

# Regional aspects of investment policy in construction

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**Abstract.** The article presents the results of the analysis of the problems of regional investment in terms of determining the volume of investment costs in capital construction projects. The purpose of the study is to determine the relationship of the state's pricing policy in the construction industry to the process of allocating investments for the construction of infrastructure facilities in the regional context. The signs of uneven possibilities of budgets of different regions are highlighted. Pricing factors for construction products, in particular, due to the regulatory framework, are identified as local reasons for differences in capabilities. The types of construction objects with characteristic qualities for carrying out such an analysis are determined. Research methods are based on a piecemeal comparison of linear models of direct costs and cost conversion indices in territorial standards. Differentiation of state pricing standards is considered on the example of special types of work in the construction of urban infrastructure facilities. The estimation of the difference in the cost indicators of territorial standards is used in the assessment of the investment potential of the region. The results obtained show a multiple difference in the cost of construction resources in neighboring regions without proper justification. This makes it possible to determine the volume and cost parameters of construction projects, the creation of which is possible within the framework of the current regional budget. The proposed three-dimensional model of the timing, cost and risks of the project provides grounds for calculating the qualitative indicator when choosing objects of investment programs of the regions. It is concluded that there is a need to move from a system of loosely interconnected territorial and sectoral budget and regulatory bases to a unified information environment.

## 1 Introduction

The state structure of the Russian Federation and peculiarities of the construction of the budget system of the country, along with its traditionally positive features, also have significant systemic problems associated with territorial differentiation of the level of fiscal capacity. Due to the presence of regions - "donors" and subsidized regions (the latter are the

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majority), there is a serious difference in the volume of investment, reproduction of fixed assets, living standards and demographics. All this occurs in the context of almost complete institutional identity of the regions in terms of administrative management, the structure of the regional economy, and public formations. The search for and solution of regional problems is more often considered in the context of state budget management functions - centralization of the revenue part and subsequent distribution to the regions cause the greatest number of censures from experts in the business community and science.

Without denying the importance of volumetric indicators and budget policy in general, it should also be understood that the causes of global problems often have localized, purely specialized causes. The causes are hidden in the technology of industries, legal and normative tools of regulation, traditional and decades-tested solutions, which do not correspond to the challenges of our time. In this regard, the authors implemented an approach to highlight and study the problems of regional differentiation on the example of a separate construction industry. Since construction is represented by a fairly wide range of newly built, reconstructed and technically re-equipped objects, there are characteristic features of investment and implementation of housing, transport and industrial projects. The predominance of investment schemes and sources of investment plays a significant role in the choice of the object of research. In housing construction the share of private investments is significant, and the ratio of public and private investments also depends on the level of economic development of the region. The objects of industrial purpose also do not have an even distribution, the well-being of the region may not mean a significant amount of industrial production, which is a feature of the post-industrial economy. The construction of urban infrastructure facilities is of considerable interest in studies of territorial differentiation, which is due to a number of reasons:

1. The network of urban roads, resource supply networks, as a rule, is formed and in any case requires maintenance, reconstruction and modernization works. This determines a guaranteed minimum volume of construction work on these objects.
2. objects are located in one region; the same construction title or property cannot be located in several constituent entities of the Russian Federation.
3. There is a stable system of subjects of investment activity, including federal, regional, local, industry level. The industry level in infrastructure projects, in turn, is represented by companies with significant or unitary state participation (JSC "Russian Railways", FGC "UES", etc.).
4. The share of specialized construction works, in respect of which it is possible to take separate measures of technical and price regulation, is large.

The above characteristics of the construction of urban infrastructure indicate a significant role of the state not only in the allocation of investment volumes, but also in regulating their specific needs per unit of created capacity of production facilities. Integration of pricing and budgeting according to A.I. Tolmachev [1] plays a significant role as budget regulation. The state nature of pricing has been a priority in our country for more than two centuries, and considerable practical experience has been accumulated in this area, both in development methodology [2,3] and in application of estimate norms [4]. At the current stage pricing has serious problems connected both with standards and methodology of forming the cost of work at the stage of architectural and construction design. This is noted in a number of works devoted to the reforming of the estimate-normative base in the construction sphere [5,6].

The federal and territorial unit rates (FER and TER) acting in the Russian Federation for the construction-assembly work are made in the base prices for the period of 01.01.2000. The estimates calculated in accordance with TER are the costs of resources, works, services, etc. adjusted with the help of recalculation indices of the estimated cost for a particular region of the Russian Federation. TER estimates are created taking into account

different climatic conditions in different regions and hence different working conditions. In case TERs are not available for the subject, the FERs are used when making estimates. Such methodology was justified under the stable conditions of state regulation of prices on the resources for construction, in the present conditions of market instability criticism of this method long ago formed a professional movement, which is regularly reflected in the periodical press [7,8].

The territorial unit rates are valid until their abolition. The Ministry of Construction of Russia can cancel the TERs by issuing an order or an order. Currently 66 regions of the Russian Federation are provided with TERs and may use them. For instance, if we consider regions of Ural and Siberia, Omsk, Tyumen and Sverdlovsk regions have TERs valid, whereas in Novosibirsk, Kurgan, Tomsk regions the cost of capital construction objects is calculated according to FERs. Thus, only formal analysis of staffing of regions with norms gives grounds to believe that spending of budget funds in these regions will have different normative basis even in the federal normative base. If we add to this the branch differentiation of norms, the situation becomes even more complicated - the development of branch resource and cost indicators had in its basis other price and organizational prerequisites [9,10]. Regulation of the composition and cost of resources in the development of regional and branch estimate standards has always been in the local centers of competence. In this case, you can be guided by the concept of accuracy, formulated in the works on the reliability of the estimated cost [11]. As noted in the works of O.V. Didkovskaya, on the example of the Samara region, the dynamics of changes in the cost of construction resources does not allow the use of existing methods of estimate rationing to ensure sufficient accuracy of the calculations [12]. In large cities the volumes of implementation of large construction projects - street and road network, residential complexes and related infrastructure also greatly depend on the choice of the estimate-normative base. Even traditional methods of forming the costs of operating technical resources do not keep up with changing economic conditions and regional characteristics.

The purpose of the study the authors defined the identification of private technological and regulatory reasons for unequal opportunities of the subjects of the Russian Federation in the implementation of investment in infrastructure. The main tasks are two - the analysis of the causes and the development of prerequisites for the formation of a computational model for assessing opportunities of budgets. The peculiarity and novelty of setting the goal and objectives is that traditional estimates of investment budgets of the regions are mainly quantitative, they do not take into account specific needs for investment by type of facilities and works. When there is an economic analysis of the implementation of investment projects, in particular, estimated costs - the problems of investment policy of the regions are not raised.

## **2 Materials and methods**

By the example of the Omsk region and neighboring regions we analyzed 8 unit rates from the list of basic pricing rates used in the calculation of the estimated cost of urban road overhaul facilities and compared their natural and cost indicators. The list of pricing rates was defined with the help of analysis of project documentation on the objects of urban road capital repair. The main condition of choosing the rates and their inclusion into the list of pricing rates was their definition of 50% and more of costs of construction and erection works in the estimated cost of objects and their most frequent application. Such approach is used in the analysis of pricing of different kinds of the objects under construction [15], however, the resource set and the construction organization has significant differences.

Data on current costs of the selected pricing rates for the Omsk, Sverdlovsk and Tyumen regions were determined by recalculation with the corresponding indices to FER

and TER, and for Novosibirsk, Tomsk and Kurgan regions - by recalculation with the corresponding indices only to FER, since TER for these regions are absent. Tyumen region is represented by 6 climatic zones, from 1 to 5 zones there is little or no variation in indicators of labor remuneration of workers and machinists. In this regard, the indicators of zones 1 to 5 were averaged and considered as a single zone. The sixth climatic zone for the Tyumen region is characterized by the most difficult climatic conditions and has higher TER values, in this connection, for the purity of analysis it was considered as a separate object of analysis.

The analysis showed that the value indicators of TER for all presented regions in current prices are lower than the value indicators of the base region. The TER values in current prices may differ by multiples for the same rate composition.

Thus, some of the TER rates are significantly higher than the FER, while another part, on the contrary, is significantly lower. In this situation, different sets of works estimated by TER within one entity may differ in cost, both upward and downward from the calculations made in FER. In this regard, for different sets of works arises the variability of calculation methods with the use of TER or FER. However, the simultaneous application of TER and FER rates in the development of estimate documentation is not permitted by law.

In the case when the object of capital construction or repair crosses two or more subjects of the Russian Federation at the same time, there is a variability of cost estimation of works. Thus, the cost of the same work package assessed in accordance with TER in the neighboring subjects can differ significantly up and down. Obviously, in determining the amount of investment and the layout of the budgets of the regions there is a situation of arbitrary choice of the principal decisions that determine the costs. In some cases, the specifics of the economy and management of the priority contractor may serve as a criterion for choosing the investment policy, which is inconsistent with the basic principles of pricing.

Recalculation from the basic price level to the current price level is carried out with the help of indices of change in the estimated cost of construction, published by the Ministry of Construction of Russia. These indices are calculated on the basis of the data available with the Federal Autonomous Establishment "Glavgosexpertiza Rossii" and submitted by the executive authorities of the subjects of the Russian Federation, taking into account the forecast inflation rate set by the Ministry of Economic Development of Russia. The Ministry of Construction of Russia publishes quarterly indices for recalculation of the base cost to the current cost for TER. TER is indexed less frequently. This can be due to the untimely transfer of the data required to form indices or a complete lack of interaction between regional and federal services, as well as the subject's disinterest in updating TER standards.

If we compare the indices to TER for the subjects under consideration, their value is lower than the index of changes in the estimated cost of construction to TER of the base region in the following percentages:

- for the Omsk region 27%;
- for Sverdlovsk region 22%;
- 21% for Tyumen Oblast.

If we compare the index for FER and TER, the picture is as follows:

The index to TER in Moscow Oblast differs only by 0.01% from the index for FER, the index to TER in Omsk and Tyumen Oblasts is lower by 25%, and in Sverdlovsk Oblast - by 18%.

In view of the fact that the TER indices lag behind and are not updated in time and the calculation of the quarterly index should be made taking into account the projected inflation and the data submitted to the Ministry of Construction of Russia by the subjects of the Russian Federation, it is reasonable to assume that their application in the subject of the

Russian Federation distorts the estimated cost of capital construction objects in the current price level.

To confirm this, we made calculation of the estimated cost of the complex of works on cutting the surface layer and laying asphalt-concrete mixtures per 1000 square meters in TER without considering the cost of construction resources in the basic and current price levels for the subjects under consideration to assess the difference in cost.

The calculation showed the following:

Omsk region: 25,762.91 (base) 171,323.41 (current)

Tyumen Oblast, zones 1-5: 26 107.97 (baseline) 182 494.71 (current)

Tyumen Oblast, Zone 6: 26,519.40 (baseline) 185,370.60 (current)

Sverdlovsk region: 18,785.59 (base) 130,184.13 (current)

Previously, when analyzing the rates, we have already drawn attention to the significant difference between the TERs in each of the constituent entities. However, the calculation of the cost of a set of works shows a certain average value, commensurate (with the exception of Sverdlovsk region) with the estimated cost of these works in the subjects under consideration.

An analysis of pricing rates in this part showed that in neighboring regions the cost of operating the same machines and mechanisms differs by up to 80-90%.

Climatic conditions, which could justify such a difference in the cost indicators of rates, are similar in these subjects. In this situation, the principle of calculating the costs for the operation of machines and mechanisms, which form a significant part of the cost of a unit rate, should not differ. However, as the analysis shows, the cost for the same machine or mechanism used differs by multiples.

With regard to the analysis of pricing rates in terms of labor remuneration of workers and machinists, it was determined that the FER rates of labor remuneration of workers with respect to TER:

- for the Omsk region - higher by 50% - 60%
- for the Sverdlovsk Oblast - lower by 50% to 60%
- for the Tyumen Oblast, Zones 1-5. - lower by 10% - 15%
- for Tyumen region, Zone 6. - Lower by 50% - 90%

The FER indices as to the labor remuneration of machinists with regard to TER:

- for the Omsk Oblast - higher by 30 - 60%
- For Sverdlovsk Oblast - lower by 5% to 50%
- For Tyumen Oblast, Zones 1-5. - varies in the range from minus 10% to plus 60% to

TER values. For the zone 6 of the Tyumen Oblast the values of FER in relation to TER are lower by different percentages, from 20% to 150%.

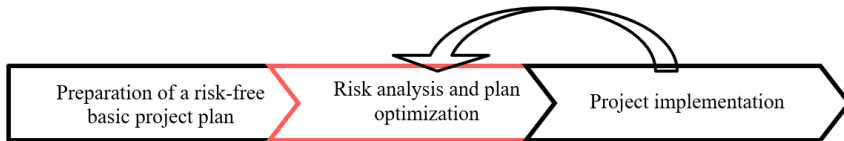
Thus, one can see a twofold difference in the indices of labor costs for workers and machinists in the basic price level of the Omsk and Sverdlovsk regions. Regions, however, are located in one climatic zone and have approximately the same environmental conditions, and the indices of changes in construction costs to TER differ by 4% (Omsk Region - 6.65; Sverdlovsk Region - 6.93). In order to understand the reasons for such high differences in terms of labor remuneration in the neighboring subjects, we analyzed the main socio-economic indicators of these subjects, which include the living wage in 2020, the number of employees and unemployment rate, monthly average per capita income and consumer spending, gross product, investment in fixed capital, as well as the volume of works by economic activity "Construction" according to Rosstat.

According to Rosstat data for 2020, the leading position among the subjects under consideration for almost all indicators is taken by the Tyumen region, the second place is taken by the Moscow region (with which we draw parallels as a base region for FER), and the third place is taken by the Sverdlovsk region. The Omsk region was among those catching up on many parameters of the Rosstat data.

For example, as to tariffs 27-03-012-02 (surface layer cutting of asphalt concrete) and 27-06-029-01 (paving) in distribution of indicators of wages of workers and machinists, the same trend of subject distribution as in socio-economic indicators is traced.

Thus, the existing TERs in terms of labor remuneration of workers and machinists of the subjects under consideration reflect the real picture and have a direct dependence on the socio-economic development of each of the regions under consideration.

Considering the investment program of the region in the field of construction, we can highlight the key scheme of risk management, adopted in modern risk management and presented in figure 1:



**Fig. 1.** Scheme of risk accounting in work.

When risk analysis is included in the optimization process, the volumetric-value scheme of the project "time-cost" turns into a scheme "time-cost-risk", which can be interpreted as a three-dimensional surface. Accordingly, changes (or differences) in terms (T), estimated costs (S) and risks (R) in different regions can be represented as:

$Tdx + Sdy + Rdz = dq$ , where  $q$  - a function of the project that characterizes the quality.

Understanding that costs, terms, and risks are normatively and factually linked in construction projects, we can assume that a change on one axis affects the others:

$\int_{L(n)} T(x, y, z)dx + S(x, y, z)dy + R(x, y, z)dz$  for path  $L$  of the  $n$ -th project implementation.

Then, similarly to the Newton-Leibniz formula, the difference in the qualitative indicators of the  $n$ -th project will depend on the progress of its implementation:

$$K(L1) - K(L2)$$

The qualitative indicator can be assigned according to the criteria contained in the evaluation objective. In assessing the budgetary capacity can be guided by the normative expression

$$I = \sum_i V_i * S_i, \text{ where } V_i - \text{where (capacity) of construction,}$$

$I$  - investments in construction

Given that the path of implementation (technological and organizational scheme) may vary during the implementation of projects, the cost and scope of work are formed through increments -  $dV$  и  $dS$ . Accordingly

$$\int dI = V_i * S_i + \text{const}$$

The constant in this case can be interpreted as a qualitative level of implementation of the object, for example, saving budget funds while obtaining good quality construction products. That is, there is an opportunity to express  $\text{const} = K(L1) - K(L2)$ .

The result can be used as a whole to determine the feasibility of the region's investment budget, and in particular, to identify the most problematic types and complexes of works in construction.

### 3 Results

The analysis of the structure of estimated costs can be continued for other types of work and costs. However, it is fundamental for the construction that there are significant complexes of specialized works in the projects - the construction of infrastructure support of residential areas, cable and overhead lines in hydropower construction. It is these works that bear the greatest price risks in the implementation. With this in mind, in the general flow of analysis and criticism of pricing in construction, the methodological novelty of the study is its selectivity in respect of specialized works.

The presented results of the analysis convey the reality of the current pricing situation, when completely unchanged by the length of the linear object the design solutions change the cost by half or two times at once when crossing the administrative boundaries of the regions. It is logical to wonder whether this is one of the reasons for the difference in socio-economic development of adjacent regions, when with an equal budget the opportunities to create capacity, determined by the estimated standards, are unequal.

According to the authors, the solution to the problem must begin with the introduction of information, not only normative, but also analytical, to the public level. Informatization and digitalization of construction can offer very interesting solutions for this. Comparison of normative unit costs of construction has determined the need to develop a methodological framework for a comprehensive approach to the assessment and comparison of regions, not only by indicators of estimated standards, but also taking into account the timing and risks of projects. The proposed approach to determining the achievability of the investment program objectives through the criterion of quality requires approbation in practice and, most importantly, the development of threshold (acceptable) values of quality (investment savings, reduction of time, resource savings, etc.). The novelty of the approach, consisting in the joint consideration of the problems of investment and pricing, allows to propose for discussion and further development a volumetric indicator of regional opportunities for investment in construction.

### 4 Conclusion

We can conclude that the current pricing system is not only complex and imperfect, but also has a variability of approaches to calculating the estimated cost of capital construction objects in neighboring regions. The state, being a customer, has to evaluate and buy not the process of construction, but the units of construction products, such as 1 km of road, cubic meter of the building volume or the indicator of the functional purpose of the object.

Of course, there are many factors that affect the development of each subject of our country and not all of them are related to the expenditure items of the budget. But the amount of natural goods created with the use of budget funds is directly determined by the quality of their expenditure processes. Construction in this sense is a well-regulated industry, where the formation of the cost of construction products is entirely in the hands of the state. Thus, the elimination of unjustified interregional differences in the federal pricing standards can serve as a significant step towards ensuring equal conditions for the implementation of construction projects, regardless of the region of construction and the departmental affiliation of the construction site.

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