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SPATIAL DEVELOPMENT OF SOCIO-ECONOMIC SYSTEMS IN THE STUDIES OF VOLOGDA RESEARCH CENTER OF RAS



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Russia, as the largest country in the world by area, has enormous, but unfortunately, currently insufficiently effectively used spatial potential, which, in the context of exacerbation of geopolitical and other challenges of the external and internal environment, can act as one of the key endogenous factors in the development of the country. This actualizes the need to develop and implement a scientifically sound state policy of spatial development at the federal, macro- and regional levels, aimed at revealing the potential of urbanized and non-urbanized territories, including on the basis of network forms of their interaction. The article considers the main stages of evolution and directions of research in Vologda Research Center of the Russian Academy of Sciences on the problems of spatial development of socio-economic systems of various levels of hierarchy, which has actually been end-to-end since its foundation in 1990. The paper shows that the range of issues studied, the methodology, as well as the tools used have been constantly evolving. In particular, in the studies of spatial development there was a transition from the regional (Vologda Region) to the macroregional (European North of Russia, Northwestern Federal District) and federal levels. The staff mastered new promising methods and tools for conducting research (GIS, methods of analyzing big data, spatial econometrics, etc.), the information base expanded: data aggregation services were actively used (Kontur.Fokus, List-Org, AVITO, CIAN, etc.), data from the Federal Tax Service, as well as data obtained from our requests to Rosstat, surveys of residents, heads of

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municipalities, business entities, big data from the social media VKontakte, etc. The key results obtained, their scientific and practical significance are presented, promising areas for further research in this problematic field are substantiated. The article allows assessing the contribution of Vologda scientists to the development of theory, methodology, as well as institutional and instrumental support for the spatial development of Russia and its regions in the context of exacerbating modern challenges.

Spatial development, public policy, big data, GIS, micro level, spatial development strategy.

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Introduction

The special relevance of conducting comprehensive fundamental and applied scientific research on the spatial development of socio-economic systems at various levels of the hierarchy is due to the global, national and sectoral trends that have developed or are currently actively gaining momentum, forming both limitations (challenges) and new opportunities for the socio-economic and spatial development of Russia and its regions¹ (Kvint, 2022; Uskova, Ustinova, 2025; Russia 2035..., 2025).

In our opinion, the key global political trends include the intensification of geopolitical confrontation in the world, mutual sanctions pressure, which led to the intensification of the processes of deglobalization, the disintegration of the world into zones of influence (“pan-regions”) and the strengthening of integration processes within these zones. For Russia, this manifested itself in the virtually complete severance of direct economic ties with Western countries that had developed in the post-Soviet period, the reorientation of economic activity toward the East, as well as toward the domestic market, and the stimulation of the development of the supply-side economy.

Since the socio-economic space is derived from the economic model of the country’s development that has emerged at one or another

historical stage, which determines, inter alia, if there are patterns in the allocation of productive forces, directions and nature of the use of scientific and technological progress (STP) achievements in economic activity, then it seems advisable to pay attention to a number of technological¹ and economic trends that are actively developing at the present stage, namely: the transition of the world economy to the fourth technological paradigm, the introduction of digital and platform technologies, the development of ICT. This changes the traditional model of extraction and processing of raw materials and the allocation of productive forces: territorial disparities between mining and processing centers are decreasing, the role and importance of rail transport is increasing, the role of maritime logistics is increasing; the need for labor is decreasing due to the automation of production. New sectors of the economy are actively forming (robotics, 5G, blue economy, forest bioeconomy, distributed bio-processing, biotechnology, development of materials for the chemical industry, industrial Internet of Things, photonics) (Kozhevnikov, 2025b). In such a situation, it is obvious that the growth opportunities of the domestic economy are exhausted solely due to the raw material model of development.

Along with this, global environmental challenges are becoming more acute: against the

¹ The unified plan for achieving the national development goals of the Russian Federation until 2030 and for the future until 2036 (approved by the Government of the Russian Federation on February 13, 2025). Available at: <https://www.garant.ru/products/ipo/prime/doc/411156963/> (accessed: 09.09.2025); Analytical note “Horizon 2040. The White Paper. Agency for Strategic Initiatives. Available at: https://ruef.ru/assets/files/editions/Block_Gorizont_web_p_0208.pdf (accessed: 09.09.2025). About the contours of the long-term forecast and what it means for the Arctic. Available at: http://www.forecast.ru/_ARCHIVE/Presentations/DBelousov/2025_03_03_RosArct.pdf (accessed: 09.09.2025).

background of an extensive business model in most developing countries, anthropogenic pressure on the environment is increasing, and natural resources are being depleted. Climate changes have been observed quite actively in the world in recent decades, which is manifested in the melting of permafrost and the growing influence of these processes on economic activity, especially in the North and Arctic regions. In this regard, the climate agenda is relevant for government regulation in the world, which leads to a decrease in demand for traditional Russian exports – oil and coal; the need for an efficient solid waste management system.

All of the above is happening against the background of accelerated urbanization and degradation of the periphery, a pronounced decrease in the birth rate, population aging in Russia and the majority of developed countries, depopulation due to natural and migration decline; population growth in Africa and the Asia-Pacific region.

At the same time, an objective trend is found in the increasing demands of the population for the comfort and safety of the living environment, which is manifested in a request to improve the quality, comfort and accessibility of housing, urban, cultural and leisure environment². These processes occur, as a rule, against the background of growing territorial differences in living standards associated with spatial changes in economic activity. These circumstances increase the requirements for the spatial connectivity of the country, the mobility of resources, ensuring the sufficiency of infrastructure, and the emergence and development of new centers of economic growth.

We should note that these patterns are currently identified in key top-level strategic documents of Russia as challenges that need to be taken into account when developing long-term priorities for socio-economic and spatial development. In particular, in the National Security Strategy of the Russian Federation (approved

by Presidential Decree 400, dated July 2, 2021), the need to strengthen the unity of the economic space, develop cooperation and economic ties between the subjects of the Russian Federation is identified as a priority in the context of ensuring economic security amid global turbulence.

The focus on the need to overcome the imbalances in the socio-economic development of territories caused by forced urbanization and the locational compression of the developed space is fixed in the Strategy of Scientific and Technological Development of Russia (approved by Presidential Decree 145, dated February 28, 2024). The scale of the existing problems is evidenced by the following figures: the ratio of the average GRP per capita of the 10 leading regions to the 10 outsider regions increased from 6.6 to 13.5 times only in 2000–2023. At the same time, the differences between the leading region and the outsider region in terms of per capita GRP are significantly higher: in 2023, 65.8 times (Nenets Autonomous Area / Republic of Ingushetia)³. The situation is somewhat better in terms of social indicators due to the state's "redistributive" policy. Thus, in 2000–2023, the differentiation of 10 leading regions and 10 outsider regions by average per capita income decreased from 4.8 to 3.5 times. However, the existing imbalance in the Russian Federation's space and the increasing differences in business conditions pose a challenge to ensuring the country's national security.

The new Strategy for the Spatial Development of the Russian Federation until 2030 with a forecast until 2036 (approved by RF Government Resolution 4146-r, dated December 28, 2024) identifies a priority for the formation of a balanced territorial organization of the economy aimed at increasing the production of goods and services for the domestic market and added value created in the national economy, in particular including by unlocking the potential of various types of territories. It is

² The unified plan for achieving the national development goals of the Russian Federation until 2030 and for the future until 2036 (approved by the Government of the Russian Federation on February 13, 2025). Available at: <https://www.garant.ru/products/ipo/prime/doc/411156963/> (accessed: 09.09.2025).

³ For reference: the differences in per capita GRP between the leading and the worst region in India were 10 times, in Brazil – 5.7 times, in China – 4.5 times, in the USA – 2.2 and 5.3 times (excluding and including the District of Columbia/DC) (Bakhtizin, 2024).

supposed to create conditions for ensuring the stability of the settlement system by stopping the outflow of population from the regions of Siberia, the Far East and the Arctic, small and medium-sized cities, and rural areas. Backbone settlements (BS; 2,160 units, more than half of which are small towns, urban-type settlements, villages) should play an important role here as organizing centers at the sub-regional level, including those providing social services to residents of adjacent territories⁴.

We should note that the spatial development policy in Russia at the present stage is aimed at achieving national goals through the implementation of a number of government programs and projects. At the same time, one of the key problems that reduce its effectiveness, in our opinion, is the *poor elaboration of institutional and instrumental support for the implementation of strategic priorities of spatial development*. In this regard, there is an urgent need for scientific and methodological support for these processes.

Currently, the problems of spatial research in Russia are developing mainly within the framework of the following leading scientific schools:

a) *Moscow school* (A.G. Granberg, A.G. Aganbegyan, O.V. Kuznetsova, N.N. Mikhieva, A.N. Pilyasov, S.S. Artobolevsky, T.G. Nefedova, A.G. Druzhinin, L.B. Vardomsky, A.I. Treivish, E.M. Buchvald, A.V. Odintsova, S.N. Rastvor-tseva, I.V. Manaeva, N.Y. Zamyatina, A.V. Kotov, S.P. Zemtsov, and others);

b) *Saint Petersburg school* (V.V. Okrepilov, S.V. Kuznetsov, L.E. Limonov, B.S. Zhikharevich, N.M. Mezhevich, S.V. Fedoseev, A.M. Fadeev, P.V. Druzhinin, O.V. Tolstoguzov, S.S. Lachin-skiy, and others.);

c) *Ural school* (A.I. Tatarkin, V.N. Lazhentsev, Yu.G. Lavrikova, E.G. Animitsa, V.V. Akberdina, I.A. Antipin, S.G. Pyankova, T.E. Dmitrieva, I.V. Naumov, A.V. Suvorova, etc.);

d) *Siberian school* (A.G. Granberg, A.G. Aganbegyan, V.A. Kryukov, V.I. Suslov, S.A. Suspitsin, V.E. Seliverstov, V.V. Kuleshov,

N.M. Ibragimov, V.M. Gilmundinov, K.P. Glushchenko, E.A. Kolomak, L.V. Melnikova, V.I. Blanutsa, Yu.S. Ershov, etc.);

e) *Far Eastern school* (P.A. Minakir, A.G. Isaev, A.N. Demyanenko, B.H. Krasnopolsky, O.M. Prokapalo, S.N. Leonov, D.A. Izotov, and others).

Scientists from Vologda Research Center of the Russian Academy of Sciences (VolRC RAS), which is celebrating its 35th anniversary this year, have also contributed to the development of theoretical and methodological foundations and tools for the spatial development of Russia and its regions. The paper is devoted to the main stages and specifics of the formation of the problems of spatial development of socio-economic systems in the research of VolRC RAS staff, during which the methodology was continuously developed and supplemented, the research tools and information base were expanded, and all new aspects were covered, as a result of which spatial topics are currently among the main ones in the problem field of research of VolRC RAS scientists.

The formation stage of spatial research at VolRC RAS (1990 – first half of 2017)

During this period, Vologda Research Center of the Russian Academy of Sciences (formerly VSCC CEMI RAS, ISED T RAS) conducted a number of research and applied works on the problems of socio-economic, spatial development of Russia and its regions. At the same time, the expansion and deepening of such research was ensured to a large extent by strengthening ties and cooperation with leading economic institutes of the Russian Academy of Sciences (the Institute of Regional Economics of the Russian Academy of Sciences, the Institute of Economics of the Ural Branch of the Russian Academy of Sciences, the Institute of Socio-Economic and Energy Problems of the North of the Komi Scientific Center of the Ural Branch of the Russian Academy of Sciences, the Institute of Economics of the KarSC RAS, the Central Economics and Mathematics Institute of the

⁴ Unified list of backbone settlements of the Russian Federation (approved by the Presidium (Headquarters) of the Government Commission for Regional Development in the Russian Federation (Minutes 143pr, dated December 16, 2024)).

Russian Academy of Sciences, Institute of Economic Forecasting of the Russian Academy of Sciences, etc.). This made it possible to enrich the available methodological and instrumental support for spatial research.

One of the first and, in our opinion, landmark works of this period is the monograph "Vologda Region: Moving Toward the Market", where the authors' attention was focused mainly on the study of trends in the socio-economic development of the region during the market reforms of the 1990s, their inconsistency and complexity, their impact on the daily life of the population the region (Ilyin et al., 1995).

We should note that at the initial stage, the focus was primarily on research related to territorial aspects of development and the search for reserves to increase the efficiency of industrial complexes (agriculture and the timber industry), which form the economic basis of most municipalities in the region.

Thus, since 1992, monitoring of the functioning and development of agricultural organizations in the Vologda Region has been organized and is currently being implemented⁵ (Pashko et al., 1994). It is carried out on the basis of questionnaires that are sent to the heads of large and medium-sized organizations in the agricultural sector of the region. Such monitoring, which also includes an analysis of official statistics, makes it possible to identify key problems and territorial features of the development of this area.

During these years, researchers (A.A. Pashko, M.F. Sychev, V.A. Ilyin, P.M. Sovetov, T.V. Uskova, A.N. Chekavinsky, A.A. Anishchenko, and others) implemented projects, including those aimed at analyzing the spatial organization of the agricultural sector in the region, as

a result of which the need to stimulate integration relations between agricultural science and production, the development of a network of supply, marketing, processing, and credit cooperatives was substantiated (Pashko et al., 1997; Ilyin et al., 2007a; Uskova et al., 2013c).

Along with this, the essence of territorial differentiation of agricultural production, the factors that promote it, as well as the forms, methods and tools of state agrarian policy aimed at reducing such differentiation were investigated. Based on the materials of the Vologda Region, the specialization of agricultural production zones (typology of territories) was substantiated and the specifics of the financial and economic activities of the "model" farms of the region in the identified zones were studied. Measures and tools of state management of agricultural production have been developed and scientifically substantiated to smooth out territorial differentiation⁶ (Anishchenko, 2018).

Another broad area of research is related to monitoring the state and development problems of the *forest complex in the region*. The projects implemented by the scientists were devoted to the development of a program for the development and restructuring of timber enterprises in the Sokolsky industrial hub for the period 1998–2005 (A.S. Shulev)⁷; assessment of the limits of economic accessibility of the development of the calculated logging area of the Vologda Region (A.S. Shulev, M.A. Kukoverov, Z.S. Mironova, E.S. Trunov)⁸; development of recommendations for implementation in the timber industry indicative forecasting (Z.S. Mironova, T.N. Stateeva, A.S. Shulev) (Mironova et al., 2000). The main conclusions and research proposals formed the basis for the

⁵ Vologda Region: Progress of agrarian reform in 1993–1995 (based on surveys of heads of agricultural enterprises and experts in 1993–1995): Information and analytical note on the results of research. Executed by A.A. Pashko, I.L. Brause. Vologda, 1996. 9 p.

⁶ Directions and instruments for mitigating the consequences of territorial differentiation in agricultural production: Information and analytical note on the third stage of research. Executed by A.N. Anishchenko. Vologda, 2017. 46 p.

⁷ Designing a program for the development and restructuring of forestry enterprises in the Sokolsky industrial hub (taking into account improved environmental safety) for the period 1998–2005: Research report. Executed by A.S. Shulev. Vologda, 1998. 114 p.

⁸ Assessing the limits of economic affordability of development of the estimated cutting area in the Vologda Region. Stage 1. State Forest Fund: Report on the first stage of research. Executed by M.F. Sychev, M.M. Polyakov, A.S. Shulev, A.V. Kozlov, M.A. Kukoverov, Z.S. Mironova. Vologda, 2002. 117 p.

concept of stabilization and development of the timber industry for the period 1998–2005, adopted by the Government of the Vologda Region.

In 2000–2005, researchers became involved in the preparation of draft strategies, plans and programs for the development of forestry enterprises, including “Development of program measures for the priority construction of logging roads funded by the regional road fund” (A.S. Shulev, M.A. Kukoverov, A.A. Sedov)⁹; “Regional program for the integrated use of wood resources waste and low-grade wood in the Vologda Region for the period up to 2010” (M.M. Polyakov, A.S. Shulev, M.A. Kukoverov, Z.S. Mironova, E.S. Trunov)¹⁰.

During this period, a set of measures was developed to ensure the sustainability of the Vologda Region timber industry in the context of a market strategy for its development (T.V. Uskova, T.N. Trunova, Z.S. Mironova, K.A. Zadumkin); draft strategies for the development of the Vologda Region timber industry until 2020 (Z.S. Mironova, M.A. Kukoverov), The Vologda Region Forest Plan (Z.S. Mironov), the Program for increasing the sustainability and innovativeness of the Vologda Region forest complex, including through the formation of a forest cluster (R.Y. Selimenkov), and others were designed. Recommendations and proposals for the development of the forest complex are reflected in a number of planning documents on the sustainable development of the sector, adopted at the Government level of the Vologda Region¹¹ (Sychev et al., 2011; Selimenkov, Sovetov, 2012).

A number of works were devoted directly to a comprehensive study of the features and

problems of the spatial development of the region, the main results of which are presented in monographs (Ilyin et al., 2007b; Ilyin et al., 2008; Ilyin et al., 2009; Uskova et al., 2010, etc.). In addition, research was carried out in the interests of the Government of the Vologda Region: strategies and programs for the development of tourism (2014) and dairy (2015) clusters in the Vologda Region were designed.

Within the framework of the work, the drivers of territorial differentiation were identified and ways of reducing it were conceptualized (V.A. Ilyin, T.V. Uskova, S.A. Selyakova, R.Yu. Malyshev)¹². Later, this area was developed in the works of T.V. Uskova and N.V. Voroshilov: the essence, content, factors, causes and management mechanisms of intraregional socio-economic differentiation were investigated, methodological tools for assessing the differentiation of socio-economic development of municipalities were proposed and a mechanism for overcoming its consequences was developed (Uskova, Voroshilov, 2015).

During this period, the first comprehensive studies were carried out to study the features and problems of the development of *nodal* (large cities and urban agglomerations) and *non-nodal* (medium/small cities, rural areas) elements of the spatial framework of the region. In particular, a system for monitoring the living conditions of the population of a large city has been formed, which is based on data from surveys of residents and allows for a comprehensive assessment of the quality of the urban environment. Since 1994, such an assessment has been carried out on a systematic basis (every 1–2 years) for Vologda and Cherepovets¹³ (Ilyin et al., 1997; Uskova, Kozhevnikov, 2013).

⁹ Theoretical foundations and practical experience of developing a network of multi-purpose forest roads: Information and analytical note on the first stage of research. Executed by A.S. Shulev, N.N. Vasilyeva. Vologda, 2003. 53 p.

¹⁰ Testing typical directions of development of wood processing based on waste-free technologies in a market economy (using the example of JSC Semigorodny Lespromkhoz): Research report. Executed by M.M. Polyakov, A.S. Shulev, A.V. Bely, N.Yu. Manoylova. Vologda, 1994. 88 p.

¹¹ Designing the main strategic directions for the development of the forestry complex of the Vologda Region until 2020: Final report on research. Executed by Z.S. Mironova, R.Yu. Selimenkov. Vologda, 2007. 117 p.

¹² Differentiation of socio-economic development of the districts of the Vologda Region and the formation of effective territorial agglomerations: Final report on research. Executed by V.A. Ilyin, T.V. Uskova, S.A. Selyakova, R.Yu. Malyshev. Vologda, 2006. 133 p.

¹³ Monitoring of living conditions in the city of Vologda (based on population estimates): Information and analytical note on research. Executed by T.V. Uskova, D.P. Zharavin. Vologda, 2004. 82 p.

At the same time, methodological tools for assessing the competitiveness of large Russian cities were developed and tested (Uskova et al., 2013b), as well as a set of measures to modernize their economy and social sphere (Uskova, Nesterov, 2010; Uskova et al., 2013d). A set of projects has been implemented to develop strategies for the development of important areas of Vologda: corporate social responsibility until 2025, housing construction industry until 2025, industry until 2030, and consumer market until 2020. During this period, the first studies on the formation and development of urban agglomerations in the regions of the country began¹⁴.

A number of studies have been devoted to the development of small and medium-sized cities. First of all, the work should be noted here, which includes an analysis of key problems and substantiation of promising directions for the modernization of the economy of the single-industry town of Sokol (Uskova et al., 2012).

During this period, research on the development of municipalities in the region, a significant part of which are rural areas, was quite actively conducted. In particular, a scientific and methodological complex of their research and management of their development was formed (typology, methodological assessment tools and organizational and economic mechanism of potential development) (Uskova, 2009; Uskova et al., 2013a; Voroshilov, Gubanova, 2014; Chekavinsky et al., 2017). A system for monitoring the reform of the institution of local self-government has been formed, based on surveys of heads of municipalities, which started in 2007, and official statistics. The survey of the heads of municipalities in the region also makes it possible to identify the development problems of various types of municipalities (rural and urban settlements, municipal districts). Since 2014, the annual bulletin "Socio-Economic Development of Municipalities of the Vologda Region" has been issued, which reflects the results of these studies.

During this period, a number of strategic planning documents were developed for

the Vologda Region and municipal districts (strategies for the socio-economic development of Babaevsky, Vashkinsky, Vologodsky, Gryazovetsky, Sokolsky, Cherepovetsky and other municipal districts, as well as the city of Vologda).

Considering the development of foreign economic and interregional cooperation as factors intensifying the economic growth of the territory, VolRC RAS staff began research on this topic in 2010. Together with the Center for System Analysis and Strategic Studies of the National Academy of Sciences of Belarus, a number of research works on the problems of trade and economic integration were carried out (Uskova, Selimenkov, 2013; Selimenkov, Kashintsev, 2014). Projects have been implemented to enhance inter-regional economic cooperation (Lukin, Uskova, 2016).

Thus, in methodological and instrumental terms, a certain scientific reserve was formed during this period, which served as the basis for further expansion and deepening of spatial research not only at the regional, but also at the macro-regional and federal levels.

The stage of development and deepening of spatial research at VolRC RAS (2017–2025)

Comprehensive and systematic spatial research at VolRC RAS began in 2017, when a laboratory for spatial development and placement of productive forces was established on the basis of the Department of Socio-Economic Development and Management in Territorial Systems. In 2017–2022, it was headed by Sergey A. Kozhevnikov. In April 2023, by order of the director of FSBIS VolRC RAS, the laboratory was transformed into the Center for the Study of Spatial Development of Socio-Economic Systems (hereinafter referred to as the Center, headed by Candidate of Sciences (Economics) S.A. Kozhevnikov), which includes two divisions: the laboratory for the spatial development of territorial systems and intersectoral complexes, and the laboratory for the study of spatial socio-economic systems management problems. The

¹⁴ Ilyin V.A., Selyakova S.A., Malyshev R.Yu. et al. (2006). Formation of urban agglomeration: Textbook. Vologda: VNKTs CEMI RAS. 126 p.

Table 1. The main research directions of the Center, taking into account the priorities of the development of fundamental science and spatial development of Russia

Document	Research area
1. Long-Term Fundamental Scientific Research Program in the Russian Federation (approved by RF Government Resolution 3684-r, dated December 31, 2020)	5.6.3. "Spatial Economics": – studying the patterns of transformation of the socio-economic space of the Russian Federation; systemic analysis of the development of Russian regions and their interactions; – mechanisms for the formation of a new model of spatial development of the Russian economy, ensuring sustainable development and connectivity of its territories in the face of global challenges of the 21st century; – designing a long-term development strategy for Russian macro regions; studying long-term development issues in Crimea, the North Caucasus, the Urals, Siberia, the Far East, the North, and the Arctic, taking into account state policy, global and national challenges
2. Strategy for Spatial Development of the Russian Federation until 2030 with a Forecast until 2036 (approved by RF Government Resolution 4146-r of December 28, 2024)	Priorities for Russia's spatial development: – forming a balanced territorial organization of the economy that promotes the development of a supply-side economy, aimed at increasing the production of goods and services for the domestic market and increasing added value, including by unlocking territorial potential; – creating conditions for ensuring the sustainability of the settlement system in the Russian Federation, including conditions for halting the outflow of permanent residents from the regions of Siberia, the Far East, and the Arctic, small and medium-sized cities, and rural areas; – reducing the level of inter- and intra-regional differentiation in the socio-economic development of constituent entities of the Russian Federation
Источник: составлено авторами.	

Center currently includes six people: Candidate of Sciences (Economics) Sergey A. Kozhevnikov, Candidate of Sciences (Economics) Nikolai V. Voroshilov, Candidate of Sciences (Economics) Svetlana S. Patrakova, Candidate of Sciences (Economics) Ekaterina D. Kopytova, Junior Researcher Marina A. Lebedeva, laboratory researcher Mikhail Yu. Pokutniy. The share of highly qualified personnel is 67%.

The main research directions of the Center correspond to the key directions of the Program for Fundamental Scientific Research in the Russian Federation for the long term (approved by RF Government Resolution 3684-r, dated December 31, 2020) and the priorities of the new Strategy for Spatial Development of the Russian Federation until 2030 with a forecast until 2036 (approved by RF Government Resolution 4146-r, dated December 28, 2024, *Tab. 1*).

Within the framework of this methodological approach, during 2017–2025, the team implemented a number of research projects under government assignments, grants from scientific foundations (RFBR, RSF, fund of the President of the Russian Federation), and work in the interests of government authorities.

The scientific research platform is the theories of the supporting framework

(N.N. Baransky, G.M. Lappo, P.M. Polyan, etc.), polycentrism (P. Schmitt, K. Volgmann, A. Münter, etc.), proximity (A. Torre, R. Boshma), the theory of central places (W. Christaller, A. Losch), network interaction (M. Castells, B. Wellman, D. Nok, N.Smorodinskaya, etc.). Taking into account their provisions, the position is substantiated that the balanced spatial development of the country and its regions is ensured through the development of sustainable socio-economic ties between regions, as well as through the "large city – medium/small town – village" line within one region based on the use and development of the potential of various types of territories. In other words, unlike the previous stage of the formation of research, the Center now studies the problems of not only directly developing nodal and non-nodal elements of space, but also ensuring their socio-economic connectivity with each other, since it is the system-network paradigm of socio-economic space that is seen as more relevant to reality at this stage of the development of productive forces (Pilyasov, 2025).

In turn, the development of spatial research at VolRC RAS in this period was carried out in the following key areas (*Fig. 1*).

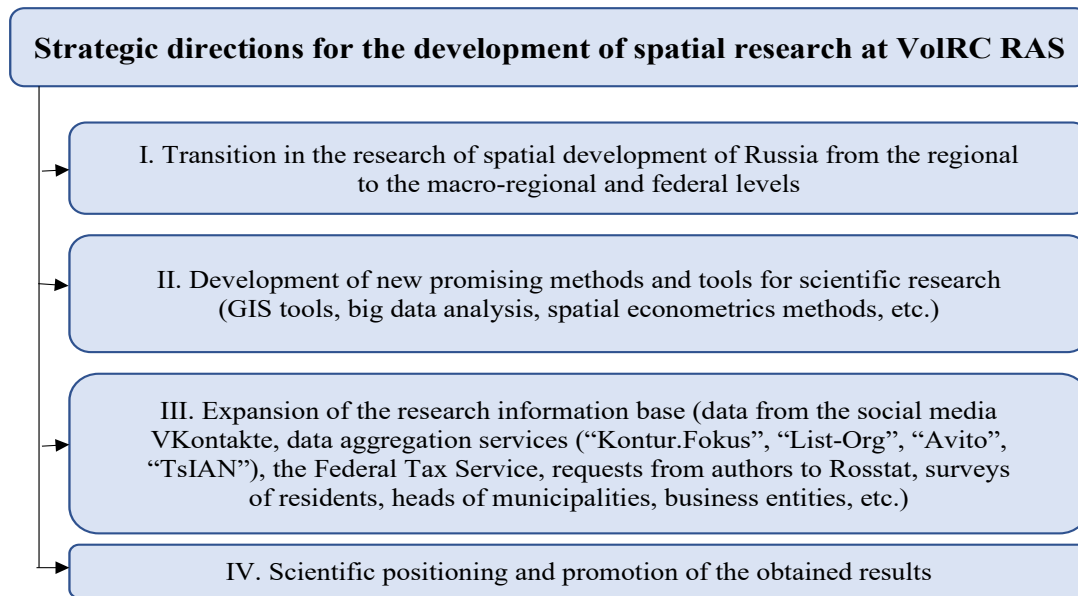


Figure 1. Directions of spatial research development at VolRC RAS in 2017–2025

Source: own compilation.

Let us take a closer look at each of the directions.

I. The transition in the research of spatial development of Russia from the regional to the macro-regional and federal levels.

In 2017–2025, the Center made a gradual transition to the study of Russia’s spatial development at the macro-regional (European North of Russia, Northwestern Federal District) and federal levels (other federal districts), as well as methodological approaches to conducting such research.

a) Federal research level

Together with other departments of VolRC RAS, a monograph on national projects was prepared and published in 2024, which explored, among other things, infrastructural aspects of the spatial development of the country’s regions (National Projects of Russia..., 2024). The publication was disseminated to other regions and received about 20 reviews from federal and regional authorities and scientific organizations.

In addition, in 2023–2025, the Center’s staff implemented a work under a major grant from the Russian Science Foundation “Agglomeration or enclavization: What is the experience of the development of large

Russian cities?” (head – Candidate of Sciences (Economics) S.A. Kozhevnikov). The object of the study was 8 emerging urban agglomerations (from various federal districts of Russia) with a population of less than 500 thousand people, the cores of which are big and large cities. Within the framework of the grant, a theoretical and methodological approach and tools for complex diagnostics of urban agglomerations of the “second echelon” were developed (Kozhevnikov et al., 2024a; Voroshilov, Kozhevnikov, 2024). It has been revealed that these agglomerations have the potential to become real growth points at the macro and regional levels, but their key problems are weak internal integration (Kozhevnikov, Voroshilov, 2024; Kozhevnikov et al., 2024a; Sekushina, 2024b) and the inefficient structure of the economy, which is dominated by activities that are not affected by the scale effect (Kopytova, Voroshilov, 2025; Kozhevnikov, 2025a). In March 2025, a monograph based on the results of the study was prepared and is currently being published.

b) Interregional (district) level of research

In 2017, the staff (T.V. Uskova, S.A. Kozhevnikov, N.V. Voroshilov), together with colleagues from other depart-

ments of VolRC RAS, within the framework of the Fundamental Research Program of the Presidium of the Russian Academy of Sciences “Spatial development of Russia in the 21st century: Nature, society and their interaction” implemented a major research project dedicated to the economic and social transformation of rural areas of the Northwestern Federal District in the post-Soviet period, the study of key features and problems their development, as a result of which a collective monograph was prepared (Uskova et al., 2021a).

In 2018–2019, T.V. Uskova, S.A. Kozhevnikov, and N.V. Voroshilov, in partnership with colleagues from the Institute of Geography of the Russian Academy of Sciences (Moscow), implemented the research project “Problems of spatial restructuring: the example of the formation and development of urban agglomerations as points of territorial growth in the context of addressing strategic development issues in the European North and the Arctic zone of Russia” within the framework of the fundamental research program of the Presidium of the Russian Academy of Sciences “Spatial restructuring of Russia taking into account geopolitical, socioeconomic, and geoeological challenges”¹⁵. Using a monographic, historical method, economic geography tools, and sociological surveys of the population conducted by the authors, the study identified the characteristics and problems of the formation and development of urban agglomerations in the regions of the European North of Russia.

As a result of the research in 2020, a short information and analytical note “The mechanism for managing the formation and development of urban agglomerations in the European North of Russia”¹⁶ was prepared, which substantiates the possibility of the formation and development of 10 potential agglomerations in the European North of Russia. In April 2021, it was sent to federal authorities (the State Duma, the Federation Council of the Federal Assembly of the Russian Federation, minis-

tries), senior officials of the constituent entities of the Russian Federation, municipalities of agglomerations, and scientific organizations; 36 reviews were received, which supported the need for the development of urban agglomerations, including those with a population of less than 500 thousand inhabitants; the authors’ conceptual proposals for the formation of a management mechanism for the development of such agglomerations were approved.

During this period, research continued on the problems and prospects of the development of timber industry (Uskova et al., 2021b) and agro-industrial (Anishchenko et al., 2019) complexes in the regions of the European North of Russia.

In 2024, the team conducted for the first time a study of the spatial development of the Northwestern Federal District in the post-Soviet period. For this purpose, the authors have developed a conceptual approach to the study of spatial development at the macroregional level, which is based on the *framework and center-peripheral approaches* and considers the spatial organization of the macro region through the prism of the transformation of settlement, production, economic, infrastructural and ecological frameworks. The processes of degradation of the potential of the northern and northeastern territories and low connectivity of space have been identified, which leads to a further shift of the “center of gravity” of the macro region to Saint Petersburg, the Leningrad and Kaliningrad regions against the background of the periphery of the socioeconomic space of the district. The necessity of forming a hierarchically polycentric model of the organization of the region’s space is substantiated, the nodes of which are urban agglomerations of various levels of hierarchy and a number of supporting settlements beyond their influence (Uskova et al., 2024).

Based on the findings of the study, a pilot issue of the bulletin “Socio-economic space of the Northwestern Federal District regions:

¹⁵ Problems of spatial restructuring on the example of the formation and development of urban agglomerations as points of territorial growth in the context of solving strategic problems of the development of the European North and the Arctic zone of Russia: Final report on research. Executed by S.A. Kozhevnikov, N.V. Voroshilov. Vologda, 2018. 155 p.

¹⁶ Mechanism for managing the formation and development of urban agglomerations in the European North of Russia: Information and analytical note. Headed by T.V. Uskova; executed by N.V. Voroshilov. Vologda, 2020. 32 p.

State and development trends. 1990–2023”¹⁷ (a team of authors under the general editorship of T.V. Uskova, S.A. Kozhevnikov) was prepared, which, together with a brief analytical note and an overview of changes in the ranks of regions in January 2025, was sent to the state authorities of the subjects of the Russian Federation, scientific organizations; 56 reviews were received as feedback, which supported the conclusions reached and made valuable suggestions for further development of the materials, as well as interest in receiving similar newsletters for the Central and Ural federal districts.

A number of studies of the Center’s staff during this period were devoted to the development of small and medium-sized cities in the macro region (T.V. Uskova, I.A. Sekushina, S.A. Kozhevnikov), as a result, the following key scientific results were obtained: a methodological approach to designing a typology of cities based on their specialization and position in the settlement system was elaborated in order to substantiate the priorities of state policy for their development. A methodological approach has been developed to assess the formation and direction of economic relations in small cities (Kozhevnikov, 2025c; Uskova, Sekushina, 2021). Based on its use, the dependencies of the current state and potential of modernization of the city with the complexity of the economy, its integration into national and regional value chains were identified (Sekushina, 2024a; Kozhevnikov, 2023a; Kozhevnikov, 2023b). The trends, barriers and prospects of digitalization of small and medium-sized cities in the European North of Russia were revealed (Sekushina, 2022).

Researchers pay considerable attention to the issues of ensuring production and economic (Kozhevnikov, Patrakova, 2022; Patrakova, 2025b), transport (Kozhevnikov, Patrakova, 2024; Uskova et al., 2025), social (Kozhevnikov, 2023a; Kryukov, Kozhevnikov, 2024), institutional (Kozhevnikov, Sekushina, 2021) and other connectivity of socio-economic spaces of the macro region, the development of scientific

foundations and institutional and instrumental support for spatial integration at the inter- and intra-regional levels (Kozhevnikov, 2025b; Kozhevnikov, Patrakova, 2022), balancing the socio-economic space along the “city–village” line (Voroshilov, Gubanova, 2018; Voroshilov, 2021; Uskova, Patrakova, 2022).

Since 2025, the Center’s staff has been implementing a new research topic, “Factors and tools for ensuring balanced spatial development of Russia’s regions in the face of increasing challenges” as part of a state assignment. The object of the research is the deep territories of the Northwestern Federal District regions (rural territories and small towns), and the subject is organizational, economic and managerial relations related to the search for sources of modernization of these territories as part of the transition to a neo-endogenous development model.

c) Regional level of research

As part of the expansion of the monitoring system for the development of municipalities in the Vologda Region, which has been implemented at VolRC RAS for more than 10 years, in 2024 a methodological approach to the study of the spatial development of the region was proposed, including the formation of a typology of municipalities in the region based on the criterion of peripherality (i.e. distance from large cities: urban agglomerations, near, middle and far periphery), and by the share of the rural population in the total population of the region (types: completely rural, predominantly rural, predominantly urban areas). As a result of testing this approach, key trends and problems of socio-economic development of each group of territories have been identified, which can form the basis of a differentiated policy for their development. Long data series (since the 1990s) show the processes of forced locational compression of the developed space around two large cities in the region (Vologda, Cherepovets); it is revealed that a number of small cities in the region currently have the potential to turn into real organizing centers at

¹⁷ Socio-economic space of the regions of the North-West of Russia: State and development trends. 1990–2023: Analytical bulletin. Issue 1. Edited by T.V. Uskova, S.A. Kozhevnikov. Vologda: VolRC RAS, 2024. 139 p. Available at: http://www.vscs.ac.ru/uploads/activity_files/2025/04/28945.pdf (accessed: 10.09.2025).

the sub-regional level by preserving their economic core with a fairly a diversified production structure.

Based on the results of the study, the next issue of the bulletin “Socio-economic development of municipalities of the Vologda Region. Issue 11” was prepared in 2024 (T.V. Uskova, N.V. Voroshilov)¹⁸. This bulletin and a brief note were sent to the state authorities of the constituent entities of the Russian Federation and scientific organizations in February 2025; 21 reviews were received as feedback. In addition, the results of the study were discussed at a meeting of the Russian Municipal Academy in February 2025 and received support.

II. Development of new promising methods and tools for scientific research (GIS tools, big data analysis, spatial econometrics methods, etc.).

Spatial research involves the use of flexible tools for the scientific tasks at hand. In particular, GIS tools (QGIS software, etc.) are currently being actively used, primarily in the construction of cartograms that reflect various aspects of the spatial development of the country's regions (population density, transport accessibility of the administrative center of the municipality, etc.) and were used by the authors of the bulletin on the spatial development of the Northwestern Federal District. In addition, GIS was used in the construction of isochrons of transport accessibility, the use of satellite images, which allowed the delimitation of a number of urban agglomerations in Russia (Kozhevnikov et al., 2024b), to assess the transport connectivity of the northern territories of Russia, etc. (Kozhevnikov, Patrakova, 2024).

Currently, the Center's staff actively uses spatial econometrics tools, which are applied in leading foreign and domestic research in this problematic field: assessment of spatial autocorrelation, construction of traditional and spatial regression models based on temporal, spatial, panel data with random and fixed effects (in the software environment STATA, Gretl, R-Studio, MS Excel) (Petrakova, 2025a;

Kopytova, Patrakova, 2024). All this makes it possible to ensure greater scientific validity and reliability of the conducted research, their compliance with the frontier directions of the development of world spatial science.

III. Expansion of the research information base (data from the social media VKontakte, data aggregation services (“Kontur.Fokus”, “List-Org”, “Avito”, “TsIAN”), the Federal Tax Service, requests from authors to Rosstat, surveys of residents, heads of municipalities, business entities, etc.).

One of the main difficulties in conducting spatial research is the weak information support in Russian statistics. In this regard, there is an urgent need to expand the information base.

The Center's staff actively used big data from VKontakte social media to study spatial interactions (primarily social connections of the population). In particular, using the TargetHunter service, large data was collected from users of settlements in the European North of Russia, which make it possible to assess the spatial distribution of their social ties (kinship, friendship), migration attitudes of the population (Kozhevnikov, 2023b), including in the space of urban agglomerations (Kryukov, Kozhevnikov, 2024); public activity in government publications, assessment of civic participation, etc. (Sekushina, Lebedeva, 2024).

At the same time, in recent years, the Center's research has been actively using micro level data (business entities). So, based on continuous parsing from the “Kontur.Fokus” service, the information on the financial and economic activities of business entities was investigated by the specifics of the manifestation of agglomeration effects at the micro level (Kozhevnikov et al., 2024c; Kopytova, Patrakova, 2024); An assessment of the economic specialization of the studied urban agglomerations according to detailed foreign economic activity has been carried out (which is not allowed by the current statistics of Rosstat as a whole, especially for the municipal level), promising projects of vertical integration

¹⁸ Socio-economic development of municipalities of the Vologda Region. 2000–2023: Information and analytical bulletin. Issue 11. Edited by T.V. Uskova, N.V. Voroshilov. Vologda: VolRC RAS, 2024. 132 p.

and cluster-network have been substantiated, which makes it possible to consolidate the potential of the core city and the satellite area of the agglomeration (Kozhevnikov, 2025a; Kopytova, Voroshilov, 2025). Currently, a similar study is being conducted for small towns, which will make it possible to substantiate their promising specializations and priorities for modernizing their economies, including in relation to large cities and rural areas.

To study the housing market of urban agglomerations in Russia, large data were collected (106.6 thousand ads from Avito), characterizing the dynamics of the change in the cost of housing offers (1-room apartments) in the core and municipalities of the satellite zone for the period 2018–2022. Their processing made it possible to assess the degree of integration of the housing market along the “core – satellite zone” line as one of the manifestations of agglomeration effects (Kozhevnikov et al., 2024a).

Along with this, data from expert and sociological surveys are actively used. For example, since 2007, an annual survey of heads of municipalities of the Vologda Region has been conducted; since 2023, a survey of heads of municipalities of the Northwestern Federal District has been conducted. Since 1992, an annual survey of the heads of agricultural organizations in the region has been conducted; in 2024, as part of an initiative project, a survey of the chairpersons of the councils of consumer associations of the Vologda Region was conducted. Since 1994, sociological surveys of the population of large cities of the region (Vologda, Cherepovets) regarding the quality of the urban environment have been organized. All this makes it possible to overcome the limitations of existing domestic statistics and more comprehensively explore the features of the spatial development of socio-economic systems at various levels of hierarchy.

IV. Scientific positioning and promotion of the obtained results.

Science develops in the close collaboration of researchers; therefore, significant efforts of the Center’s staff at this stage were aimed at

scientific positioning and promotion of the results obtained, their popularization in the media and at specialized events¹⁹.

Along with this, VolRC RAS acted as a platform for holding “anchor” thematic conferences/sections with the active involvement of leading researchers. Thus, on April 23, 2025, the All-Russian Scientific and Practical Conference “Agglomeration processes in the regions of Russia: features and problems of activating positive effects” was held at VolRC RAS, where topical issues of theory, methodology and practice of urban agglomerations development in the regions of Russia were discussed. The event was attended by reputable scientists, young specialists and government officials from 14 regions of Russia, as well as the Republic of Belarus and the Republic of Azerbaijan. About 80 researchers joined the conference, including 7 doctors of sciences and 27 candidates of sciences (71% of speakers with academic degrees).

The issue of the journal “Problems of Territory’s Development” presented to your attention is thematic. It contains articles by leading Russian researchers on the spatial development of Russia and its regions. Undoubtedly, such issues make it possible to share advanced knowledge in this problematic field and enrich Russian science as a whole. In our opinion, it is advisable to support and develop this practice in every possible way.

Research development prospects

VolRC RAS has ambitious goals both in the development of fundamental and applied spatial research. To address these issues, a Development Strategy for the Center for Spatial Development of Socio-Economic Systems until 2030 and for the period up to 2040 is currently being developed and implemented.

In terms of the development of fundamental research, an important and promising direction is the actualization of N.N. Kolosovsky’s energy production cycles in the context of the market and new challenges; further develop-

¹⁹ Some of the media publications: 1. Scientific approach. Argumenty i fakty, 2024, no. 16. 2. In search of effective tools for the development of small towns in the north of Russia – from scientists of Vologda Research Center. Nauchnaya Rossiya, 2021, November 28. 3. The seasoned one is not forgiven: For what needs the money will be allocated to villages. Izvestia, May 26, 2024, etc.

ment of methodology and methodological tools for designing promising specializations of local territories, taking into account their potential (including network interaction), traditional and new factors of location, which implies the need to strengthen sectoral research. Some aspects of this issue will be implemented within the framework of the research topic FMGZ-2025-0013 “Factors and tools for ensuring balanced spatial development of Russian regions in the context of increasing big challenges” (2025–2027). The solution of these tasks is possible through the active use of microlevel data (business entities) in research, the development of GIS analysis methods and modeling, spatial modeling of socio-economic systems, including taking into account spatial and temporal components.

Another important task is the further development of the monitoring system within the framework of the Center’s activities, ensuring its complementarity with the emerging monitoring system at the macro-regional level in VolRC RAS. This will allow us to form a comprehensive view of the features, problems of socio-economic and spatial development of the Northwestern Federal District.

At the same time, it is necessary to strive to ensure that the Center’s research acts as scientific, methodological and instrumental support for the implementation of the priorities of the new Spatial Development Strategy of the Russian Federation until 2030 with a forecast until 2036. The potential is seen in the implementation of projects aimed at scientific substantiation of priorities and projects for the development of cities at various levels of hierarchy and urban agglomerations (for example, in the development of master plans and programs for the development of anchor settlements); promising specializations and projects for the modernization of the economy of non-urbanized territories, taking into account the consolidation of their potential.

Successful solution of these tasks is possible on the basis of further development of the Center’s human resources, development of new competencies, including through establishing close network cooperation with other leading scientific organizations and scientists engaged in research in this problem field.

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