

# Socio-Economic Role of Infrastructure Projects in the Spatial Development of the Volga Federal District

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**Abstract:** The article is devoted to assessing the role of infrastructure projects in the spatial development of the Volga Federal District. First of all, the regions of the Volga Federal District were ranked by the factor of financing infrastructure projects. Then, regression dependencies of this factor with socio-economic indicators of the constituent entities development were identified. In addition, a map was developed reflecting the spatial differentiation of the Volga Federal District regions on the development of infrastructure projects.

**Keywords:** Infrastructure projects, Spatial development, Regional economy, Social and economic development, Regression analysis.

## INTRODUCTION

Infrastructure projects are essential tools for spatial development. Being mechanisms for the implementation of strategic plans for the socio-economic development of territorial systems, they serve the main goal – improving the quality of the population lives (Hung 2020).

In the Russian Federation, the basis of project management is a set of national projects in the priority areas of the country's development until 2024, approved by the President of the Russian Federation V.V. Putin in May 2018 (Decree of the President of the Russian Federation dated May 7, 2018). A separate block is devoted to infrastructure projects, due to the fact that the infrastructure provision of the territory contributes to its socio-economic and spatial development, serves as a factor for attracting investment and human capital.

The role problems of infrastructure projects in this work are raised at the regional level, at which most reproductive processes are closed (Regional economics: lecture notes, 2018; Susanti *et al.*, 2020). The object of research is infrastructure projects as a factor in the spatial development of the Volga Federal District and its constituent entities. The subject of the study is the socio-economic and spatial relations that arise in the process of development and implementation of infrastructure projects in the Volga Federal District.

This article actualizes the issues of understanding infrastructure projects as poles of territorial growth with an emphasis on the use of regression and cartographic analysis methods. Conclusions are drawn about the place and role of infrastructure projects in the Volga Federal District and its constituent entities, which may be useful for improving the spatial development of the region. Considering the fact that the spatial development block is one of the determining ones according to the strategic planning approach, the issues raised are able to complement and actualize the set of goals and objectives, priority areas and mechanisms for implementing infrastructure projects for the ongoing socio-economic development of the Volga Federal District (Federal Law "On Strategic Planning in the Russian Federation" dated 06.06.2014). This determines the relevance, theoretical and practical significance of the research topic.

## Objective of the Study

The objective of this research is:

- To substantiate the approach to the study of infrastructure projects as drivers of the territory socio-economic development;
- To rank the costs of infrastructure projects by constituent entities of the Volga Federal District;
- To identify the regression dependence of the cost factor for infrastructure with socio-economic indicators of the Volga Federal District regions;
- To present a map reflecting the spatial differentiation of the development of infrastructure projects in the Volga Federal District;

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- To draw conclusions about the role of infrastructure projects in the spatial development of the Volga Federal District and its constituent entities;

### Scope of the Study

This study covers 14 constituent entities of the Volga Federal District: six republics (Bashkortostan, Mari El, Mordovia, Tatarstan, Udmurtia, Chuvashia), seven regions (Kirov, Nizhny Novgorod, Orenburg, Penza, Samara, Saratov, Ulyanovsk regions) and Perm Territory.

### Significance of the Study

The theoretical significance of the work is to clarify the concept of infrastructure projects as a factor in the spatial development of the region and the implementation of strategic plans.

The practical significance of the work is to assess the role of infrastructure projects in the spatial development of the Volga Federal District using econometric and cartographic methods. The developed model can become a tool for statistical analysis of the dynamics of regional development and the prediction of their socio-economic potential for the strategic period.

Thus, the practical meaning of the work is to determine the role of infrastructure projects to ensure the improvement of the spatial development of the Volga Federal District constituent entities and the implementation of the region strategic goals.

### LITERATURE REVIEW

The problems of spatial development and the role of infrastructure projects in the development of regions were studied by representatives of various economic and geographical areas Golikov and Dvoskin consider infrastructural development in conjunction with the features of a particular territorial system, introducing the concept of an infrastructure-territorial complex, while U. Aizard, E. Alaev and N.N. Baransky used the concept of an infrasystem (Golikov and Dvoskin 1990; Caraka 2020; Caraka *et al.*, 2021). These categories are the basis of the conceptual apparatus for the study of infrastructure projects as drivers of spatial development. Buhr *et al.* focus on the role of infrastructure projects for economic growth (Buhr 2003), L.V. Oveshnikova, O. A. Donichev and O. Yu. Tarasova study the return on the implementation of infrastructure projects for regional development. Mordovchenkov and Mamedova pay special attention

to the spatial effects of the implementation of infrastructure projects (Nikolaeva and Mordovchenkov 2010; Du *et al.*, 2020). The spatial aspects of the development of the region, the categories of economic and social space are most fully reflected in the works of A.G. Granberg ([www.econorus.org](http://www.econorus.org)). Thus, in our study, we relied on a wide range of theoretical and methodological developments for the authorship of the above scientists.

Among foreign researchers, the role of infrastructure projects in spatial development is being actively studied in the United States, China, Australia, and in a number of leading European countries - in England, Germany, Spain, the Netherlands, Italy, etc. The dynamics of the number of publications on selected issues in foreign databases have a positive trend since 2010, which confirms the relevance of the topic in the scientific community for the implementation of practical tasks of territorial development.

### METHODOLOGY

The methodological approach to solving problems combines the concepts of sectoral (infrastructural) and regional socio-economic geography, the theory of spatial development of the region, as well as a systematic paradigm for describing territories.

Among the methods were used: document analysis, statistical data, econometric methods (regression and correlation analysis), mapping and other graphical methods of presenting the information. The comparative method is used to analyze the subjects of the Volga Federal District.

The information base for the study was the statistics of regional development from the sites of Rosstat and its territorial units in the regions of the Volga Federal District. The main documents were Plans for the creation of objects of investment and infrastructure activities, the Strategy for socio-economic development of the Volga Federal District and its entities (<http://mert.tatarstan.ru>).

### RESULTS AND DISCUSSION

First of all, we present Table 1, in which the costs of infrastructure projects by constituent entities of the Volga Federal District are ranked (starting from the maximum financing and then in descending order).

As can be seen from the table, the leaders are the Samara region, the Republic of Tatarstan and the Nizhny Novgorod region.

**Table 1: Costs of Infrastructure Projects by Subjects of the Volga Federal District (2017) (<https://infraone.ru>)**

№	Constituent entities of the Volga Federal District	Expenditures on infrastructure projects, milliard rubles
11	Samara Region	28,6
22	Tatarstan Republic	23,8
33	Nizhny Novgorod Region	21,2
44	Bashkortostan Republic	15,8
55	Perm Territory	12,4
66	Mordovia Republic	10,1
77	Orenburg Region	7,4
88	Saratov Region	7,4
99	Chuvashia Republic	6,2
110	Udmurtia Republic	6
111	Ulyanovsk Region	5,9
112	Penza Region	4,1
113	Kirov Region	3,9
114	Mari El Republic	3,1

In the next step, we carried out an econometric analysis of the regression dependence of the cost factor for infrastructure projects and socio-economic development indicators in the Volga Federal District constituent entities: investment inflows, quality of life index, emissions of harmful substances into the atmosphere from stationary sources. The results of checking the econometric model for compliance with the Gauss-Markov conditions are shown in Table 2.

Infrastructure costs in the regions of the Volga Federal District have a direct strong influence on the inflow of investments into these territories, which justifies the rule of investing in facilities with already developed infrastructure. Thus, infrastructure is a factor in attracting investment.

From the graph in Figure 1 it can be seen that the inflow of investments is maximum in four subjects - Tatarstan, Bashkortostan, Samara and Nizhny Novgorod regions. The same entities are leaders in financing infrastructure projects, which proves a direct correlation between these indicators.

A strong correlation (0.79) was noted in the indicators of the infrastructural provision of the region and the index of quality of life. Thus, it can be stated that infrastructure development is one of the fundamental signs of ensuring a decent quality of life for the population.

Based on the data presented in Figure 2, one can also note the tendency that in four leading entities by

**Table 2: The results of the factors regression dependence econometric analysis of socio-economic development in the constituent entities of the Volga Federal District and its verification under the conditions of Gauss-Markov (<https://infraone.ru>; <http://mert.tatarstan.ru>)**

Explanatory variables (x)		Costs for infrastructure projects, million rubles		
Explained variables (y)		Inflow of investments, million rubles	Quality of Life Index	Emissions of harmful substances into the atmosphere from stationary sources, kg
Correlation coefficient (R)		0,81	0,79	0,45
Statistical significance of the factor ( $t_{cal}$ )		4,78	4,44	1,75
The overall quality level of the model (R2)		0,66	0,62	0,2
Residue autocorrelation	DW method	No		
	Rows method	No		
Heteroskedasticity		No		

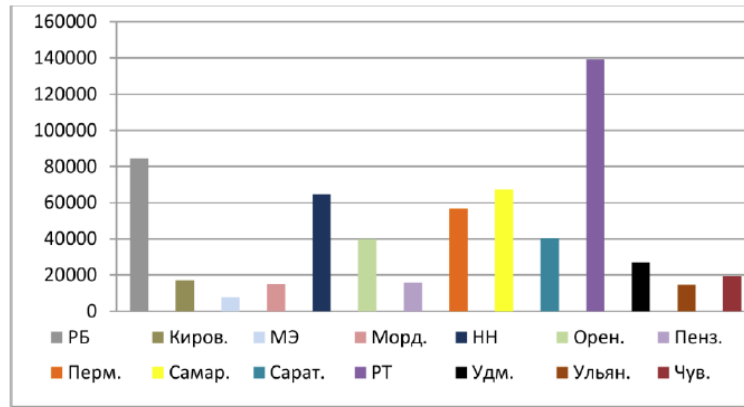


Figure 1: Investments in fixed assets by subjects of the Volga Federal District, million rubles (<https://infraone.ru>).

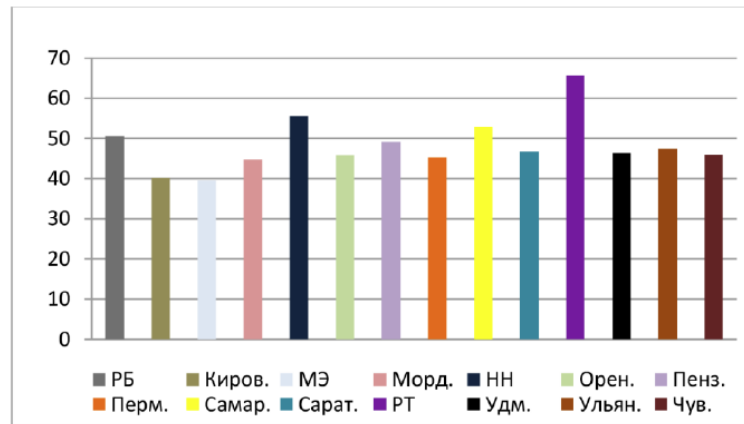


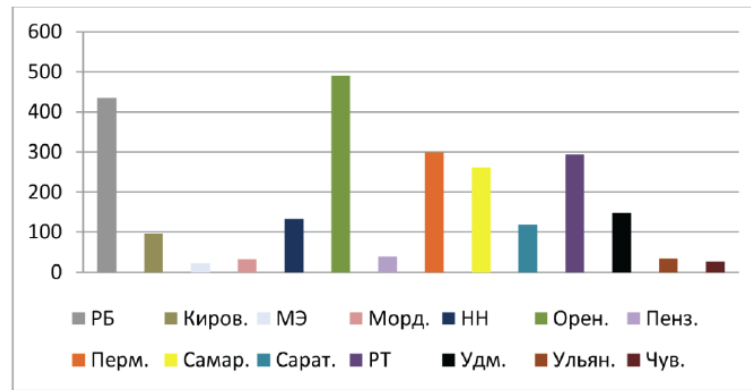
Figure 2: Quality of life index by subjects of the Volga Federal District (<https://infraone.ru>).

the quality of life index (Tatarstan, Samara, Nizhny Novgorod regions, Bashkortostan), financing of infrastructure projects exceeds the indicators of other regions. This again proves the importance of implementing infrastructure projects for the purpose of ensuring a decent quality of life for the population. The fact that the quality of life is the main direction in the preparation of strategic development plans, and the quality of life index has a close regression relationship with the costs of infrastructure projects, we can conclude that infrastructure requires special attention in the planning process as a factor that can become a driver of territorial development.

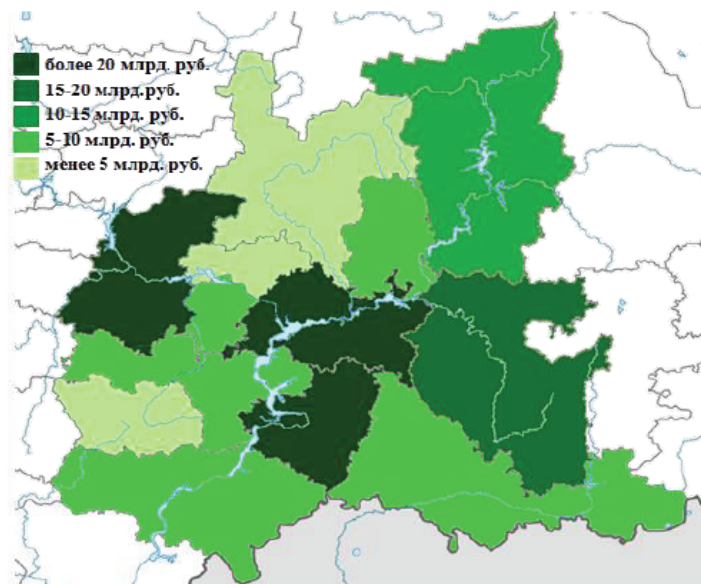
We also note a moderate relationship between the factor of emissions of harmful substances into the environment, depending on the growth in the number of infrastructure costs and, accordingly, the formation of more infrastructure in the Volga Federal District. Thus, infrastructure projects can carry environmental threats, which require their calculation at the stage of engineering and the search for ways to rehabilitate the territory from polluting factors.

The graph in Figure 3 shows the presence of maximum emissions of harmful substances into the atmospheric air in the Orenburg Region, Bashkortostan, Perm Territory, Tatarstan, Samara Region. These regions occupy the seventh, fourth, fifth, second and first places in financing infrastructure projects, that is, they are leaders. On the contrary, entities with minimal costs for financing infrastructure facilities (the Mari El Republic, Mordovia, Penza, Ulyanovsk Oblasts and Chuvashia) are characterized by low emissions of harmful substances into the atmosphere. Thus, it can be stated that there is a feedback between the indicators of infrastructure financing and emissions of harmful substances into the environment - with the increase in infrastructure projects, as a rule, the ecological damage to the air atmosphere increases.

For clarity, financing of infrastructure projects in the Volga Federal District subjects is shown in Figure 4 and reflects the spatial aspects of the location of the leading regions for the placement of infrastructure facilities.



**Figure 3:** Emissions of harmful substances into the atmosphere from stationary sources in the Volga Federal District, kg (<https://infraone.ru>).



**Figure 4:** Financing of infrastructure projects for the subjects of the Volga Federal District for 2017, milliard rubles.

It should be noted that the dependence of investment factors and quality of life on indices of infrastructural support for the economy various sectors, the regions characteristic of the Volga Federal District. Consider, by type of infrastructure: the most important from the point of obtaining investments view is the index of the territory's provision with energy infrastructure (0.68), and then there are transport infrastructure (0.6), telecommunications (0.59), and communal (0.51).

In addition, the influence of the infrastructural security of the Volga Federal District subjects on the quality of life was revealed. By type of infrastructure, the picture is as follows: a correlation coefficient of 0.67 is typical for telecommunications, utilities and transport infrastructure, the lowest contribution to the quality of life index is typical for energy infrastructure (0.52).

Thus, the implementation of infrastructure projects varies depending on industry specialization. Energy infrastructure makes the largest contribution to attracting investment to the territory, but a smaller (compared to other types) contribution to the formation of an index of the quality of life of the population. Also important were telecommunications, utilities and transport types of infrastructure provision for the integrated development of territorial systems, in this case, the regions of the Volga Federal District.

## CONCLUSION

In the course of the study, we presented a ranked series of constituent entities of the Volga Federal District on infrastructure costs, and also revealed regression dependencies of this factor with socio-economic indicators of investment inflow, quality of life

index and emission of harmful substances into the atmosphere. Thus, using econometric, statistical and cartographic methods, it was substantiated the approach to study infrastructure projects as drivers of the territory spatial development, and was proved the importance of taking into account infrastructure projects when developing plans for the socio-economic development of territorial systems. All of these can be used for further research of constituent entities of the Volga Federal District and other regions Russian Federation.

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