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**INFRASTRUCTURAL PRIORITIES AND REGULARITIES OF  
SPATIAL DEVELOPMENT OF REGIONAL SYSTEMS**

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***Abstract***

Territorial systems are classified as complex systems. The degree of their sustainability is determined by the characteristics of the social, economic and environmental components. The state of the reproductive potential, understood as a necessary condition for sustainability, depends on the complex result of their interaction. Full implementation of development priorities is not obvious. Given the accuracy of goal-setting prospects for the development of regional systems and planning horizons based on existing patterns, the implementation of priorities is possible. But risks are not excluded. In particular, they arise as a consequence of modern concepts of spatial development: polarization is able to increase. The social direction of regional development is more vulnerable. The infrastructure component of the territorial systems ensures risk reduction. This is possible thanks to the substantiation of the basic forms and models of the spatial development of regional systems. In them, the infrastructure subsystem accumulates the potential of its individual types. The theory of this issue is evolving. The current stage of development of regional systems is justified by the transition to an integration infrastructure that combines the features of the industry links of the infrastructure and the infrastructure of the innovation system. As a result of this interaction, a controlled reorganization of the regional system is predicted. The category "quality of life" is proposed to be used as an indicator of resolving potential conflicts between priorities and patterns of territorial development, and its indicators should be used as measures of the dynamics of optimization processes.

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**Keywords:** Infrastructure, innovative economy, patterns, priorities, quality of life, regional system.



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## **1. Introduction**

### **1.1. Investigation of infrastructure aspects of territorial development in the framework of the scientific direction "spatial economics"**

The problems of territorial systems in the Russian Federation are almost always at the center of scientific and public attention. The establishment of patterns of their spatial development at the regional level is necessary for the improvement of the formed scientific foundations. For these purposes, theoretical achievements of scientists in the field of regional and spatial economics are used, one of the founders of which in our country is academician N. Nekrasov. By the beginning of the XXI century, leading regional scientific schools headed by Academician A. Granberg stood out: Moscow, Ural, Far Eastern, north-west, Siberian. Thanks to the work of these scientists and their colleagues, spatial economics has now become an independent area of economics. Within this framework, the theoretical and methodological provisions of regional development in the infrastructural aspect are investigated.

### **1.2. Improving the quality of life as a modern priority for regional development**

The changes in the economy of recent years in Russia predetermine the vectors of regional research. Nowadays, there are more and more studies that offer new approaches to assessing the level of development and prosperity of territories that go beyond the economic dimension alone, where such vital aspects as quality of life, infrastructure, equality, safety and environmental sustainability are considered (Minakir, 2015; Zubarevich & Safronov, 2011). Prospects for the transformation of territorial systems are considered in the light of the influence of the concept of sustainable territorial development and spatial development models (Basiago, 1999; Grimes, Apatov, Lutchman, & Robinson, 2014). In addition, the characteristic conditions of their development associated with the challenges of an innovative economy and post-industrial transformation are of great importance. The identified evaluation factors of development take into account the threats and constraints that affect the sustainability of regional systems. In these processes, the importance of the priorities of regional development increases, creating conditions and providing opportunities for improving a person and satisfying his needs with the preferential use of the concepts of "quality of life", "standard of living", and "social security". Changes in these qualitative characteristics are primarily reflected in the infrastructure component of regional systems.

The progressiveness of the processes of formation of the innovation model of the economy is obvious: they make it possible to provide complete guarantees for the population of decent living conditions and the improvement of its quality. At the same time, the potential for the emergence of various kinds of contradictions in territorial systems caused by inertial tendencies is not excluded, and the complex of management measures ensuring opposition to their negative impact is still at the stage of its formation (Zagler, 2002; Atkociuniene, Kiausiene, & Urmoniene, 2014; Jungmittag, 2006; Gushchina, 2017).

## **2. Problem Statement**

In modern conditions of Russia, the processes of spatial development of regional systems are not synchronous, they have different dynamics, as well as a different vector of development, especially in the

short term, which indirectly increases the asymmetry of the socio-economic space. As a result, distortions and violations of the stability of regional systems occur. The social direction of development of the regional system becomes its most vulnerable link, which reduces the positive effects of strategic management. Insufficiently high rates of social development of regional systems have a negative impact on both the economic and their environmental components, without providing the required balance. To prevent possible disruptions in the functioning of regional systems, it is necessary to develop preventive management measures. This, in turn, necessitates the improvement of the theory and methodology of strategic territory management, using mainly infrastructural development patterns (Peretto & Schmulders, 2002; Romer, 1986; Romer, 1990; Henckel & McKibbin, 2010; Munnell & Cook, 1990; Straub, 2008; Czernich, Falck, Kretschmer, & Woessmann, 2011).

### **3. Research Questions**

- 3.1. Determine the place and role of the theory and methodology of the infrastructure development of territorial systems of the regional level in the modern system of economic sciences.**
- 3.2. Identify the main stages of the evolution of the theoretical foundations of the infrastructure development of regional systems and characterize them from the standpoint of the influence of the current strategic priorities.**
- 3.3. To establish the degree of influence of infrastructure components on the transformation processes of regional systems.**

**To substantiate the infrastructural laws of the spatial development of territorial systems in the context of the polarization of the socio-economic space.**

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

The study aims to analyze the evolutionary changes in the content of the processes of formation and spatial development of the territorial system of the regional level in the aspect of identifying priorities and patterns of changes in its infrastructure component. The obtained results are supposed to be used to refine and detail the concept of “quality of life” as conditions for increasing the sustainability of the functioning of the regional system.

### **5. Research Methods**

5.1. Currently analysis of the existing methodological approaches suggests that the regional economy is a complex system that has both a functional and spatial organization. Therefore, to achieve the goal of this study, a spatial approach is used to study the role of infrastructure in the development of regional systems. The modern approach to the study of regional development, and, in particular, its infrastructural components, involves the analysis of spatial functions and infrastructure dysfunctions,

which provide the appropriate conditions for sustainable development in the social and economic spheres of social life.

5.2. Models and methods of spatial economics made it possible to identify trends, patterns and new strategic priorities for the infrastructural territorial development of regional systems in the context of socio-economic polarization and the imperatives of the innovation economy.

5.3. In the process of studying the infrastructure aspects, the quality of life indicators were modeled within the framework of the concept of spatial development of the regional system and scenarios of control actions were developed aimed at improving the sustainability of the regional system and maintaining the balance of its functions and connections.

## 6. Findings

### 6.1. The evolution of the concept of "infrastructure" as an object of study of spatial economics

Modern scientific foundations of the infrastructural development of territorial systems, both in Russia and abroad, have been forming for a long time, but there is still no unequivocal assessment of this socio-economic phenomenon. It is believed that the emergence of the term "infrastructure" in the meaning, close to today's, is associated with the works of P. Rosenstein-Rodan in the 1950s. Since that time, it has actively penetrated into economic, geographical and other disciplines in various interpretations.

The meaning of the term "infrastructure" has a different meaning, reflecting:

- the influence of factors of development of private entrepreneurship in certain sectors of the economy that meet the needs of the population;
- characteristics of a set of conditions (material, institutional and individual) that allow for the appropriate allocation of resources to ensure full integration and a high level of economic activity;
- stages and methods of formation of a multifunctional system for ensuring the development of a modern economy built on the potential of the service sector.

At this stage, the infrastructure is considered as an integral part of the socio-economic system (Peters, 1987; Bruneckiene, Cibinskiene, & Guzavicius, 2010; Frischmann, 2005). This feature of the ownership (or dependence) of the infrastructure on the territorial system remained for a long time leading for objective reasons. The functioning of the infrastructure is determined on the basis of the general principles of the organization of the system and is subject to both the priorities and the characteristics of its organization (Holtz-Eakin & Lovely, 1996; OECD, 2007; OECD, 2015; Roller & Waverman, 2001).

The process of creation, size and properties of infrastructure elements, the ways of their interaction directly depend on the strategic goals and tactical objectives of the regional system development. Accordingly, in the spatial aspect, the following functions are initially justified:

- transport support (highways, railways, waterways of traffic, transport hubs and facilities (airports, bridges));
- utility infrastructure (water supply and drainage, energy supply, waste recycling);
- social security (a complex of buildings, enterprises and institutions of the non-production sphere, functioning to meet the material and spiritual needs of the population, including housing, public services, education, science).

As the social division of labor deepens, changes occur in the assessments of infrastructure development. Changes are associated with the constant redistribution of economic roles of participants in regional markets, with the loss of many of them dominant, with the features of their spatial localization (Kwak, Chih, & Ibbs, 2009; Engel, Fischer, & Galetovic, 2010; Andrieu, 2007). As a result, the known forms of infrastructure “maintenance” and “provision” of territorial administration and the exclusivity of the market mechanism become less relevant.

A new view of infrastructure is scientifically linked to the requirements of its compliance with new priorities for the spatial development of regional systems (Fageberg, 2000; McKibbin & Henckel, 2010; Stevens & Schieb, 2007). It describes a transition in understanding the content of infrastructure processes and their organization: from servicing material production processes to full-fledged, relatively independent development. It means:

- the complication of the functions of infrastructure elements and the multiplicity of options for their spatial projection in the system of regional development;
- limited opportunities for initiating and implementing infrastructure development forms of the territory exclusively by market actors, even if they are highly competitive;
- the acquisition by the infrastructure of regional systems of strategic functions and powers.

As a result, management issues are resolved on a fundamentally new basis: when developing long-term development plans for both individual territorial entities and integral systems at the national level, the functioning of infrastructure elements is considered in their entirety, taking into account the dynamics of changes.

The scope of issues of infrastructural development of regional systems is expanding. The justification of a local-level infrastructure initiative, even insignificant in scale, is no longer possible without adhering to the strict framework of the process being organized for legislative and regulatory support. Such initiatives, in general, are of high cost and not sufficiently protected from investment risks, therefore they must have high guarantees to ensure their implementation. For this purpose, special mechanisms for their implementation are used, which, along with the participation of the state, provide for the creation of special structures capable of guaranteeing the specified parameters of system changes.

Thus, objective prerequisites are created for the transition from an isolated consideration and the formation of infrastructure elements to the definition of the forms of their interaction, both among themselves and with the environment external to them. The traditional isolation of individual elements of the infrastructure is replaced with the prediction of the results of their joint operation.

In the conditions of our country, preconditions were also formed for the transition to the complication of the processes of infrastructural development of regional systems. Their detailed study by scientists and specialists gave rise to the emergence of the concept of inter-sectoral infrastructure. It is based on the principle allowing autonomy for the formation of infrastructural functions aimed at the functioning of the entire economy as well as its large spheres, complexes or nodes, as well as facilitating the unification of several groups of sectors of the national economy that have internal economic unity and they are not contradictory in technologies of implementation. This concept marked a turning point in the system of domestic scientific knowledge in terms of infrastructure and the onset of a qualitatively new stage in their research, thus anticipating the modern integrated principles of forming regional systems.

The further development of the theory and methodology of the infrastructure development of regional systems is due to the formation of the “new economy”, globalization and internationalization. To date, it is generally accepted to compare in time and space the phenomena described by the terms “new economy” and “infrastructure”, and this justifies the expediency of their further study in a similar way.

## **6.2. Infrastructure legitimacy of regional system structuring**

Structuration of regional systems is a controlled, continuous, and not a one-time process of dismembering the whole into separate components - structural elements that perform certain functions and are in strictly fixed and functionally determined interconnections among themselves. The structure of a regional system, based on a set of stable connections of an object, ensures its value and identity to itself, as well as the preservation of the basic properties of various external and internal changes (Dontsov & Yushkova, 2017). In this regard, the establishment of dependencies between the infrastructure and structural components of regional systems allows us to predict their subsequent development in the format of transformation processes.

The study showed that at the previous stage of development of regional systems, the structural principles were used as the basis of their main principles, and the infrastructural principles were used as secondary. On this theoretical basis, the hierarchy of objects of regional development and the relationship between them was determined. It determines the method of their subordination to each other, as well as the stage of transition from one state to another. The stages were characterized with the intensity of the processes occurring in them. Depending on the methods of interaction, the features of the spatial development of regional systems and their identity are identified.

The formation of regional systems based on the principles of structuring ensured their optimal functioning, providing for a certain balance of functions and relationships that have quantitative and qualitative parameters. As a result of this, territorial systems began to be formed on the basis of spatial standards.

The theoretical foundations of structuring laid the foundation for modern approaches to modeling regional systems. Some of their provisions are also being put into practice in various types of experimental long-term development - strategies and plans for the development of the territory right up to the beginning of political and socio-economic reforms of the 1990s. It seemed that the market type of the economic system is capable of surpassing the socialist type in a complex of characteristics and indicators, as well as guaranteeing unconditional fulfillment of activities assigned to the city-forming and city-

serving functions in the rank of special objects. It was expected to reduce the influence of external factors on the performance of specified "technological cycles" of functioning. Minor deviations in the proportional ratios of the elements within the regional system were allowed. Gradually, over the years of market reforms, the models developed in the conditions of the economy of socialism have lost their significance. They came into conflict with the new requirements, which was expressed in their technological mutual exclusion. Thus, while regional systems as a whole retain their traditional forms of functioning, they can transit to new forms of development, provided that a strategic adaptation mechanism is developed to level out problem situations caused by external factors.

### **6.3. The rise of infrastructure priorities for the development of regional systems in the context of the formation of an innovative economy**

The development of the methodology of strategic adaptation at the present stage of development of regional systems is largely determined with the processes of formation of an innovative economy. As a response to the challenges of the innovation economy in regional systems, regimes are developed and the rate of transformational changes in the system is determined. The establishment of change parameters is necessary to substantiate the applied adaptation methods. They contain tools for managing the process of interaction between structural and infrastructural components of regional systems. In submission to the general logic of the predicted changes, a motivated choice of tools is implemented they directly affect the infrastructure subsystem in relation to each of its component types.

The action of the imperatives of the innovation economy, inseparable from the achievements of scientific and technological progress is carried out in the framework of the reorganization of the existing institutional environment. One of its most active elements is the national and regional innovation systems. Under these conditions, the innovation infrastructure becomes a "guide" of the strategic principles for the development of regional systems. By analogy with the types of infrastructure components of regional systems studied to date, it contributes to the initial appearance of new spatial forms and their subsequent consolidation in the structure.

In analyzing the potential of the innovation infrastructure, the focus is mainly on the types of economic activity, as a rule, the innovation sector, scientific and educational activities that can meet the high standards of development of the national economy.

The authors identified the following signs of the manifestation of such standards, as applied to the system of strategic management, in the spatial aspect of consideration. They are:

- manufacturability and universality of management tools developed, regardless of the specifics of the regional system;
- the consistency of the projected managerial innovations to the traditional nature of the functioning of the regional system, determined by the strategy;
- the efficiency and flexibility of the system for developing tactical decisions that accumulate long-term goals and the need for constant innovative system updates in the "project office" formats.

Depending on how the indicated manifestations of the influence of the innovation infrastructure are reproduced in specific regional systems, a further process takes place, affecting the already formed elements, and subsequently, their connections. The establishment of patterns of their interaction with each other and with the regional system determines the development of scenarios for its reorganization.

#### **6.4. Modeling of quality of life indicators in the concept of spatial development of a regional system**

The development of a scenario for the reorganization of the regional system is an essential but not the final stage of strategic management. It cannot be regarded as a rigid structure, since innovative processes are carried out continuously. They lead to structural and infrastructural changes in the system as a result of the diversification of existing types of economic activity, increasing the efficiency of interaction between economic agents, creating new competitive advantages.

Planning of changes assumes reducing the polarization of the socio-economic space by leveling the heterogeneity of development indicators of individual regional systems and their groups. This explains the need to justify the assessment system of developed scenario so that with all the existing diversity of regional systems the optimal forms of their reorganization, providing for an increase in the quality of life, are determined.

The authors propose to use in the current system of public administration scoring changes, expressed in terms of quality of life. It is not well studied in the spatial aspect, in contrast to the concept of "standard of living". The standard of living is determined with the results of achieving certain levels of income and consumption of material goods and services, but not with the primary development of human potential. And, as a result of this, welfare assessments through the consumption of material goods and services began to predominate in economics, and the concept of "quality of life" is used as a supplement. Quality of life in modern concepts of well-being is understood as the ability of an individual to use available resources (health, education, family and social ties, civil rights, finances) to manage his own life. In the most general form, the existing assessments consist of the quality of the population (health and education), self-sustainment (income and employment), basic characteristics of the human environment (the influence of natural and anthropogenic factors), social transformations (provision of basic services, social relations, social security and exercise of rights).

Based on the use of a set of indicators that characterize the dynamics of changes in the quality of life in comparative assessments, it is proposed to expand the concept of the spatial development of the regional system.

## **7. Conclusion**

7.1. The study showed that the features of the description of the stages of the evolution of regional systems are determined with the presence or absence of contradictions between priorities and patterns of infrastructure development. The priorities of infrastructure development reflect the totality of its leading properties and characteristics, which are projections of the general principles of socio-economic development of regions and countries. The regularities of infrastructure development are based on



identifying the potential of territories, systematic analysis of trends, and establishing methods for their quantitative assessment.

7.2. Overcoming these specified contradictions is a prerequisite for ensuring the constancy of the control action aimed at increasing the stability of the regional system and preserving the balance of functions and connections. Infrastructure components in these conditions are the regulator of socio-economic processes.

7.3. The innovation infrastructure of a regional system is the bearer of signs of national and regional innovation systems, understood as an environment of institutional changes in the economy. The innovative infrastructure stimulates the process of multiple and non-uniform formation of spatial forms of development of the territory, able to adapt to the established regional system.

7.4. To ensure a stable balance of territorial systems at the regional level, a balance of social, economic and environmental components is necessary. It will ensure the cyclical nature of the processes of reproduction of regional potential, which contributes to its sustainability. The influence of external factors on the regional system leads mainly to infrastructural transformations, which give rise to new characteristics concerning the distribution of functions, density of connections, intensity of processes, etc. They are able to enhance regional differentiation. To reduce such negative effects, preventive mechanisms of strategic management are needed as an element of the optimization model for regional systems. The result of optimization is estimated by the indicators of quality of life, which are fixed in the concept of spatial development, based on the synchronization of socio-economic and territorial indicators.

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