	192	4,824
From 10 to 20	6,943	8,615	1,196	696	15,558
More than 20	146,966	107,365	718	647	254,331
total:	155,196	119,517	1,914	1,535	274,713
GRAND TOTAL:	180,586	211,224	8,195	9,544	391,810

Table 3
Ratio of bushes depending on the category of green planting

Type of GUGP	*Single bushes and bushes in groups*	*Bushes in green hedge*	*In total*	*%*
	1st category			
PARK	69,580	50,302	119,882	56
GARDEN	14,870	13,270	28,140	13
SQUARE	23,417	14,470	37,887	18
BOULEVARD	21,056	8,183	29,239	14
TOTAL:	128,923(59.9%)	86,225(40.1%)	215,148(100%)	100
	2nd category			
PARK	167,162	50,641	217,803	71
GARDEN	15,753	9,482	25,235	8
SQUARE	16,216	4,805	21,021	7
BOULEVARD	27,658	16,387	44,045	14
TOTAL:	226,789(73.6%)	81,315(26.4%)	308,104(100%)	100
	3rd category			
PARK	33,092	42,042	75,134	80
GARDEN	1,695	1,404	3,099	3
SQUARE	2,151	299	2,450	3
BOULEVARD	12,333	1,217	13,550	14
TOTAL:	49,271(52.3%)	44,962(47.7%)	94,233(100%)	100

(*contd...*)

(*Table 3 contd...*)

Type of GUGP	*Single bushes and bushes in groups*	*Bushes in green hedge*	*In total*	*%*
	4th category			
PARK	102,181	16,282	118,463	96
GARDEN	0	0	0	0
SQUARE	4,820	0	4,820	4
BOULEVARD	0	0	0	0
TOTAL:	107,001(86.8%)	16,282(13.2%)	123,283(100%)	100
BUSHES OF ALL CATEGORIES, GRAND TOTAL:	511,984	228,784	740,768	

Table 4
Ratio of green plantings depending on their category

Type of GUGP	*Small-bulbous plantings*	*Perennial grassy plantings*	*In total*	*%*
	1st category			
PARK	0	5,896	5,896	15
GARDEN	2,250	6,890	9,140	24
SQUARE	21,800	1,534	23,334	61
BOULEVARD	0	0	0	0
TOTAL:	24,050	14,320	38,370	100
	2nd category			
PARK	30,000	36,032	66,032	98
GARDEN	0	644	644	1
SQUARE	0	415	415	1
BOULEVARD	0	131	131	0
TOTAL:	30,000	37,222	67,222	100
	3rd category			
PARK	2,038	6,214	8,252	99
GARDEN	0	0	0	0
SQUARE	0	0	0	0
BOULEVARD	0	125	125	1
TOTAL:	2,038	6,339	8,377	100
	4th category			
PARK	0	11,399	11,399	100
GARDEN	0	0	0	0
SQUARE	0	0	0	0
BOULEVARD	0	0	0	0
TOTAL:	0	11,399	11,399	100
GRAND TOTAL for all the categories:	56,088	69,280	125,368	

740,768 units were analyzed, 511,984 of them are single bushes and bushes in groups, 228,784 – bushes in green hedge.

The plants growing in territories of green plantings of St. Petersburg are presented by small-bulbous plants and perennial grassy plants (tab. 4).

Also, the analysis of characteristics of GUGP objects has been made.

3. RESULT

Based on the carried out analysis of objects and the territories of green plantings of St. Petersburg the system of indicators has been developed to identify the volumes of works per unit of measurement, necessary for costs calculation of works on maintenance of objects and the territories of green plantings of St. Petersburg. The provided volumes do not consider frequency of carrying out specific work types.

For example, the following formula was applied to determine the total quantity of trees per 1 hectare of GUGP $N_{\text{tr tot per 1 hectare}}$ (2):

$$N_{\text{tr tot per 1 hectare}} = \frac{N_{\text{tr}}}{S_{\text{GUGP}}} \tag{2}$$

where N_{tr} – total quantity of trees of GUGP objects of each category;

S_{GUGP} – total area of GUGP objects of each category, hectare.

As a result, some 49 dependences were made, on which the final volume parameters have been calculated (tab. 5).

The system includes several blocks depending on an accounting unit:

1. Trees;
2. Bushes (single and in groups, and also in green hedges);
3. Lawns;
4. Flower-gardens;
5. Paths and platforms.

It has been revealed that for correct forming of standard rates of finance expenses on maintenance of objects and the territories of green plantings the additional data which are absent in passports of objects of green plantings are required. For example, according to Production schedules (Committee on improvement of the Government of St. Petersburg, 2012) one of work types is modeling cutting of crowns. When calculating standard rates of finance costs, this work type is divided into two categories depending on height of trees (under 5 meters and over 5 meters). For cutting of trees over 5 meters specialized equipment is used and, respectively, it increases costs. Therefore it is necessary to account differentiation of trees by height in the inventory of green plantings.

Thus, except the standard parameters specified in passports of green plantings it is necessary to determine the following indicators in addition:

1. Tree height (meters);
2. Diameter of tree caudex (cm);

Table 5
Calculation of volumes of works on a unit of measure per 1 hectare of the area of GUGP

Indicator	*Measure unit according to RUP Trees*	*Volumes of works for categories*			
		I	*II*	*III*	*IV*
Total quantity of trees per 1 hectare of GUGP	1 tree	123.22	172.20	245.40	473.55
Quantity of trees under 3 years per 1 hectare of GUGP	10 trees	3.53	4.71	0.04*	0.02*
Quantity of coniferous trees per 1 hectare of GUGP	10 trees	13.21	26.31	1.02*	2.68*
Quantity of deciduous trees per 1 hectare of GUGP	10 trees	110.01	145.89	1.44*	2.06*
Quantity of trees over 3 years per 1 hectare of GUGP	10 trees	119.70	167.49	2.42*	4.71*
Quantity of trees over 20 years per 1 hectare of GUGP	10 trees	82.64	134.53	1.86*	4.38*
Area of loosening of holes of trees under 3 years per 1 hectare of GUGP	1 sq.m	11.76	15.71	0.11*	0.08*
Quantity of trees from 3 to10 years per 1 hectare of GUGP	1 tree	8.23	11.00	8.56	5.82
Quantity of trees over 10 years per 1 hectare of GUGP	1 tree	111.46	156.49	233.17	465.23
Quantity of trees under 10 years per 1 hectare of GUGP	1 tree	11.76	15.71	12.23	8.32
Quantity of poplars over 20 years per 1 hectare of GUGP	1 tree	2.99	6.89	14.91	1.24
Quantity of poplars and willow over 20 years per 1 hectare of GUGP	100 trees	8.04	16.51	21.75	2.35
Quantity of trees over 20 years except poplars and willows per 1 hectare of GUGP	100 trees	74.60	118.02	164.23	436.06
Trees along street roads area per 1 hectare of GUGP	sq.m	6.47	10.86	19.69	719.59
Green plantings area per 1 hectare of GUGP	sq.m	8,184.04	7,769.28	8,558.71	8,982.18

Notes: * For III and IV categories volumes of works are increased by additional coefficient (1%) as not in all territory the full complex of works is applied fully.

3. Availability of wounds, hollows, mechanical damages, etc.;
4. Age of tree (in current passports, trees are ranged as follows: under 10 years, 10-20 years, over 20 years. It has been revealed that more detailed differentiation with an interval of at least 5 years is necessary);
5. Age at the time of inventory and the current age (for trees and bushes);
6. Planned position of a tree on maps that are used for inventory.

If some of these indicators are missing, volumes of works are calculated approximately through indirect parameters.

4. DISCUSSION

Thus, based on the analysis of modern domestic and foreign literature, practical experience in the field of landscape gardening economy the author's system of the indicators necessary for forming of costs for works on maintenance of objects and the territories of green plantings has been offered. Analogs of the provided system have not been revealed.

Also, recommendations about enhancement of certification of green plantings have been made.

5. CONCLUSION

Management of green plantings in megalopolises is a debatable and contradictory area, where various social, financial, town-planning and other interests meet. Modern methods of management of green objects are inefficient; they require enhancement and increase of objectivity.

The system of indicators developed by authors allows proving mathematically calculation of financial expenses on maintenance of objects and territories of green plantings, and, as a result, leads to more effective expenditure of budgetary funds.

Based on the conducted research it is possible to make the following conclusions:

1. One of the reasons of inefficient control over green plantings of megalopolises is understating of standard rates of financing in this sphere, and also underestimation of economic and social value of green plantings.
2. Calculation of standard rates of finance costs on maintenance of green plantings needs to be carried out based on the system of indicators including volumes of works per unit of measurement and also frequency of accomplishment of a specific work type.
3. Actual data of certification of objects of green plantings must be initial for identification of volumes of works per unit of measurement.
4. Existing indicators of certification of green plantings are not enough for reasonable and full calculation of standard rates of financial expenses.

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