

CDSSES 2020**IV International Scientific Conference "Competitiveness and the development of socio-economic systems" dedicated to the memory of Alexander Tatarkin****“PATH DEPENDENCE”: THE TRANSFORMATION OF THE SOCIAL SPACE OF THE EURASIAN MACROREGION**

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Abstract

The article discusses the issues of updating the foundations of the toolkit methodology associated with spatial development research. These issues are related to structural changes in the economy and inevitably affect various aspects of spatial development. Further, these changes predetermine the transformation of the regional social space. Clarifying several methodological foundations and adapting digital tools for spatial development study allows us to consider the macroregion as a complex heterogeneous multilevel socio-economic system. The research results related to system analysis and building a system of models and spatial development are considered. Particular attention is paid to inherited development ("Path Dependence") and new factors in accelerating the economic and social transformation of regions. Among them: urbanization, agglomeration processes, and the formation of transport corridors. This study's direction creates the basis for a deeper study of the development prospects of the industrially developed and very specific Eurasian macroregion - the Urals. Analysis of spatial development in the "center - periphery" format and subsequent zoning contribute to the prospective integration of territories, starting with the zones of the highest concentration of socio-economic potential.

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1. Introduction

The article examines the updating of the foundations of the methodology and tools for searching for managerial decisions related to the study of spatial socio-economic development issues. The need for such an update is due to many reasons. In the context of globalization, many social changes are associated with structural transformations in the regional economy. The development of communications inevitably accelerates the transformation of social space.

Such changes affect various aspects of spatial development prospects. Relationships between territories are growing. Key objects that form the regional social space are changing. The most dynamic objects of spatial development require special attention. Large cities, agglomerations, and zones of transport corridors largely change the regional trajectory of previous development. The influence of such objects often goes beyond the traditional administrative-territorial boundaries. Further, new prospects for the joint development of local administrative-territorial entities with integration at the macroregions level open up.

New opportunities for studying complex and heterogeneous socio-economic systems of macroregions are associated with the use of information technologies. Among them, a special place is occupied by the adaptation of visualization technologies - computer graphics, supplemented by a problem-adapted analysis and evaluation system.

2. Problem Statement

The study of the prospects for the socio-economic development of the macroregion is associated with a comprehensive interdisciplinary analysis of many interrelated problems of socio-economic development. On the one hand, it touches upon the "past" factors that determined the previous development of the territory. On the other hand, they complement the "future" factors that determine new trends in spatial development.

The role of factors of mutual spatial influence of territories on each other is increasing. The increasing economic and social extraterritoriality noted in such cases presupposes the development of processes that go beyond the administrative boundaries of territorial entities.

The transformation of social space, reflected in the changes in the settlement framework, is considered one of the key moments of regional development. This affects the basic settlement network - the settlement framework. Changes in the settlement framework are usually associated with the territorial concentration of the population. This largely determines the regional vector of further development. Among them: agglomeration processes and the formation of agglomerations, the development of communications and the formation of transport corridors. The formation of zones of transport corridors on the routes of movement of goods and services between agglomerations has a significant impact on the socio-economic transformation of all adjacent territories. Taken together, they determine the main provisions of promising regional development. Against their background, new trends are reflected: urbanization (associated with agglomeration processes and the formation of agglomerations) and the growth of communications (associated with migration, a change in logistics and the development of transport corridors).

In such conditions, it is necessary to consider the problem of constructing a multilevel model of the long-term spatial development of the macroregion, including the development of the main territories, the transformation of the settlement framework, the overlap of old and new trends. To this are added the problems of "Path Dependence" that have historically developed for the macroregion. This formulation of the problem presupposes consideration of an interconnected complex of interdisciplinary issues. They touch on a number of foundations of the study of the development of complex multilevel spatial socio-economic systems.

3. Research Questions

The main issues of the socio-economic development of the macroregion are related to the study of the transformation of a complex multilevel spatial system. The construction of a multilevel model in such conditions is inevitably associated with the classification of many factors and the integration of local models. Conceptually, three groups of questions should be distinguished here that characterize various aspects of spatial transformation. These are the questions:

- related to general patterns of regional development and the construction of complex multilevel models,
- characterizing the inertial component of development ("Path Dependence"),
- defining key areas of spatial transformation (development of agglomerations, transport corridors, etc.).

The use of a combination of various local models is inevitably associated with the issues of adaptation of previously approved methodological foundations to the specifics of the problems being solved. It touches upon the general foundations of regional development management (Tatarkin, 2014), the model of the concept of systemic sustainability of the regional economy (Kleiner, 2015a; Kleiner, 2015b). Reflection of regional specificity in this case is associated with spatial adaptation.

The predetermination of the prospects from the previously made choice, defined as "Path dependence" - "dependence on previous development" is manifested in many aspects of socio-economic development (Rastvortseva, 2018). In the sphere of spatial socio-economic development of territories, "Path Dependence" is often associated with the issues of infrastructural constraints, archaism of the engineering communications network. Among them, the issues of the structure of the road network (Guoa et al., 2020), electric power infrastructure (Karvonen & Guy, 2018), railways and other engineering communication facilities (Zhan et al., 2017). In the "Path Dependence" aspect, spatial constraints on the configuration of territories are considered (Gordeev, Zyryanov et al., 2019). Promising regional issues related to the development of agglomeration processes or transport corridors usually have their own patterns of development (Laird & Venables, 2017).

The whole set of the considered problematic issues of spatial development is supplemented by information preparation issues of the search for solutions.

4. Purpose of the Study

The purpose of the research presented in the article is to determine the number of methodological foundations of the macroregion's spatial development and adapt the tools for their practical adaptation.

The general patterns of the macroregion's modern development require updating the research methodology in several areas of spatial development. Among them:

1. Uneven development and changes in the assessment of dynamics and sustainability. Path Dependence vs. the Implications of High-Tech Growth.

2. Territorial integration, spatial expansion of macro-regions, extraterritoriality of economic and social relationships and cross-border development.

3. The heterogeneity of the development of territories, an increase in the diversity of forms from agglomerations to small settlements, the formation of "growth points" in the format of both individual objects and spatial zones of development corridors.

4. Changes in society's requirements for the quality of life, expansion of requirements, renewal of priorities. The growing influence of the factor of mobility.

The macroregion is viewed as a complex heterogeneous multilevel socio-economic system with several additional specific development constraints in each specific case. In this case, the features of the industrial Eurasian macroregion (Urals) are considered below. The Eurasian settlement framework's specificity, uneven distribution of population and communications, evident for the Urals macro-region. It is characterized by a high population concentration in certain densely populated areas and vast territories with a minimum of the permanent population. As communications and integration processes develop: administrative boundaries diminish their role of importance (including in the context of the development of the Eurasian Economic Union).

The inhomogeneity of the settlement frame: the presence and location of various "centers of gravity", the multiplicity of the "cores" of urban settlements, the differences in dynamics and its polarization according to the types of settlements, predetermine *the multilayer reflection of the settlement frame in models of spatial development*. The complex and heterogeneous spatial organization of the population becomes *one of the key determinants of the individuality and specificity* of building models of spatial development. At the same time, many characteristics of interconnected objects of the social space of territories are also changing.

New opportunities for studying complex and heterogeneous socio-economic systems of macroregions are largely associated with information technologies. Among them, an important place is occupied by the use of visualization technologies - computer graphics and a problem-adapted assessment system. All of the above gives a detailed description of the research goal.

5. Research Methods

Conducting research related to a qualitatively new, more detailed representation of the macroregion and touches upon several interdisciplinary system analysis points. Such a study involves a combination of several assessment principles and the use of a two-step procedure for analyzing spatial systems. At the first stage, the parameters of the development of *local spatial systems* are considered.

Including specific ones: "contrast" of the structure, agglomeration factors of growth, etc. Then, at the second stage, the interrelationships of developing a set of local systems are considered, covering all aspects and criteria (following the principles of "Pareto efficiency"). This combination of approaches has advantages over each of them separately. Such an *open for development (flexible) two-stage analysis procedure* reflects the interconnections of local models and is quite easily adapted to the conditions of real information support.

Further adaptation is associated with the imposition of a general ordered multilevel hierarchical model on the specific network structure of the spatial settlement framework.

Generalization of the prospects for the development of social space objects, defined within the framework of local models, *is associated with problem-oriented zoning of territories*. It is based on the capabilities of visualization technologies associated with the use of geoinformation technologies. Within the framework of the general problem-oriented zoning, the centers of the zones of the most promising settlements are considered as promising points of growth. These also include the zones of key supporting infrastructure facilities (for example, transport corridors along the main highways).

An important role in determining the prospects is played by *the problem of overcoming the trends of inherited development*, indicated by the problem of "Path dependence". In this case, much attention is paid to the necessity and possibility of overcoming "Path dependence" in order to accelerate socio-economic development (Thrasher, 2019). It also addresses the issues of transition from one development trajectory to another (Sipido & Nagyova, 2020) and orientation towards achieving sustainable development goals (Grosso et al., 2020). Separately, there are the issues of "Path dependence" related to urbanism, the transformation of megacities, their adaptation to the changing needs of a growing population (Kwamie et al., 2016). It partially touches upon the problems of "Path dependence" associated with the cultural and historical conditions of decision-making (Kotilainen et al., 2019). A separate place is occupied by the problems of inherited development associated with local regional characteristics and prospects (Barkhatov et al., 2019; Gordeev, Podoprigora et al., 2019).

The main results of the considered approach to in-depth study of the problems of spatial development were tested in the course of an interdisciplinary analysis of the transformation of the settlement frame of the Eurasian territories.

6. Findings

The considered author's approach to the construction of a flexible adaptable system of macroregion transformation models creates the preconditions for solving qualitatively new problems of spatial development. Updating the methodological apparatus of spatial research and the use of visualization technologies significantly expand the possibilities for solving practical problems in the field of spatial development management.

A similar approach to determining the most promising areas of transformation of the settlement framework was tested for the Urals macroregion. In accordance with the formulation of the problem, the composition of the territories of the macroregion was expanded. The traditional administrative-territorial formations of the Urals were considered together with a number of those around them, who had inherited economic, social and cultural relationships with each other. These are Russia's territories: Sverdlovsk

district, Chelyabinsk district, Tyumen district, Kurgan district, Perm area, Republic of Bashkortostan, Orenburg district, as well as the transboundary territory of Northern Kazakhstan (Kostanay district).

A multilevel scheme for transforming the settlement framework of the Ural macroregion, reflecting the distribution of the main cities, agglomerations and zones of agglomeration processes, and transport corridors in the Urals macroregion is shown in figure 1. In the given diagram, the size of the city symbols is proportional to the population size. The size of the agglomeration processes zones is determined by the limit of hourly transport accessibility from the main cities. The width of the lines indicating transport corridors is proportional to their importance. The macroregion's central zone with the highest concentration of agglomeration transport corridors is separately marked with a dotted line. The diagram shows only the main objects of the macroregion. With further more detailed systematization and visualization, the number and variety of objects and parameters under consideration increases.

The highlighted structure of the macroregion's settlement framework reflects the specifics: regional concentration of the population, regional integration. The most significant population concentration zones are further considered as promising "points of growth" and transformation of social space. According to the totality of factors on the territory, infrastructure development zones, industrial-agrarian and socio-cultural relationships are determined. In general, they are not linked to administrative boundaries. Such a spatial referencing of zones becomes the basic point of prospective problem-oriented zoning and determination of the main parameters of territories' development.

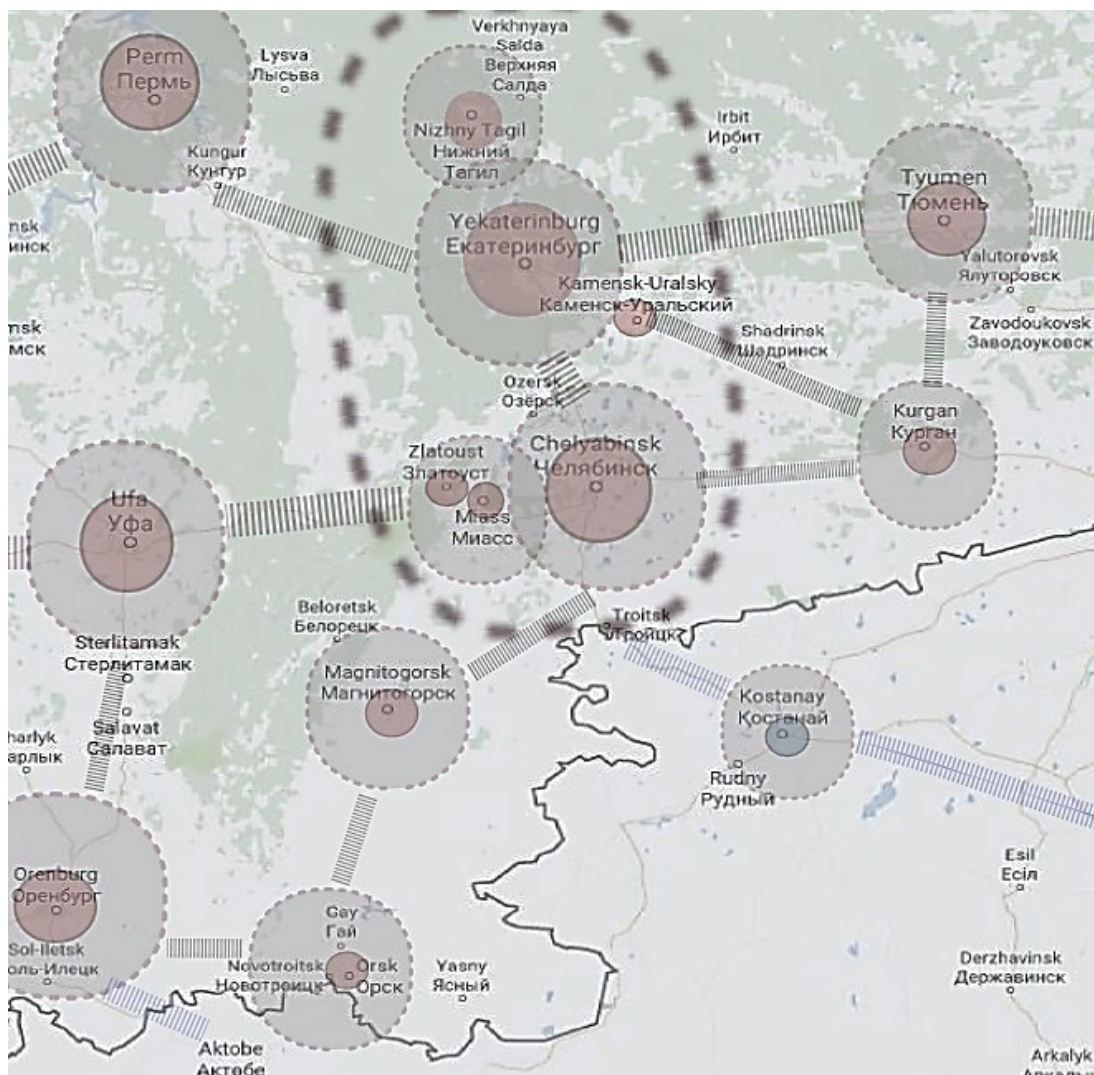


Figure 1. Multilevel scheme of transformation of the settlement framework of the Ural macroregion

Subsequent zoning of the Ural macro-region in the "center-periphery" format is aimed at defining the territories of prospective integration. Among them:

1. Central zone of agglomeration interregional interconnections (the space of the common agglomeration "core" formed by the interaction of the agglomerations of Yekaterinburg city and Chelyabinsk city);

2. The surrounding area with the location of regional agglomerations and large cities, at a distance of effective daily transport accessibility from each other. Including regional centers: Perm city, Ufa city, Tyumen city, Kurgan city, etc., including the adjacent territory of Kazakhstan - with the regional center Kostanay city).

Subsequent zoning of the Ural macroregion in the "center-periphery" format contributes to prospective integration using the spatial competitive advantages of territories, starting with the zones of the highest concentration of socio-economic potential.

7. Conclusion

Updating the foundations of the methodology for finding solutions using information-adapted models of spatial systems can significantly expand the scope of research on spatial development. The scope of possible application of the results of the above studies is quite wide. Each subsequent variant of their adaptation and application opens up new opportunities for the study of unique and little-studied aspects of the spatial socio-economic development of complex spatial systems. In such circumstances, ample opportunities open up for setting new tasks for managing spatial socio-economic development.

The zoning of the Ural macroregion in the "center - periphery" format allows considering the management of agglomeration processes in the territory in a new, more detailed formulation. Such an applied direction of expanding the scope of complex research of spatial systems allows one to move on to considering other issues, more efficient use of the features of social space and other competitive advantages of territories.

There are new opportunities for a deeper study of the prospects for the socio-economic development of territories, with consideration of "path dependence" and new specific trends for macroregions. Additional opportunities are associated with the improvement of visualization tools for solving problems of territorial administration.

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References

- Barkhatov, V. I., Pletnev, D. A., & Kapkaev, Yu. Sh. (2019). The Ural and Volga regions' centers and periphery in the context of "new normality". *Socium and power*, 5(79), 65-83. <https://doi.org/10.22394/1996-0522-2019-5-65-83>
- Gordeev, S. S., Podoprighora, A. V., & Zyryanov, S. G. (2019). "Path Dependence" in developing socio-economic space of the region. Part 1: "Path Dependence" and the local crisis in the Chelyabinsk Region. *Socium and power*, 5(79), 84-97. <https://doi.org/10.22394/1996-0522-2019-5-84-97>
- Gordeev, S. S., Zyryanov, S. G., & Sitkovskiy, A. M. (2019). Conditions for the transition from "Path Dependence" to leadership: an example of spatial development of the municipalities of the Urals. *Proceedings of the VI International Conference on Social, economic and academic leadership (ICSEAL 2019)*, 136-141. <https://doi.org/10.2991/assehr.k.200526.020>
- Grosso, G., Mateo, A., Rangelov, N., Buzeti, T., & Birt, C. (2020). Nutrition in the context of the Sustainable Development Goals. *European Journal of Public Health*, 30(1), i19-i23. <https://doi.org/10.1093/eurpub/ckaa034>
- Guoa, F., Gregorya, J., & Kirchain, R. (2020). Incorporating cost uncertainty and path dependence into treatment selection for pavement networks. *Transportation Research Part C: Emerging Technologies*, 110, 40-55. <https://doi.org/10.1016/j.trc.2019.11.015>
- Karvonen, A., & Guy, S. (2018). Urban Energy Landscapes and the Rise of Heat Networks in the United Kingdom. *Journal of Urban Technology*, 25(4), 19-38. <https://doi.org/10.1080/10630732.2018.1463034>
- Kleiner, G. B. (2015a). State - region - industry - enterprise: the framework of systemic stability of the Russian economy. Part 1. *The economy of the region*, 2, 50-52. <https://doi.org/10.17059/2015-2-4>

- Kleiner, G. B. (2015b). State - region - industry - enterprise: the framework of systemic sustainability of the Russian economy. Part 2. *The economy of the region*, 3, 9-17. <https://doi.org/10.17059/2015-3-1>
- Kotilainen, K., Aalto, P., Valta, J., Rautiainen, A., Kojo, M., & Sovacool, B. K. (2019). From path dependence to policy mixes for Nordic electric mobility: Lessons for accelerating future transport transitions. *Policy Sciences*, 52, 573-600. <https://doi.org/10.1007/s11077-019-09361-3>
- Kwamie, A., Dijk, H., Ansah, E., & Agyepong, I. E. (2016). The path dependence of district manager decision-space in Ghana. *Health Policy and Planning*, 31(3), 356-366. <https://doi.org/10.1093/heapol/czv069>
- Laird, J. J., & Venables, A. J. (2017). Transport Investment and Economic Performance: A Framework for Project Appraisal. *Transport Policy*, 56, 1-11. <https://doi.org/10.1016/j.tranpol.2017.02.006>
- Rastvortseva, S. N. (2018). Theoretical aspects of the possibility of the regional economy leaving the trajectory of the previous development. *Journal of Economic Theory*, 15(4), 633-642. <https://doi.org/10.31063/2073-6517/2018.15-4.8>
- Sipido, K. R., & Nagyova, I. (2020). Health research and knowledge translation for achieving the sustainable development goals: tackling the hurdles. *European Journal of Public Health*, 30(1), i36-i40. <https://doi.org/10.1093/eurpub/ckaa032>
- Tatarkin, A. I. (2014). Dialectics of state and market regulation of socio-economic development of regions and municipalities. *Economy of the region*, 1, 9-33.
- Thrasher, J. (2019). Constructivism, representation, and stability: path-dependence in public reason theories of justice. *Synthese*, 196, 429-450. <https://doi.org/10.1007/s11229-017-1488-7>
- Zhan, C., Jong, M., & Bruijn, H. (2017). Path Dependence in Financing Urban Infrastructure Development in China: 1949–2016. *Journal of Urban Technology*, 24(4), 73-93. <https://doi.org/10.1080/10630732.2017.1334862>