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**ANALYSIS OF COSTS FOR LAND DEVELOPMENT IN PRICE OF  
CONSTRUCTION PRODUCTS**

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***Abstract***

The article deals with the formation of Chapter 1 of the summary estimate called "The Land Development" and with the peculiarities of its calculation at the pre-investment stage, when the real costs for the preparatory period of construction are yet unknown. The study focuses on the first part of Chapter 1 of the summary estimate called "Land Registration", and specifically on the costs for the purchase of land plot and subsequent payment of land tax for the period of construction. The fact is that at the stage of formation of the summary estimate for the investor, the price of the land plot is unknown, as it will be determined after the auction. According to this, the study has proposed a mechanism to determine the cost of buying land by the three methods. They are the method of comparison of sales, the method of determination of the cost as a percentage of the cost of construction of the object and the method of determination of the cost according to the cadastral value, taking into account the correction coefficient of the negotiated discount. Requiring the accuracy of calculations, the investor has the right to decide which method will determine the cost of buying land. The article provides an analysis of the indicators necessary for calculating the cost of land and suggests the direction of further research.

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**Keywords:** Land development, summary estimate, the cost of land purchase, the mechanism of formation of the cost of registration of land plot.



## 1. Introduction

In determining the necessary amount of investments for the construction of a complex of structures, in accordance with the method of determining the value of construction products in the Russian Federation (MDC81-35.2004) (MDS Method of determining the cost of construction products on the territory of the Russian Federation, 2004), it is necessary to calculate and provide summary estimate of the construction cost. This document is a determining factor in the justification of the limit of funds required for the construction of all the facilities of the project. The summary estimate of construction costs, approved in accordance with the established procedure, serves for opening the financing of construction. The calculation is made according to the structure of capital investments, that is, the estimated cost of each object is distributed according to the graphs, indicating the estimated cost of "construction works", "installation works", "equipment, furniture and inventory", "other costs" and "total cost". In the summary estimate of the cost of industrial and civil construction, the distribution of funds are to 12 Chapters.

The determination of the price index for each Chapter based on the estimated calculations guarantees sufficient accuracy of the investment substantiation. (Ardzinov, 2009; Nosenko, 2009). The exception is only the first chapter of the summary estimate (SE), i.e. "Land Development".

## 2. Problem Statement

**Table 01.** Classification of works and costs included in Chapter 1 of the summary estimate named "Land Development"

The scope of work and expenses for land development	
Land plot registration	Land use planning and management
1. Cost of allotment of land plot, issuance of architectural and planning assignment and allocation of building limit lines	1. Costs related to compensation for structures listed for demolition, for planting, sowing, plowing and other gardening works, performed on the alienated territory, to compensation of losses and lost profits, for the transfer of buildings and structures (or construction of new buildings and facilities instead of demolished), compensation of losses caused by performing water-management works, termination or change of conditions of water use.
2. Costs of staking and fixing the main axes of buildings and structures, and their stabilization	
3. The cost of demining the construction site in combat areas	
4. Land payment for the seizure (redemption) of the land plot for construction, as well as payment of land tax (rent) during the construction period	2. Cost of reimbursement of production losses in case of land withdrawal
5. Costs related to receiving the initial permitting documentation (IRD) by the customer and the project organization	3. Costs related to unfavourable hydrogeological conditions of the construction site and the necessity of loop road construction for urban transport

The limit of funds necessary for the land development as part of the price of construction products in the formation of the summary estimate is subdivided into two aggregated cost groups:

- costs related to the registration of the land plot;
- costs for the development of the territory.

The first Chapter of SE defines the scope of work and expenses by the following classification (table 01). (MDS, 2004; Kljuev, 2011).

At the stage of pre-investment calculations, it is impossible to determine with sufficient accuracy the value of all costs included in the preparation of the land development. This is especially referred to the costs of obtaining the initial data, technical conditions and the necessary approvals, as well as the costs for the purchase of land for construction, payment of land tax (rent) during the construction period. At the stage of preparation of the investor's estimate documentation, these costs are not determined, the land is not redeemed, and the technical conditions are not received.

Accordingly, the size of investments can be determined either tentatively or referring to the analogue projects.

### **3. Research Questions**

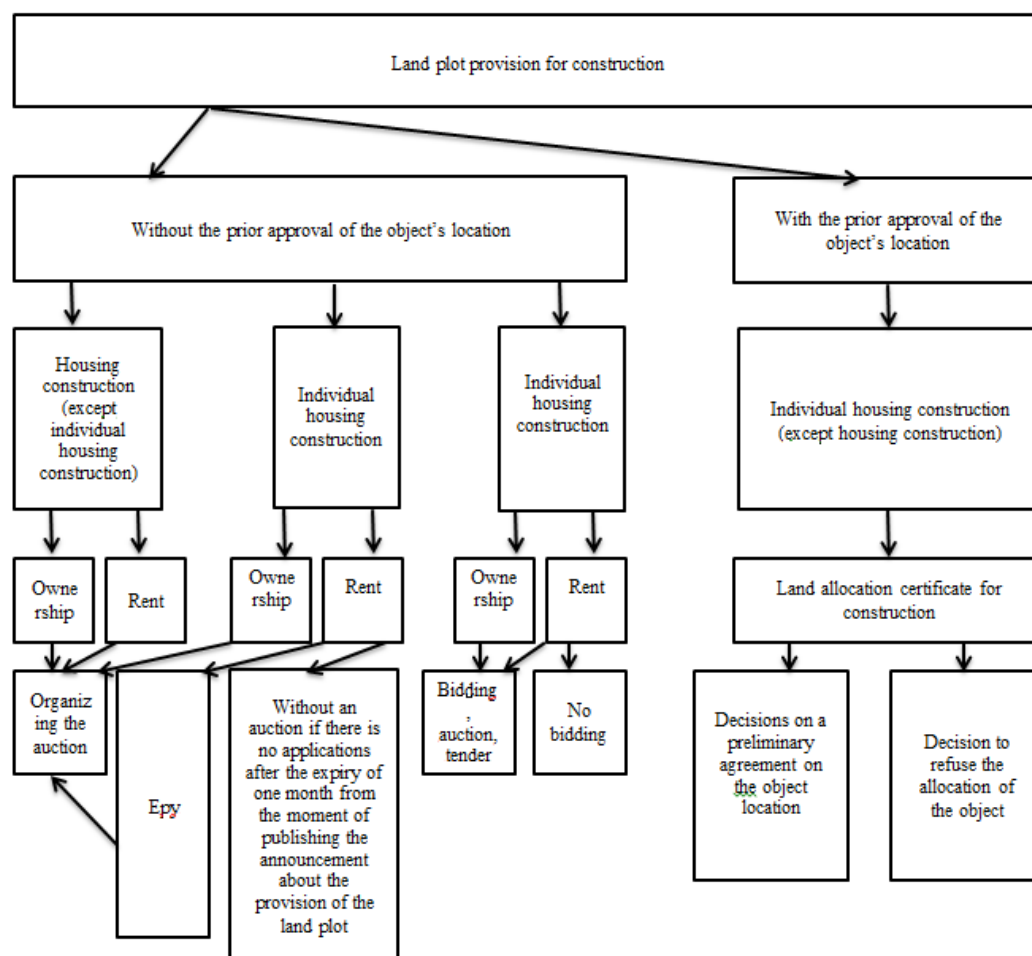
Unfortunately, for the current period the approximate amount of the costs for the preparation of construction is not defined and is not fixed methodically. There is a single document – Letter from the Ministry of Construction of Russia dated November 14, 1996 N Be-19-30/12, which shows us the approximate distribution of costs for the works provided by community public services and utilities, which cannot be used at this time. This document shows the dependence of the cost of provided works as a percentage of the construction cost.

The recommended indicators at the current stage of development of the market relations raise doubts. First, the procedure for providing community services and utilities has changed, and second, tariffs for services have changed. Moreover, they are systematically reviewed and adjusted. At the stage of formation of the contractor's estimated documentation, the service providers will evaluate these services, and this evaluation will be a part of the volume of capital investments for the construction of the complex of objects. However, it is impossible to evaluate these services correctly at the pre-investment stage.

The letter mentioned above offers to estimate community services and utilities in total, in the amount of 0.1% from cost of construction, whereas the results of the our analysis show that only the cost of purchase of the land fluctuates today from 0.9 to 11% of the total cost of construction of a residential facility.

According to the results of this analysis, the most significant value of investments falls on the payment for land at the redemption of the land plot during construction. The provision of the land plot today is in accordance with the following scheme (Figure 01).

According to the scheme, we see that the acquisition of land in the property for the needs of construction occurs through the auction; therefore, the purchase price of land depends considerably on the location of the construction site, the type of land-use permits and the surface area of the allotment. (Solin., 2010; Preminina., 2012; Yakupova & Galimova, 2016).



**Figure 01.** Scheme of land plot provision for construction.

The cost of land calculated in Chapter 1 of the summary estimate depends on the type of land allotment. (Yamshchikova, 2014; Yamshchikova & Bobrova, 2017). In case of purchase of land, the calculation depends on the purchase price, plus the amount of land tax for the period of construction. The estimator can count the land tax independently as a percentage of the cadastral value of the land, the value of which can be determined by multiplying the area of the allocated land plot by the cadastral value of the square meter of land. Cadastral value of the land in the context of the types of permitted use (RUB/square meter) is taken from the results of the state cadastral assessment of the lands of the constituent entities of the Russian Federation for each cadastral quarter. In accordance with article 389 of the Tax Code of the Russian Federation (Tax code of the Russian Federation, 2017), the tax rates on land shall be established by normative legal acts of representative bodies of municipal entities (laws of cities of federal significance of Moscow, St. Petersburg and Sevastopol) and may not exceed:

1) 0.3% (agricultural land or land in agricultural use in settlements, utilized for agricultural production; occupied by housing and engineering facilities and infrastructure of housing and communal complex or acquired for housing construction; acquired (provided) for individual household plots, horticulture, gardening or animal husbandry, as well as the suburban household; limited in circulation in accordance with the legislation of the Russian Federation, provided for defence, security and customs purposes);

2) 1.5% (for other land plots). The basis for establishing and levying land tax will be a document on the right to land.

#### **4. Purpose of the Study**

At the stage of drawing up of the investor estimate documentation, difficulties in calculation arise during determination of cost of purchase of the land when the land plots for construction are allocated and auctions on sale of these sites are not carried out. (Župová, 2012; Up-zoning New York city's mixed-use neighborhoods, 2005; Johnston, 2003; Erhun & Tayur, 2003). Unfortunately, in practice, these costs are simply not included in the summary estimate, which leads to an underestimation of the cost of construction and the unreasonable total investment for the construction of the facility. The purpose of the research is to develop a method of forming the amount of land payment in the first chapter of the summary estimate at the pre-investment stage with sufficient accuracy.

#### **5. Research Methods**

In accordance with the task, the study suggests a methodical approach to solving the problem of formation of the cost of land purchase in compiling the summary estimate. At the pre-investment stage, it is possible to determine the value of the land plot by three methods. The first is the method of comparison of sales, which is applied to the areas occupied and not occupied by buildings. The condition of the application of this method is the availability of information on the prices of transactions with the analogue land plots. The second method is to determine the cost of buying land as a percentage of the construction cost of the facility. To use this method, it is necessary to define quite exact dependencies of the cost of land from the estimated cost of the main construction object. The third method is to determine the cost of land purchase according to the cadastral value, taking into account the correction coefficient "trade discounts". The customer makes the decision of choosing the method of calculating the cost of land depending on the desired accuracy of calculations in the formation of total investment.

#### **6. Findings**

To calculate the cost of land by comparison of sales, it is necessary to have information about the prices of transactions with analogue land plots. In this case, the use the quotation price is allowed. (Johnston, 2003). In this method, the comparative analysis of the land plot and the analogue objects is made, taking into account the amendment on the date of the offer, the location, the recommended values of the discount on the bidding. The advantage of this method is that it establishes an accurate indicator of the cost of buying land, although there is some deviation from the future real purchase.

The following two methods of calculation are applicable if a reduction in the timing of the summary estimate is required. In determining the cost of land purchase as a percentage of the outcome of the second chapter "Basic Construction Objects", it is necessary to define rather exact dependencies of the cost of land from the estimated cost of the main construction object.

In the course of the analysis, the study has revealed the following dependence revealed for the housing construction of Irkutsk (table 02).

Table 02 shows that the interval of changes in the percentage of land value from construction costs varies considerably from 0.821 to 11.561%. In our opinion, the most significant criterion of percentage variations is the location of the land plot, which is determined by the cadastral quarter. The last two residential complexes in table 03 are located in one cadastral quarter and their percentage ranges from 2.396 to 2.805%. However, this dependency is not the only one. The objects located in 33 and 3 cadastral quarters have a significant deviation in percentage. It is necessary to consider dependence of change of a percent from the building area, the total area of the object, storeys and other elements, which is the purpose of our further research.

**Table 02.** Land plot analysis of the market value of the land plot depending on the estimated cost

Name of construction Object	Location of construction site (cadastral quarter)	Market value of the site, thousand roubles	Estimated cost of construction, thousand roubles	% of the cost of land from construction costs
Residential complex "Duet"	Irkutsk, the 6th micro district of Novo-Lenino, Yaroslavskogo Street (38:36:000003)	4 432.32	413 984	1.071
Residential house in Leninsky District of Irkutsk	Bauman Street in Irkutsk (38:36:000003)	11 499.85	272 376.08	4.222
Residential complex with built-in non-residential premises in Oktyabrsky District of Irkutsk	Baikalskaya Street, Oktyabrsky District (38:36:000023)	14 235.38	123 138	11.561
Residential complex, Shirjamova Street	Shiryamova Street10a, Irkutsk (38:36:000024)	4 791.51	241 256.52	1.986
Residential complex with built-in non-residential premises in Sverdlovsky District of Irkutsk	Irkutsk Region, Irkutsk City, Sverdlovsky District, Mayakovsky Street 69 (38:36:000033)	2 407.411	293 103.43	0.821
Residential complex "Ochag"	the 4th Zheleznodorozhnaya Street, Irkutsk (38:36:000033)	4 176.83	112 904.59	3.699
Apartment House, Raduzhny Micro District	113 cadastral number 38:36:000029	18 606.90	233 035.55	7.985
Residential complex "Alterra"	Irkutsk, University District, 114. (38:36:000030)	4 926.35	173 160.30	2.845
Residential complex "Central Park"	Irkutsk, Trilissera Street, 5 (38:36:000021)	5 294.91	220 970.59	2.396
Residential complex with built-in non-residential premises in Oktyabrsky District of Irkutsk	Irkutsk, Oktyabrsky District, the Upper Embankment (38:36:000021)	6 444	229 759.24	2.805

The third method is to determine the cost of land purchase according to the cadastral value, taking into account the correction coefficient of transference from cadastral value to market one. When estimating the value of the land plot by the method of comparison of sales, the term "Discount coefficient for bidding" defines this coefficient.

According to the analysed objects, we have calculated the discount rate for the auction (table 03).

**Table 03.** Trade discount rates for valuation of land market value

Location of construction site (cadastral quarter)	Market value of the site, thousand roubles	Cadastral value, thousand roubles	The market value of the land to the cadastral value
Irkutsk, the 6th micro district Novo-Lenino, Yaroslavskogo Street (38:36:000003)	4 432.32	3 661.2	1.21
Bauman Street in Irkutsk (38:36:000003)	11 499.85	22 760.46	0.51
Baikalskaya Street, Oktyabrsky District (38:36:000023)	14 235.38	12 238.76	1.16
Shiryamova Street 10a, Irkutsk (38:36:000024)	4 791.51	4 768.32	1.005
Irkutsk Region, Irkutsk City, Sverdlovsky District, Mayakovsky Street 69 (38:36:000033)	2 407.41	3 619.10	0.67
the 4th Zheleznodorozhnaya Street, Irkutsk (38:36:000033)	4 176.839	6 846.61	0.61
Raduzhny District 113 (38:36:000029)	18 606.90	34 207.37	0.54
Irkutsk, University District, 114. (38:36:000030)	4 926.35	4 411.97	1.12
Irkutsk, Trilissera Street, 5 (38:36:000021)	5 294.91	6 817.46	0.78
Irkutsk, Oktyabrsky District, the Upper Embankment (38:36:000021)	6 444	3 726.41	1.73

The trade discount rates have not such wide range, which leads to a more accurate calculation of the cost of buying land. In the further study, it is necessary to determine the ratio of the market value of land to the cadastral (discount for bidding) for each cadastral quarter, which will simplify the calculation of land fees in the formation of a consolidated estimate of cost of the construction.

## 7. Conclusion

Thus, we will have a result with different levels of accuracy when we use our proposed method of determining the cost of land costs, depending on the method of calculation. This indicator will undoubtedly influence the final result of investments in the implementation of construction. The level of accuracy, as well as the method of calculation, depends on the customer's choice. In addition, we expect to continue the

studies, with the plan to obtain clear dependencies of the percentage values of land plots on the total cost of construction and cadastral value of the land, taking into account various criteria.

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