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RURAL REINTEGRATION IN THE RUSSIAN FEDERATION AND ITS IMPLEMENTATION TOOLS



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A key problem in the country's spatial development is the outflow of population from rural settlements to urban agglomerations, caused by the growth of inter-territorial differentiation in the standard and quality of life, which has resulted in the disintegration of economic space. Under these conditions, the task of reintegrating rural areas, coupled with curbing the negative dynamics of population migration, is becoming a priority. A number of strategic documents are aimed at implementing this priority, and the formation of a network of core communities with accelerated development of social, transport, and utilities infrastructure has been identified as the primary approach to improving the quality and standard of living in rural areas and increasing their attractiveness to residents and businesses. The selection of anchor settlements, currently carried out on a formal basis, determines the relevance of the study, the purpose of which is to develop a rational structure for the network of anchor settlements by addressing the following objectives: analysis of the "rural reintegration" category; substantiation of the methodological aspects of developing a rational structure for the network of anchor settlements; development of an algorithm for conducting computational experiments to evaluate the effectiveness of regulatory measures and development projects. The scientific novelty of the study's results lies in the formation of a rational structure for the network of anchor settlements. A distinctive feature of this work is the use of a methodological approach based on integrated inter-municipal interaction for

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the implementation of socially and economically significant projects, as well as an assessment of their effectiveness using an adaptive modeling system and forecasting the dynamics of the interdependence of territorial attractiveness and population migration behavior based on agent-based modeling. The practical significance of the results lies in improving the validity of decisions made by government agencies in the area of sustainable rural development through computational experiments conducted based on target values for planned and implemented socio-economic projects.

Territorial reintegration, integration, disintegration, population migration, population migration behavior, region, spatial development, economic space, models, scenarios, agent-based modeling.

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Introduction

The growing spatial differentiation of Russian territories in terms of standard of living and quality of life has led to residents' outflow from disadvantaged areas and a decrease in the birth rate. Migration processes are particularly active in rural areas, which is facilitated by poor infrastructure provision (housing facilities, gasification and water supply) in rural settlements. The population in rural areas decreased by 7.77 million people in 2012–2023, while the number of residents of other settlements, including cities and urban-type settlements, increased by 3.14 million people. In addition, the deterioration of life in rural areas hinders the development of agro-industrial production due to the lack of highly qualified labor resources.

This fact is noted, in particular, by V.V. Rau, L.V. Skul'skaya, T.K. Shirokova (Rau et al., 2022), who consider steady migration of rural youth to cities to be the reason for the decline in the rural population in most countries and one of the main factors concerning the shortage of qualified personnel. In addition, a decrease in the population of rural areas leads to a deterioration in the demographic state of Russia, a reduction in the total number of working-age people, and the number of rural settlements (in 2012–2023, their number decreased from 18,831 to 14,575, that is, by 4,256 units).

As a result, significant areas of rural territories are being withdrawn from the economic space of the country and regions,

which complicates the solution of tasks to ensure the economic and food security of the country, and weakens the integrity of its territorial framework. The continued growth of differentiation of Russian territories in terms of standard of living and quality of life will lead to a further increase in rural migration to urban agglomerations, exacerbating their infrastructural and environmental problems.

Similar views are expressed by E.B. Dvoryadkina and E.A. Belousova, according to whom the current policy “bleeds out” the periphery, contributing to the implementation of negative scenarios for the demographic development of small settlements, and insufficient infrastructure provision “reduces the connectivity of the economic space and preserves its imbalances” (Dvoryadkina, Belousova, 2023). S.Yu. Pakhnina believes that the negative result of population concentration in large urban agglomerations is an increase in the uneven development of territories (Pakhnina, 2023).

According to N.V. Voroshilov, “to achieve the goal of spatial development of the Russian Federation, it is necessary to solve the problem of reducing the level of interregional differentiation in the socio-economic development of the RF constituent entities, as well as reducing intra-regional socio-economic differences, including by increasing the stability of the settlement system through the socio-economic development of cities and rural territories” (Voroshilov, 2023).

The strong influence of inter-territorial socio-economic differentiation on the outflow from small settlements, especially rural ones, necessitates the implementation of a set of systemic measures to reduce existing differences, which will contribute to growing sustainability of the development of these territories, increasing the balance of development of the country as a whole.

The urgent need to reduce the spatial differentiation of the country in terms of standard of living and quality of life, and to reduce intra-regional socio-economic differences determines the importance of solving two interrelated tasks in the strategic perspective¹: 1) reintegrating rural territories into the Russian economic space to maximize the involvement of the space in achieving national goals, taking into account the need for effective use of available resources and the formation of a balanced territorial organization of the economy; 2) overcoming the migration outflow of the rural population to urban agglomerations, which involves the identification and systematic assessment of a set of factors influencing it.

However, there is currently no clear understanding of how to solve these problems. This determines the relevance of the research aimed at developing a methodological approach and methodological tools that will improve the validity and effectiveness of public administration in this area, taking into account one of the key tasks – the restoration of the country's economic space by reducing inter-territorial differences in the standard of living and quality of life and increasing the attractiveness of rural areas to retain / attract the population.

In this regard, the aim of our research is to form a rational structure of a network of anchor settlements by solving the following tasks: analyzing the category “rural reintegration”; substantiating methodological aspects of forming a rational structure of a network of anchor settlements; developing an algorithm

for conducting computational experiments to evaluate the effectiveness of regulatory measures and development projects.

The subject of the study is the interrelated processes of rural reintegration and overcoming the migration outflow, as well as the tools to ensure them.

Theoretical and methodological aspects of the study

One of the scientific approaches to understanding and overcoming spatial differentiation is the theory of territorial reintegration. Within the framework of the studied issues, a number of issues can be identified that have been studied to one degree or another, which is reflected in a significant number of scientific publications.

Quite a lot of Russian works have been devoted to the problems of integration at the macro and meso levels: Yu.A. Borko (Borko, 2020), M.V. Vladyka, I.V. Chistnikova, F.M. Ermachenko (Vladyka et al., 2020), N.V. Gontar (Gontar, 2018), L.I. Glukharev, R.S. Grinberg, M.E. Doroshenko (Glukharev et al., 2006), O.N. Misko (Misko, 2018), A.D. Nekipelov, S.A. Skibin (Skibin, 2022), etc., and foreign scientists such as J. Galbraith, R. Aron, F. Perroux, A. Marshall, G. Myrdal, P. Streathen, R. Keohane, A. Hamilton, L. Lindberg, K. Friedrich, E. Haas, F. Schmitter, J. Williamson, P. Krugman, W. Molle, A. El-Agraa, M. Porter, P. Samuelson et al.

The issues concerning the integration process management were investigated by E.V. Balatsky, L.B. Vardomskii, A.G. Granberg, N.S. Ziyadulaev, V.N. Leksin, L.I. Lidvanova, E.E. Obminskii, Yu.Ya. Olsevich, F.F. Rybakov, A.I. Tatarkin, I. Shevchenko, R.I. Shniper, and others.

Integration processes, mechanisms and technologies of political integration at the macro-level “state – state” are explored, in particular, by N.V. Sokolova, according to whom the essence of political integration, the basis of unification processes are economic dimensions

¹ On approval of the Spatial Development Strategy of the Russian Federation for the period up to 2030 with a forecast up to 2036: RF Government Resolution 4146-R, dated December 28, 2024.

with political consequences and legal support²; M. Hodges, who defines integration as “the formation of a new political system from those that existed before this divided systems” (cit. by: Rosamond, 2000).

Prominent representatives of the civilizational approach, which takes into account the existence of common cultural and historical ties, and a mentality that promotes the unification of territories into a single political, economic or military space, are S. Huntington, who noted the strengthening of ties between states with similar civilizational characteristics (Huntington, 2000), L.N. Gumilev (Gumilev, 1989), A.G. Dugin (Dugin, 2014), E.Yu. Vinokurov, A.M. Liebman, who considered the topic of continental integration of Europe, Northern and Central Eurasia (the post-Soviet space), Western, Eastern and South Asia to be relevant and assigned a key role in this process to common infrastructure projects that create opportunities for the movement of goods, services and labor (Vinokurov, Liebman, 2012).

Summarizing the content of the category of “integration of territories at various levels”, we can note that this term most often refers to the process of combining elements and structures at the level of regions, municipalities and industries to form a single economic, social and institutional space. The semantic component consists in coordinating interests, removing barriers and creating conditions for mutual strengthening of subjects through policy coordination, interregional cooperation, infrastructure development and common services.

In turn, the disintegration of territories is characterized by increasing fragmentation and distancing between parts of a single space. This is reflected in the increasing complexity of interaction between regions, deteriorating ties and increasing differences in the level of socio-economic development, accessibility of services and infrastructure. The reasons for disintegration can be both economic (uneven distribution of resources, migration flows

in favor of large centers), and institutional (gaps in administrative management, incompatibility of legal norms), socio-cultural and geographical factors. As a result, the competitiveness of territories is decreasing, development imbalances are increasing, and the risks of local crises are increasing.

If integration and disintegration are, in fact, multidirectional processes of unification/fragmentation of a single space, then, as E.S. Matyunkov notes, “the phenomenon of reintegration is inextricably linked to integration and differs from it in that reintegration is preceded by the unity of two objects” (Matyunkov, 2023).

The problem of the reintegration of territories is currently poorly understood, there is no single approach to the analysis and interpretation of this category. In its most general form, the term refers to the unification of something that had previously disintegrated, disconnected, on new principles and foundations³.

Most often, this category is explored by political scientists, geopoliticians, and sociologists at the macro, meso, and micro levels, taking as the research object, respectively, states, various supranational unions, regions, and other large socio-economic or political systems, as well as individuals at the micro level. The methodological basis of the research is the civilizational (from the concept of “clash of civilizations” by S. Huntington), political, economic, institutional and other approaches in which the processes of reintegration are analyzed at the political, economic and socio-cultural levels, as well as methods of comparative analysis involving a comparison of various cases of reintegration, for example, the incorporation of lands formerly part of the GDR into the Federal Republic of Germany, and a similar process in China regarding Hong Kong.

Despite a significant number of studies of reintegration processes from the standpoint of the civilizational approach, it does not provide

² Sokolova N.V. (2010). Political integration: Genesis and development prospects (using the example of the EU, the CIS, the Union State of Russia and Belarus): Candidate of Sciences (Politics) dissertation abstract. Voronezh. Pp. 5–8.

³ Comprehensive explanatory dictionary of the Russian language. Saint Petersburg: Norint, 2004. 1534 p.

a full-scale coverage of modern realities of a predominantly economic and territorial nature.

H. Broadman (2006), N. Petrović (Petrović, 2016), and A. Cornett (Cornett, 1999) identify globalization with the reintegration of states within a single model of economic, political, and ideological organization.

The issues concerning economic integration at all levels remain poorly explored. In this area, we can note the works of Yu.A. Borko, O.V. Butorina (Butorina, Borko, 2022), M.Yu. Mukhin (Mukhin, 2025), A.V. Andreev (Andreev, 2024), V.A. Troitskii (Troitskii, 2008).

From the standpoint of a sociological approach, O.V. Yarmak, D.A. Mirgorod, and G.V. Kosov interpret reintegration as “the reassembly of societies and social spaces, leading to the consolidation of new network communications and infrastructures; the integration of a value-semantic field, historical and social memory, and human capital; the formation of new symbolic power and political elites” (Yarmak et al., 2022).

According to V.V. Zhirinovskii, the reintegration of the “Slavic” republics represents the “restoration of unity” of the all-Russian nationality⁴. A similar opinion is expressed by E.S. Matyunkov, who understands by reintegration the return of a social group or territorial system to a historically related entity (Matyunkov, 2023).

Microlevel objects are represented by individual personalities, the processes of civic integration are studied, and the term “reintegration” is used primarily from the perspective of personal reintegration – both of individuals and their groups, in particular migrants and internally displaced persons (Nechaev, Matyunkov, 2023), and political integration of migrants. B. Garcés-Mascarene and R. Penninx consider integration policy in the European Union not only in relation to immigrants and their settlement society, but also to subjects in their country of origin (Garcés-Mascareñas, Penninx, 2016).

Consideration of civil reintegration is carried out in two aspects: on the one hand, an analysis of the behavior of migrants, on the

other, the effectiveness of measures taken by the state to successfully adapt them to public life. Sociological and political-psychological methods are mainly used for this kind of research.

As for the problems of the reintegration of territories at the regional and sub-regional levels, general theoretical issues in this area were dealt with by K. Deutsch, who developed the concept of “security communities”, which later became the basis of transactionalism (Deutsch, 1957); R. Cooper, who proposed an approach from the standpoint of which, to achieve the optimal combination of possible options for the development of economic integration, internal and external coordination should be carried out by the internal and foreign policy of the integrating countries (Cooper, 1999); E. Haas with the concept of neofunctionalism, who understood regional integration as a process in which the loyalty of political actors shifts toward a new decision-making center, and the end result is a new political community (Haas, 1958); A. Etzioni, who developed the concept of “global community of communities”, suggesting the transformation of the system of nation-states into a supranational form that has a legitimate controls law enforcement agencies and redistributes resources between Member States (Etzioni, 2001).

In Russia, the issue of regional integration has only recently begun to be developed. Along with the research of Western scientists, it mainly concerns political aspects (Schammann et al., 2020; Spindelegger, 2021; Grawert et al., 2020; Matyunkov, 2023). However, recently, works have begun appearing in which reintegration processes are considered from the standpoint of economic and cultural aspects (Leskova et al., 2023; Nechaev, Matyunkov, 2023).

Research on the reintegration of rural areas into the economic space of the region has not yet been conducted. The need for integrated rural development was mainly considered, and the directions of their sustainable development were determined (Golubeva et al., 2015; Tikhii, Koreva, 2017; Maslova et al., 2019; Kostyaev, 2020; Ushachev et al., 2021; Semin, Zorkov, 2023).

⁴ Zhirinovskii V.V. (2006). Russia will win! Moscow: Izdanie Liberal'no-demokraticeskoi partii Rossii. 296 p.

Based on the above, as a generalizing characteristic of the processes of territorial reintegration, it is possible to name the resumption and deepening of ties within a previously divided space after a period of disintegration. Its essence consists in re-coordinating strategies, restoring infrastructural and institutional coherence, mobilizing resources and reconstructing social and economic ties, equalizing conditions for access to services and resources, etc. We should note that reintegration projects are more often focused on correcting inequalities, restoring lost ties between territories, stimulating joint technological and social innovations, supporting human capital and sustainable regional identity.

The combination of modern theoretical concepts of integration, disintegration and reintegration of the economic space has led to the conclusion that integration, disintegration and reintegration are dynamically interrelated stages in the development of territorial systems: the first is aimed at creating a single interacting space; the second is causing gaps in interconnections and requiring corrective measures; the third is the resumption and deepening of ties on an updated basis.

Most often, these processes are studied mainly at the inter-country level, as well as in relation to the intra-national economy as a whole, while much less attention is paid to the regional and local levels. It is worth saying that studies of the problems (processes) of integration and disintegration significantly exceed studies on reintegration processes in terms of volume and detail. Based on the above, we can conclude that the problems of research regarding the reintegration of rural areas into the economic space of the region are insufficiently studied and extremely relevant.

Having accepted human capital as a key determinant of spatial development, in the article, the reintegration of rural territories will be understood as the process of restoring their attractiveness to the population and economic activity based on creating favorable conditions for them to perform national functions (production, demographic, labor, spatial and

communication), improving the standard and quality of life of the rural population.

In the context of Russian regional policy, rural reintegration should be based on a balanced combination of infrastructural renewal, support for the agro-industrial complex, human resource development and improvement of the quality of services in remote and rural settlements. In this case, the effectiveness of the process will be achieved through the coordination of federal programs with regional strategies, the introduction of the digital economy in rural areas, the development of local production and cooperative forms of cooperation, as well as through the creation of conditions for a sustainable influx of population, investment and innovation.

One of the most popular tools for spatial development management, territorial planning, organization of public authority and administration in many countries is the system of anchor settlements (hereinafter referred to as AS), which is based on the theory of central places by W. Christaller (Christaller, 1933).

The main idea of centrality is the economic rationality of providing goods and services, that is, not in every locality, but only in localities (central locations) that provide these services not only to themselves, but also to surrounding localities. The marginal limit (zone) of coverage of the corresponding central location is determined by the distance from the central location, starting from which it is economically impractical to receive goods or services due to high transportation costs or the presence of a closer central location (Makvart et al., 2022).

In recent years, a network of AS has been actively forming in Russia, contributing to the task of preserving small settlements, especially rural ones, as elements of the basic framework of settlement and sources of demographic growth. Nevertheless, the formal nature of the creation of such a network and the expediency of developing appropriate methodological and methodological approaches, brought to specific instrumental solutions that make it possible to form a rational structure of the AS network, is not only a scientific but also a practical task. The results of the performed

research are focused on filling this scientific gap.

In the course of the work, we used data from standard static reporting for 2012–2023, methods of retrospective and abstract logical analysis, content analysis of regulatory legal acts of the Russian Federation and the Internet resources, the methodology of agent-based simulation modeling, and data visualization.

Results and discussion

For the vast territory of the Russian Federation, the outflow from rural areas is not only an economic, but also a social, political and cultural problem. Taking into account the fact that the 2030 Agenda for Sustainable Development, adopted in 2015 by the United Nations Member States, identifies the elimination of hunger, ensuring food security and improving nutrition, promoting sustainable agricultural development, from rural development, and the possibility of their reintegration into Russian society as the second priority goals. The economic space depends on ensuring the economic and food security of the country.

Since Russia's food and economic security directly depends on the well-being of rural residents, retaining/attracting the population, especially highly qualified personnel, to rural areas is becoming one of the strategic priorities of the country's development. A number of documents have been adopted to implement it, including the Strategy for the Sustainable Development of Rural Areas of the Russian Federation for the period up to 2030⁵, the state program of the Russian Federation "Integrated Rural Development"⁶, and the Spatial Development Strategy of the Russian Federation for the period up to 2030 with a forecast up to 2036⁷.

The main message and the main objective of these documents is to curb the outflow of the rural population to large urban agglomerations (as evidenced by the targets of these documents). For this purpose, measures are envisaged to create comfortable living conditions for the rural population that meet modern requirements and standards, develop social infrastructure that reduces barriers to physical access to necessary social goods and services, build housing, develop engineering, road and energy infrastructure, and provide employment for the rural population. As a mechanism (tool) for implementation, the approach of forming a system of "growth points" is used, which is aimed at advancing the development of social, transport and communal infrastructure necessary for life, work and business development, initiated within the framework of the national project "Infrastructure for Life".

The criteria for determining the AS and adjacent territories are regulated by relevant methodological recommendations⁸, in particular:

- population ranges from 3 to 50 thousand people;
- it has a year-round transport connection with the administrative center of the constituent entity of the Russian Federation;
- more than 50% of the total population has access to social, transport, engineering, information and communication infrastructure facilities;
- it has territories for prospective development and development, etc.

In accordance with the national project, long-term development plans (hereinafter referred to as LTDP) should be developed for each category of AS (urban agglomerations, supporting framework of rural settlements,

⁵ On the approval of the Strategy for the Sustainable Development of Rural Areas of the Russian Federation for the period up to 2030: RF Government Resolution 151-r, dated February 2, 2015 (as amended on January 13, 2017).

⁶ On approval of the State program of the Russian Federation "Integrated Rural Development" and on Amendments to Certain Acts of the Government of the Russian Federation: RF Government Resolution 696, dated May 31, 2019.

⁷ On approval of the Spatial Development Strategy of the Russian Federation for the period up to 2030 with a forecast up to 2036: RF Government Resolution 4146-R, dated December 28, 2024.

⁸ On approval of methodological recommendations on criteria for determining anchor settlements and adjacent territories: RF Government Resolution 4132-r, dated December 23, 2022. On August 27, 2025, RF Government Resolution 2331-r "On amendments to methodological recommendations on criteria for determining anchor settlements and adjacent territories, approved by RF Government Resolution 4132-r, dated December 23, 2022" was adopted.

etc.), containing development activities and projects, as well as mechanisms and sources of their financing. The implementation of the LTDP is aimed at creating the necessary socio-economic conditions to improve the quality of life in this territory.

In fact, we are talking about the formation of rural agglomerations in accordance with the specified criteria – the population is up to 50 thousand people and the distance to the national park is no more than 50 km. Thus, a transition is underway from a policy of leveling development (smoothing out inter-municipal imbalances) to a policy of concentrating resources in large “growth points”.

Almost all the RF constituent entities solved this problem on the basis of a formal approach, choosing regional centers with their settlements as their AS, defining them as adjacent territories. The unified list of anchor settlements of the Russian Federation includes 2,160 AS⁹; 42 rural administrative divisions with 3,194 adjacent settlements have been identified for the Republic of Bashkortostan¹⁰. However, such a significant number of AS makes the LTDP practically impossible to implement.

To offset the disadvantages inherent in both the policy of equalization and the policy of concentrating resources at large growth points, we suppose that it is advisable to implement a third approach – the policy of integrated (coevolutionary) development, in which efforts are directed at a group of municipal districts (the basic framework of settlement), where there are “growth points” that allow for effective development not only to these areas, but also to “pull” the neighboring territories along with them.

Integrated (coevolutionary) development makes it possible to consider the territory of the region as sub-regional localizations, which include both urban and rural agglomerations, as well as subregions of economic specialization –

clusters, special economic zones, territories of advanced socio-economic development. Sub-regional formations will form the basic framework of settlement. The implementation of this approach is based on the rational concentration of limited resources of inter-municipal cooperation for the implementation of socially significant projects.

Inter-municipal cooperation is organized on the basis of program and project methodology. Its main instrument is projects for the joint development of territories. This methodology integrates a hierarchy of approaches for organizing inter-municipal management: it is programmatic at the strategic and goal-setting levels, project-based at the tactical and organizational levels, and process-based at the operational level in solving operational tasks. With this approach, the program is structured into separate projects that are directionally linked to funding sources and have responsible performers. It is important to take into account the interests and resources of stakeholders, allowing activating and accumulating the territory's potential.

Projects can be classified according to the following main directions of development (*Fig. 1*).

The integrated development approach is proposed to be implemented using methods of economic and mathematical modeling. To do this, at the first stage, the structure of the network of existing institutions of the region's social infrastructure (education, health, culture, physical education and sports) is being formed within the framework of inter-municipal integration, taking into account the following characteristics: 1) the population density of settlements, 2) their connectivity, 3) the quality of social services provided, 4) the settlement of the population in the future. When combining a network of institutions providing various types of social services with

⁹ On approval of methodological recommendations on criteria for determining anchor settlements and adjacent territories: RF Government Resolution 4132-r, dated December 23, 2022. On August 27, 2025, RF Government Resolution 2331-r “On amendments to methodological recommendations on criteria for determining anchor settlements and adjacent territories, approved by RF Government Resolution 4132-r, dated December 23, 2022” was adopted.

¹⁰ On approval of the List of reference settlements and adjacent settlements of the Republic of Bashkortostan: Government Resolution of the Republic of Bashkortostan 80, dated February 28, 2023 (as amended on June 19, 2023, amended by Resolution of the Government of the Republic of Bashkortostan 345, dated June 19, 2023).

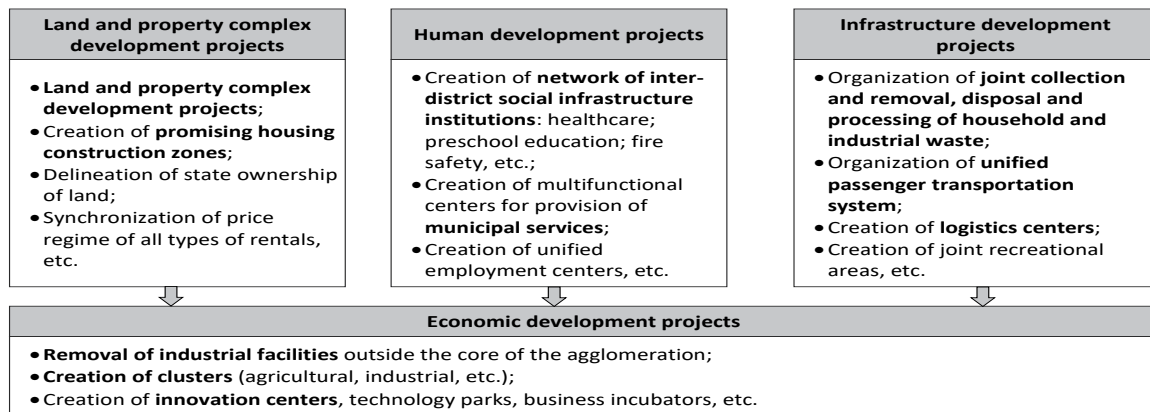


Figure 1. Classification of inter-municipal projects

Source: own compilation.

transport infrastructure, centers are identified that can geographically combine the provision of these services.

At the second stage, for a network of rural settlements formed on the basis of the development of social infrastructure and their attractiveness as a place of residence, trends and dynamics of the population are determined, demand for social, transport, communal and industrial infrastructure services is predicted; a list and spatial location of effective settlement zones in the region are formed; a multilevel system of support settlements with social, transport, communal and industrial infrastructure is being designed, structured by type, function, level and possibility of inter-municipal interaction.

At the third stage, computational experiments are conducted to evaluate the effectiveness of regulatory measures and development projects using agent-based simulation based on scenario scenarios for assessing trends in socio-economic development and increasing the attractiveness of territories during project implementation and, as a result, changes in the migration behavior of the target population.

A distinctive feature of this approach is the possibility of considering the relationship between the socio-economic development of rural areas, migration behavior of the population, value system, lifestyle as a complex, multi-agent feedback system. In fact, we are talking about the implementation of an

adaptive system for modeling and forecasting the dynamics of interrelated migration processes and the attractiveness of territories.

The implementation of the simulation model using an agent-based approach allows: 1) identifying stable trends in migration processes that are formed based on strategic options for the development of territories, 2) purposefully influencing the migration behavior of the population based on economic, socio-demographic factors, 3) within the framework of scenario options, simulating collective, system-wide behavior and, ultimately, predicting the expected effectiveness and effectiveness of a set of planned measures, programs and projects in a specific area.

Figure 2 shows the structure of the conceptual agent-based model (hereinafter referred to as the ABM), which includes agents "Population", "Enterprises", "Educational institutions", and "Authorities" in the implementation of the scenario of formation and satisfaction of personnel needs of the local labor market (hereinafter referred to as LM).

The block of scenario options is based on a comparison of a set of indicators characterizing the actual level of attractiveness of the territory with the desired one, from the perspective of target indicators of the scenarios being implemented (for example, job search and employment), in which a multi-criteria assessment of population behavior is carried out. Thus, simulations conducted based on

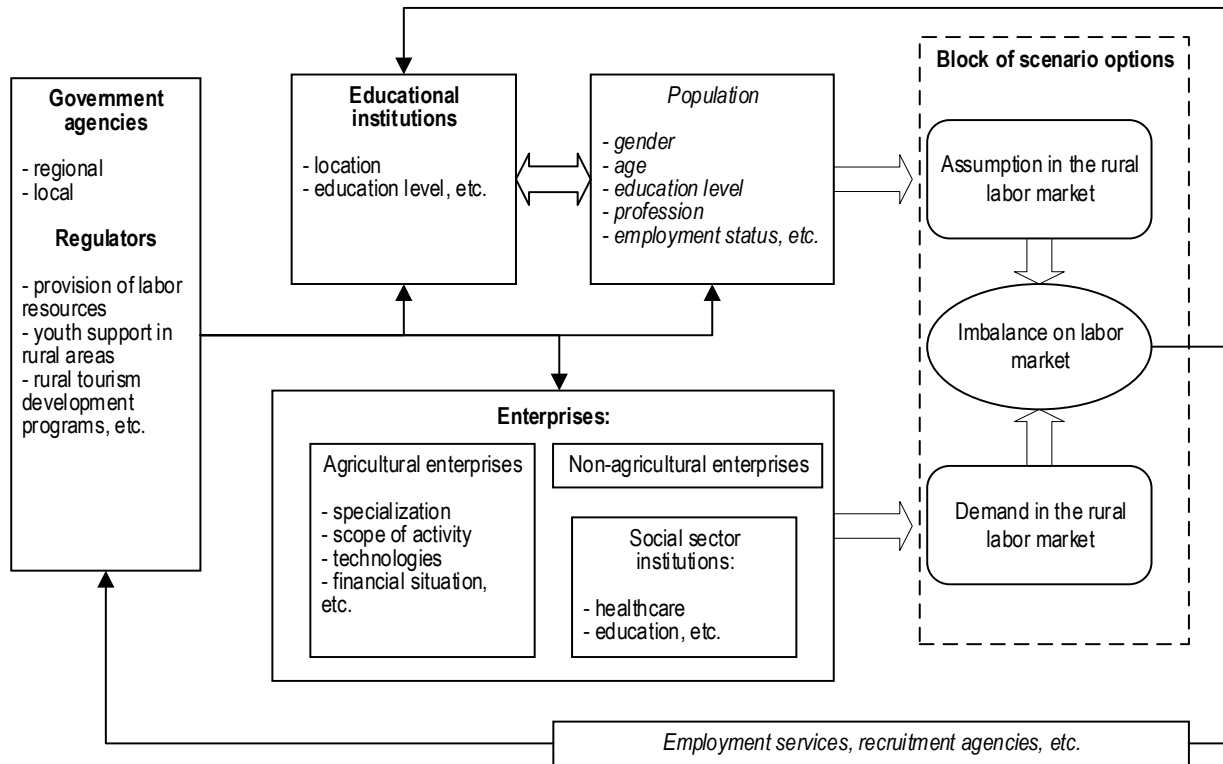


Figure 2. Conceptual agent-based model with a block of scenario options

Source: own compilation.

the design values of indicators of planned and implemented complex measures and projects will allow assessing their effectiveness and efficiency from the perspective of changing the migration behavior of the target population, thereby increasing the validity of the implementation of certain measures.

Scenarios are formed based on the strategic goals of influencing the migration behavior of the population through key factors (incentives for migration, criteria for choosing a destination) and conditions (hindering or contributing to the migration intentions of agents), and are based on both quantitative (statistical) data and the sociological surveys results.

In particular, the scenario of providing labor resources to the agro-industrial complex makes it possible to assess the degree of satisfaction of the personnel needs of agricultural enterprises based on the consideration of many factors concerning supply and demand (enterprise development prospects, labor mobility, professional and qualification needs, salary levels, etc.); the youth support scenario is to

assess the effectiveness of a set of measures to attract and retain young people in rural areas and others.

The proposed theoretical and methodological approach was tested on the example of the formation of various kinds of sub-regional localizations (urban agglomerations – Ufa, Oktyabrsky, industrial and tourist-recreational clusters of the Trans-Urals and the Northeast) of the Republic of Bashkortostan (Gainanov et al., 2021). The ABM toolkit has been implemented in assessing the behavioral aspects of agents in the labor market and education sector of the Republic of Bashkortostan (Gainanov et al., 2024).

Further research involves the formation of an information and analytical database, including qualitative and quantitative data characterizing rural areas, the population, its behavior and lifestyle, algorithms for their processing and forms of visualization of results, as well as software implementation in the formation of the AS network in the format of rural agglomerations.

Conclusion

For the vast territory of Russia, the outflow of the rural population is not only an economic, but also a social, political, and cultural problem. Due to the need to reduce the level of inter-territorial differentiation and intra-regional differences, including through the formation of a balanced territorial organization of the economy with the provision of advanced infrastructure development in rural areas, as stipulated in a number of strategic documents, the problem of rural development and the possibility of their reintegration into the Russian economic space has become so important.

The solution of two interrelated tasks – the reintegration of rural territories into the Russian economic space and overcoming the migration outflow of the rural population – was based on the economic, social and behavioral aspects of the theory of reintegration at the micro- and sub-regional levels. The formation of rational AS structure is proposed to be carried out using a methodological approach of integrated development based on the rational concentration of limited resources of inter-municipal cooperation for the implementation of socially and economically significant projects.

The relationship between the socio-economic development of rural areas and the migration behavior is proposed to be considered as a multi-agent feedback system within the framework of an agent-based approach, that is, as an adaptive system for modeling and forecasting the dynamics of interdependent migration processes and the attractiveness of territories based on scenario development options.

Scenario variants of computational experiments are considered based on the strategic goals of influencing the migration behavior, through key factors (incentives for migration, criteria for choosing a destination) and conditions (hindering or contributing to the migration intentions of agents), and are based on both quantitative (statistical) data and the sociological survey results.

The proposed methodological approach and programmatic implementation of tools for the formation of the AS network in the format of rural agglomerations will help to increase the validity of decisions taken by public authorities in the field of sustainable rural development, based on an assessment of the effectiveness of regulatory measures and development projects.

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