

**Summary of
the IRN project AP26102165 "Spatial rural development in the context of sustainable development: indicators, growth poles and strategic directions" for 2025**

№	Chapter	The results obtained
1	Theoretical and methodological foundations of the study of spatial development of rural areas	<p>The key concepts of spatial economics are summarized and systematized based on the analysis of modern theoretical approaches to the spatial development of rural areas. The study provides a comprehensive analysis of classical and modern theories of the distribution of productive forces, the concepts of center-peripheral relations, and the theory of poles of growth. Special attention is paid to the study of the factors determining the spatial differentiation of socio-economic development of rural areas in a market economy and globalization processes.</p> <p>The results of the theoretical analysis made it possible to clarify the patterns of socio-economic differentiation of territories, taking into account the specifics of rural regions of Kazakhstan. The main driving forces of spatial inequality have been identified, including agglomeration effects, transport accessibility, institutional factors, and human capital. It has been established that the spatial development of rural areas is characterized by the action of multiple factors that form unique development trajectories of individual regions.</p> <p>A theoretical basis has been formed for the subsequent development of an assessment methodology and tools for analyzing spatial development. The results of the systematization of theoretical approaches have created the necessary basis for the formation of a conceptual research model, the identification of key indicators of differentiation and the development of practical recommendations for improving the spatial policy of rural development in Kazakhstan.</p> <p>3 scientific papers have been prepared for publication:</p> <p>1 Bukatov Y., Nesipbaev R. Foreign experience in the use of GIS models in the spatial development of rural areas // Proceedings of the international scientific and practical conference "Economy of the Future: synergy of innovations and digital technologies in sustainable development" (in print)</p> <p>2 Legostaeva A.A., Aubakirova Zh.B., Kose Zh.K. Ruralization and proactive budgeting: new drivers of sustainable rural development // Proceedings of the international scientific and practical conference "Economy of the future: synergy of innovations and digital technologies in sustainable development (in print)</p> <p>3 Tomashinova A. Economic mechanisms of the influence of universities on the competitiveness of regions // Proceedings of the Cathedral student conference "Forum of Young Researchers" (in print)</p>

1.1	Systematization of theoretical approaches and patterns of spatial development of the territory	Modern concepts and patterns of spatial development of the territory are systematized on the basis of a comprehensive study of domestic and foreign scientific literature. In the course of the work, a critical analysis of basic theoretical constructions was carried out, including the theories of placement by I. Tyunen, A. Weber, V. Kristaller, the concept of cumulative causality by G. Myrdal, the theory of central places and models of spatial interaction. Special attention is paid to modern research areas related to the theory of sustainable rural development and the concept of smart specialization. As a result of the systematization, key patterns of spatial development have been identified, manifested in the concentration of economic activity, uneven distribution of resources and the emergence of central-peripheral imbalances. It is established that spatial differentiation is caused by the interaction of endogenous factors of territorial development and exogenous influences of the macroeconomic environment. The specific features of the functioning of rural areas are identified, including dependence on natural and climatic conditions, low population density and limited diversification of the economic base.
1.2	Determination of the methodology for assessing the spatial development of rural areas in Kazakhstan	<p>A unique methodology for assessing the spatial development of rural areas of Kazakhstan has been developed based on the study of international experience in the use of indicators and indicators of spatial differentiation. The study analyzes methodological approaches used in the OECD countries, the European Union and other countries with a developed agricultural sector. Special attention is paid to the experience of using composite rural development indices, methods of multidimensional statistical analysis and geoinformation technologies.</p> <p>Based on the adaptation of international practices to the specifics of Kazakhstan, a system of indicators has been formed that covers economic, social, demographic, infrastructural and environmental aspects of spatial development. The developed methodology includes three main components: a block of quantitative indicators to assess the level of development of territories, spatial analysis methods to identify patterns of location and a system of typologization of rural areas by the level of socio-economic development. A special feature of the proposed methodology is an integrated approach that allows taking into account both objective characteristics of territories and subjective assessments of the quality of life of the population.</p>
1.3	Development of the fundamentals of a digital spatial development system for rural areas	The parameters of the geographic information system model for the spatial development of rural areas have been developed, including determining the number of layers, data processing algorithms, and creating cartographic models. As part of the GIS design, the architecture of the system is defined, which includes basic cartographic layers (administrative division, transport network, hydrography), thematic layers of socio-economic data (population, infrastructure, production) and analytical layers for visualizing the results of spatial analysis.

		<p>Algorithmic support forms the core of the digital system and includes five main groups of analytical procedures (assessment of accessibility of infrastructure facilities, spatial clustering algorithms, analysis of spatial patterns, assessment of land use dynamics, algorithms for constructing integral indexes). The system is implemented based on the Django web framework in combination with geospatial extensions.</p>
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