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SPATIAL FEATURES OF SECTORAL DEVELOPMENT

Innovative Territory as a Basic Element in the Spatial Structure of the National Innovation System

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Abstract—This paper defines the economic category of "state regional innovative development policy." An integrated approach to policy design and implementation promoting regional innovation-based growth corresponds to the strategic objective of improving overall quality of life and makes it possible to solve a broad range of issues, including stimulation of innovation, deployment of new production facilities, and mitigation of the negative impact of human activity on the environment. The territories of the Russian Federation are classified according to two criteria: the importance assigned to the national innovation system and the innovative capacity to solve problems of socioeconomic development (megacities, science cities, and territories with low scientific and technological potential). The original concept of the innovative development of territories is introduced. The mechanisms underpinning the development of local innovation systems, including various approaches to innovative development of territories with low innovation potential are investigated. Examples of territories where the concept of their innovative development was realized in practice are discussed (Tomsk oblast, science cities, and special economic zone).

Keywords: regional policy, national innovation system, local territories, innovation hotspots, science cities, megacities, special economic zones

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INNOVATIVE REGIONAL DEVELOPMENT: APPROACHES TO POLICY DESIGN

Constitutionally, Russia is a federal state. This means that the federation and its subjects have equal rights within matters of their authority. Federal subjects are endowed with greater autonomy with regard to solving problems of their socioeconomic development. One of the key attributes of a federal state is the economic self-sufficiency of its subjects [6]. However, the condition of economic self-sufficiency is currently not fully satisfied in Russia. This is because federal subjects significantly differ in their economic, natural-resource, and scientific-technological potential, as well in socioeconomic development level. Furthermore, their development pathways largely depend on specific geographical, climatic, natural, historical, and national features. To date, only a few federal subjects act as the financial donors [2]. At the same time, the welfare and often the very survival of other regions depend to a large extent on subsidies from the federal budget. Academician D.S. L'vov has rightly argued that one of the weakest points of federalism consists in its economic dimension and economic conditions. This argument is still relevant today[1].

[1] Presentation by D.S. L'vov at the First All-Russia Scientific and Practical Conference "Problems and Prospects of Development of Federalism in Russia" (Moscow, 1998).

Russia's unique territorial diversity requires the development of common principles that determine the design of innovative regional development policies in line with a common national innovative development strategy. It also necessitates the elaboration of specific programs and strategies that would take into account specific territorial features. State innovative regional development policy can be defined as a coherent system of goals and objectives formulated by federal, regional, and local authorities in order to regulate regionally oriented innovation activity and to define the related principles and mechanisms of implementation.

A comprehensive solution to problems of socioeconomic development should rely on the innovative development policy elaborated based on modern scientific and technological achievements. The latter condition is necessary even for regions with low scientific, technological, and innovation potential. The design and implementation of an innovative development policy for a particular region should take into account the specific features and competitive advantages of this region [4]. It is necessary to coordinate the implementation of federal and local innovation policies at the regional level and to support interregional cooperation. At the same time, any innovation activity in and of itself gravitates toward decentralized management.

The high economic profitability and social importance of innovative activity ensure balance and strategic coincidence of interests of federal, regional, and local authorities responsible for solving national and regional socioeconomic problems, as well as for driving the development of territories and improving the quality of life among the population.

An integrated approach to the design and implementation of innovative development policy, aside from the achievement of the strategic objective of improving the quality of life among the population, also makes it possible to solve the following:

- stimulating innovative processes in areas that currently lack the required innovation capacity or natural resources;
- mitigating environmental risks;
- improving regional payment balances thanks to higher profitability of both foreign and domestic (interregional) exports of knowledge-intensive (including scientific and technological) products and services;
- supporting the development of new industries in both traditional (construction, agriculture, transport, services[2], etc.) and hi-tech sectors to increase peoples incomes and boost local budget allotments;
- creating favorable conditions for innovative private, small, and medium businesses.

The regional innovation system consisting of local innovation systems represents the institutional framework for implementation of innovative development policy. The structure of the regional innovation system is largely similar to the national innovation system. Such similarity ensures their compatibility. The sole difference between national and regional systems is the relationship between their respective subsystems.

Many regions of Russia have already established some modern basic infrastructure for science, technology, and innovation in addition to the already existing scientific, education, and industrial innovation institutions. Thus, conditions have already been put in place to support the development of regional innovation systems that take into account both the existing innovation capacity and the historical, cultural, and national background of specific regions[3].

TERRITORIAL STRUCTURE OF THE NATIONAL INNOVATION SYSTEM

Russia's regions can be divided into three groups in terms of their importance for socioeconomic development priorities:

- territories oriented towards pursuing strategic tasks and supporting national security;
- territories oriented towards fulfilling research, scientific-technological, and industrial objectives;
- administrative entities pursuing the objectives of their own development and operation.

By level of innovation potential, territories can be classified as follows:

- territories, innovation potential of which supplies their unsubsidized development;
- territories, which require a resource support for the development of their scientific and industrial potential in order to shift to the unsubsidized development;
- territories with the high scientific and technological potential, which due to the specifics of their main activity cannot develop without subsidies from public budgets at different levels;
- territories lacking their own innovation potential.

In some cases, it is necessary to impart territories with a special status. For example, some regions host hazardous facilities that require increased attention to their reliable operation. Thus, the special status assigned to such territories can be dictated by considerations of national security. Territories with a special status can be established with the following purposes:

- to eliminate the effects of major natural and man-made disasters;
- to solve the problems of depressed areas;
- to support the vital activity of territories that due to their specific geographical location require the status of a free economic zone;
- to protect nature reserve areas;
- to support the national defense system;
- to create conditions for the development of new research, innovation, and industrial centers.

Depending on their size and specific activity, municipal units can be classified as follows:

- big cities and agglomerations, which act as administrative and financial centers with a high concentration of research organizations, higher education institutions, and hi-tech productions;
- science cities with city-forming scientific, industrial, and education complexes;
- individual territories with highly concentrated scientific, technological, and education potential and without the status of municipality, academic towns;
- technological parks with city-forming industrial enterprises turning out competitive hi-tech products;
- territories focused on agricultural production;
- specialized innovative development areas: special economic zones, scientific parks, the innovation city of Skolkovo, Russky Island, etc.;
- municipal units, which host important historical and cultural landmarks, and museums, which should be preserved for future generations as the important parts of the Russian and global heritage; cultural and recreational areas;

[2] For example, one new job in a knowledge-intensive industry being accompanied by five to six new jobs in the services industry.

[3] V.V. Ivanov. *Development of National Innovation Systems*: *Theory and Practice*. (Moscow: Abelia, 2004).

• territories with low scientific, technological, and education potential.

Only an insignificant share of small and medium-sized cities (approximately 100–150) can be categorized as territories with highly concentrated scientific and education potential. This includes science cities—closed administrative entities hosting large hi-tech enterprises; industrial cities with populations of up to 100000 people, academic towns, and other areas developed due to the creation of high technologies and products.

Quality of life is inextricably linked to the level of territorial development, because the living environment evolves within the territories. Such areas are hereinafter called *local territories*. The spatial structure of the national innovation system (NIS) can be represented as nodes—local innovation systems (LISs) of different types—connected by transport, information, resource, financial, and other types of communication forming the integrated communication environment.

CONCEPT OF INNOVATIVE DEVELOPMENT OF TERRITORIES

A territory of innovative development (TID)[4] is understood as a territory located within one or several municipal units and oriented towards the development of a friendly living environment and a better quality of life by creating and/or selling competitive hi-tech products and offering services in demand by business and private consumers. A TID can evolve within one or several municipal units.

The above objective can be achieved with maximum success subject to satisfaction of the following conditions:

• the territory has a sufficient initial scientific and production potential;

• the territory has a number of real competitive advantages;

• there are large market outlets of products of the economic complex of the territory;

• the territory has sufficient sources of funding.

TID attributes can be defined by the following considerations. Any territory serves as the living environment. The attractiveness of this environment is determined by the quality of life provided in the territory. Therefore, the development indicators should primarily refer to the quality of life as well as to the existing conditions for its improvement. In this case, the basic system of indicators includes the following:

• the aggregate indicator of the standard of living;

• the level of employment and income;

• the dynamics of the number of high-paying jobs;

• the dynamics of tax revenues of the territorial budget;

• the population size and its dynamics;

• the life expectancy and its dynamics.

Basic methodological provisions of the TID concept can be summarized as follows:

1. The development of the territory should rely on maximized use of existing competitive advantages and the creation of new ones.

2. The development strategy formulated for each territory is implemented in line with an individual scenario within the overall state policy and regulatory framework. If necessary, special legislative acts can be adopted to establish special conditions determining the existence of a given TID.

3. The TID is based on a set of scientific, production, and service clusters generating competitive products and services in demand on domestic and/or foreign markets.

4. The strategy and the development program of the TID are formulated in view of key technological trends, oriented toward the use of the opportunities offered by the technological wave of the future.

5. It is necessary to take into account market requirements and the real effective demand of population.

6. It is important to develop the local infrastructure, first of all, finance, transport, telecommunications, and social infrastructure, as well as housing and public utilities.

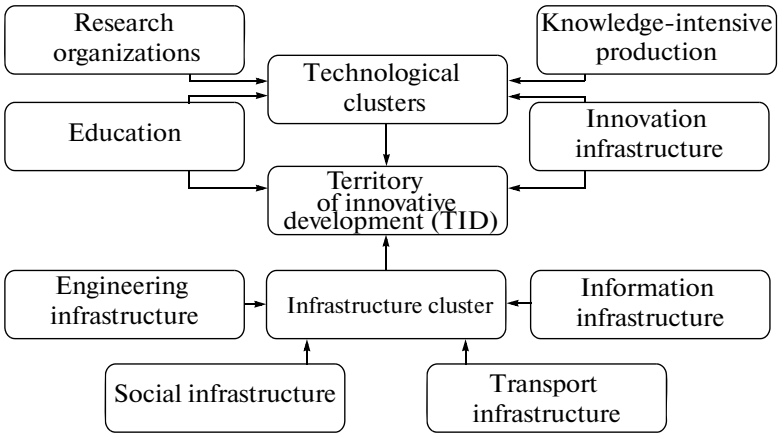
7. The economic mechanisms that determine the development of a TID should effectively combine state regulation and market mechanisms.

8. It is important to ensure the balance of interests between the country, the region hosting the TID, and the municipality itself.

The structural basis of an TID is formed by clusters [3]. Several sector clusters (scientific, technological, industrial, and service, etc.) focused on specific market segments can be created within a TID depending on its territorial economic structure (see figure). For example, the scientific and technological cluster can include research institutions involved in the creation of new technology, enterprises making hi-tech products, and infrastructure facilities designed to support innovation.

The innovation infrastructure cluster supports the development of innovation processes within a TID. The objective of this cluster is to identify and commercialize promising scientific results and technologies and to support small innovative enterprises. Specifically, this activity involves the selection, examination, registration, and support of innovative projects; advertising; dissemination of results; protection of intellectual property; search for investment; provision of production facilities, equipment, and means of communication; project expertise; marketing; consulting; promotion of innovative results on domestic and for-

[4] V.V. Ivanov. The spatial approach to the development of the national innovation system, *Innovations*, 2010, vol. 5; V.V. Ivanov and N.T. Koldaeva, Russian innovation system: territorial approach, *Innovations*, 2000, vols. 9–10.



Functional structure of TID.

eign markets; as well as the design and practical application of organizational and economic mechanisms of state support for the creation of independent small-sized technological companies engaged in the commercialization of scientific and technological results, technology project support, technological monitoring, etc.

It is important to put the scientific and education environment in place in order to ensure the adequate level of education and culture on a TID. For instance, the local scientific and education system can be created on the basis of a university. In this case, the teaching activity of the university is channelled to support staff training, and its scientific complex implements research and development for further market development.

Several possibilities to establish a university in a TID exist:

Developing a university from scratch. This strategy can be implemented within five to seven years and at a high cost. However, it makes it possible to thoroughly elaborate the mission and vision of the university, to build the necessary training and support buildings, perform licensing, enroll students, accomplish certification and accreditation procedures (three to four years after the start of teaching), and launch postgraduate and doctoral programs (as a prerequisite to obtaining the status of a university). Yet this scheme is very time-consuming and costly. It is unlikely that business circles will make important investments at least at the initial stage.

Use of a local university or one of its branches. In this case, the territory is exposed to a certain education structure with its specific values and traditions. Importantly, the interests of the university and the territory should objectively coincide. Otherwise, there is a chance of a serious conflict of interest due to the rejection of externally created teams. This strategy is suitable in the case of limited financial resources.

An integral part of the local scientific and education complex is a public school subsystem, which provides continuing education within a given TID and stimulates children to acquire knowledge more actively. Furthermore, in the territory it should be the children of foreign experts should also have access to education, which can significantly increase the attractiveness of the territory.

To increase the attractiveness and, hence, the competitiveness of a territory, it is necessary to establish an advanced vital infrastructure, including health facilities, retail and consumer services, sports facilities, and recreation centers. Such activities can be the basis of service clusters.

The development of innovative territories is a complex and lengthy process, which requires the implementation of state and local policies promoting innovative territorial development. The authorities participate in the development of a TID by providing both direct and indirect financial support and by promoting the infrastructural development of a given territory. It is necessary to differentiate powers and identify the areas of joint jurisdiction for the federal and regional authorities at an early stage.

State support to a TID involves a set of activities contributing to the development of a specific territory at the federal and regional level. Today, such state support can involve direct financing of investment projects by using budgets of different levels. It can also involve creating framework conditions for the effective operation of a TID. In this respect, relevant measures include the development and legislative support of the existing financial and institutional mechanisms stimulating the creation of clusters, as well as the design of measures aimed at improving the investment attractiveness of a TID. The choice of specific innovative mechanisms to support local development and the selection of relevant public support measures are primarily defined by specific features of the local economic system.

Key provisions of the state policy supporting a TID should reflect the following:

- the goal, objectives, and principles of the state policy;
- state support conditions, including mandatory requirements on innovative territorial development programs and their specific measures;
- basic sources and volumes of funding with indication of the approximate volumes of direct state support;
- key methods of indirect state support including tax benefits or reinvestment of tax revenue, preferential loans, and state guarantees for investors;
- other measures including infrastructure development, state orders for R&D, and the development and upgrading of industrial facilities.

One of the key problems of municipal development is financial limitations. Only a few settlements are able to develop without any subsidies. In this context, business has a greater role to play in the development of a particular territory. Furthermore, public–private partnerships have special importance for local development.

State regional development programs represent a common tool of direct public financial support. Typically, these programs are aimed at the transformation (not necessarily based on active innovation) of economically depressed regions. Furthermore, parts of such programs dedicated to promoting the development of specific innovative territories are important for political decision-making at the state level. Local authorities are involved in the financing of such programs to the extent possible depending on the state of the regional economy.

Various R&D funding public programs aimed at upgrading the technological state of local industry and boosting scientific and education potential are another important mechanism of direct public financial support for a TID.

Stimulation of investment inflow is one of the indirect financial support mechanisms. Banks and special funds are supported by the state (in some cases through partial state guarantee) to offer long-term loans at low interest rates to companies or individual entrepreneurs that launch or expand their activities in a TID. Local authorities also contribute to increasing concessional financial resources. However, such possibilities are severely limited in depressed regions for which the creation of a TID is especially urgent.

The effectiveness of local innovative development is subject to interaction between all levels of government, business, and society, which is particularly important at the stage of identifying competitive advantages of a territory, formulating innovative development priorities, and elaborating related strategies and implementation programs. For this purpose, independent expert consultants are often engaged for objective assessment of existing problems and to facilitate the search for mutually acceptable solutions.

LOCAL INNOVATION SYSTEMS: ORDER OF FORMATION

The objective of local innovative development is to ensure sustainable growth of the quality of life among the population in order to achieve the best national indices in the mid term and Human Development Index values achieved in developed countries, in the long term.

The development of a local information system (LIS) starts with forecasting and analysis focused on identifying competitive advantages, problem areas, and quantitative indicators that characterize the industrial and social state of the LIS. In this respect, one of the common methodological tools is SWOT analysis[5], which can be performed at two levels: the municipal level and the level of individual companies or organizations operating in a municipal unit.

The framework conditions that exist in the territory for business activities is assessed at the following levels: general policy, legal and regulatory framework, quality of life, support of development of economic activity, key elements of basic infrastructure (transport, telecommunications, utilities, and the environment), industrial and scientific infrastructure, and resource supply.

The results of forecasting form the basis for local innovative development strategies and related implementation programs. Next, orders for resulting products and services are formed, and the sources of resource supply are identified. In this context, special attention should be paid to the creation of new high-paying jobs.

Thus, an LIS focused on improving the quality of life and supporting the local innovation production chain from the request for innovative products to its implementation can be created in a given territory.

TERRITORIES WITH LOW SCIENTIFIC AND TECHNOLOGICAL POTENTIAL

The overwhelming majority of Russian municipalities have no immediate innovation potential and, therefore, remain excluded from innovation processes, particularly because neither the existing legislation nor the applied business practices embed any mechanisms that would encourage municipal authorities to use the available opportunities for innovative development. This situation leads to a higher socioeconomic differentiation of territories and complicates the problem of increasing the quality of life, etc.

[5] Ya.N. Dranev developed a comprehensive SWOT methodology to analyze municipalities under the EU TACIS project "Innovative Centers and Science Cities" implemented in the period of 1998–2001.

Table 1. SWOT analysis for a territory with low scientific and technological potential

Strengths	*Weaknesses*
Availability of free territories Absence of environmental problems Inexpensive workforce	Lack of financial resources Lack of qualified management staff Lack of qualified workforce
Opportunities	*Threats*
Solution of social problems thanks to the following: —development of low-tech sectors (construction) —development of advanced education system —commercial use of free land resources	Population's outflow to large cities End of settlement's existence

In turn, this leads to increasing population outflow to megacities, especially young people. The population decrease in the peripheral areas of Russia represents a real threat to the country's integrity.

Solving this problem most likely requires specific mechanisms for innovative development of local territories with low scientific, technological, and education potential. The emphasis on hi-tech development for such territories will unlikely result in positive outcomes. However, the lack of scientific and technological potential does not necessarily limit the innovative development of such territories. This quasi-paradox can be explained as follows. Innovation policy design is primarily viewed in domestic practice from the perspective of technological modernization. Yet such technological upgrading is only possible if necessary conditions are in place in a given territory. If this is not the case, it is first necessary to take measures to create such conditions. For this purpose, the state of the local territory should be assessed by using SWOT analysis (Table 1). The achieved results, combined with the outcomes of socially focused scientific and technological forecasting, will provide a basis for the formation of priorities and innovation-based development programs.

As in other cases, we proceed from the fact that the basic function of a local territory is to provide a comfortable living environment and to improve quality of life. Note that quality of life depends directly on the personal wellbeing of the population, which currently pays directly or indirectly for the biggest part of education, culture, health, and housing, etc. Therefore, the key objective is to create new high-paying jobs, which, on the one hand, requires the deployment of new manufacturing and/or services, and an appropriate level of competence among employees, on the other. When it comes to TIDs with initially low scientific and technological potential, it is necessary at the initial stage to focus on tapping into the opportunities offered by the low and medium technology sectors, such as residential housing and road construction. This makes it possible to solve social problems, develop modern transport communications, and most importantly, create sustainable jobs. In the long term, this strategy will help increase the investment and social attractiveness of a territory and thus prepare it for full-fledged innovative development.

Furthermore, it is clear that a territory cannot follow an innovative development pathway by relying on its internal resources alone. Therefore, it is necessary to provide access to foreign markets based on a territory's competitive advantages, which can help attract additional, primarily investment, resources.

The economic basis of a TID with low research potential is municipal property, local finance, and state-owned property administered by local authorities, as well as other property that serves the needs of the local population and resources allocated for specific projects.

In line with the TID concept, the structure of a TID with low scientific and technological potential can be represented as two sectors:

The industrial sector supports production and services. (One of the two structural elements may be undeveloped or absent). This sector generates new high-paying jobs. The efficiency of the industrial sector determines the development rate of a territory;

The infrastructure sector supports vital activity in the territory and comprises the entities and services responsible for the health care system, primary and secondary education, housing and public utilities, local transport, and other services.

The industrial sector generates the production output for domestic and external (in relation to the territory) markets and provides services to the population, such as residential housing, which requires the involvement of a broad range of specialists with varying qualifications in different fields. At the initial stage, job creation helps solve the problem of population outflow. However, this measure has only a temporary effect unless other problems are properly addressed, particularly those related to the development of a local education system focused on satisfying local needs.

One possible solution to this problem is the creation of a regional training system aimed both at raising

the overall education level of the population and training of specialists that can effectively solve territorial development problems. Currently, this approach is being tested with technologically advanced territories [5]. Other approaches should be developed for TIDs with low scientific and technological potential.

The core of this education system can be provided by universities of distributed type focused on regional development. Such universities consist of faculties and departments (central part) and territorial structures (branches), which act as separate structural subdivisions of different levels (institutions, colleges, and basic chairs) located in different municipal units of a given federal subject. The mandatory set of study disciplines include medicine, pedagogy, construction, transport, services, state and municipal management, finances and banking, and jurisprudence. Other disciplines can be introduced based on the specific needs of a region.

The establishment of territorial university structures is the first practical step in shifting to an innovative development pathway of a territory given that the presence of an advanced cultural and education center in the local territory can help attract investment to capital construction, purchase of equipment, and job creation, as well as raise the attractiveness of the territory in a whole.

The competitiveness of universities is propelled by a wide range of disciplines, flexible forms of study, guaranteed employment opportunities after graduation, and the possibilities of advanced training and reeducation. In parallel, students can significantly reduce their transportation costs and living expenses during the period of study.

In elaborating measures to support the innovative development of territories with low scientific and technological potential, special attention should be paid to the creation of transport infrastructure and its links to the regional and federal transportation networks. This is crucial, since many such territories are remote areas deprived of modern transport infrastructure, which is a prerequisite for development.

The decisive role in improving standards of living of the population plays the system of life support of a municipal unit, particularly responsible for maintaining and improving the state of social services and housing and public utilities. The development of social infrastructure (kindergartens, schools, hospitals, etc.) requires the engagement of private companies, which makes the territory more attractive to business.

Let us dwell on the issue of financial support to innovation processes in a TID with low scientific and technological potential. The vast majority of municipal units lack their own funds to be allocated for innovative development. The federal government and a federal subject can provide only some limited assistance. In this context, another source of financial support can be provided by private–municipal local innovative development funds fed by deductions from the business activity of commercial organizations. These funds should be used for the creation of new jobs and high-profit commercial entities. Matters related to the establishment of such funds require a special study and should be properly reflected in the regulatory framework. In turn, the budget of a TID with low scientific and technological potential should be used to support continuous operation of the vital infrastructure.

Land is an important resource administered by municipal governments. Therefore, land must be considered a factor in the development of entrepreneurship. Mechanisms stimulating innovative entrepreneurship and ensuring a balance of interests between municipalities, business, and society should be developed along with private–municipal enterprises. In this context, land serves as a municipality's contribution to business development.

IMPLEMENTATION OF THE INNOVATIVE TERRITORIAL DEVELOPMENT CONCEPT: A CASE STUDY

Tomsk oblast is the first region that has implemented the TID concept. The local program of innovative development was elaborated at the initiative of the regional administration jointly with the Russian Academy of Sciences and with the support of the Russian Government in the period of 1998–2008. The main objective of the regional innovation strategy was to ensure the sustainable economic development of Tomsk oblast on the basis of its scientific and technological potential. The key results of the program are as follows:

- a single regional regulatory framework was established in order to regulate local scientific and technological, education, investment, and innovation activity;
- the technical and material base of scientific and education organizations is used more efficiently, and centers for collective use of unique valuable equipment were created;
- a dedicated program was elaborated to support the development of the Closed Administrative Unit Seversk as a science city;
- mechanisms of innovative development were tested, which resulted in more than a fourfold increase in funding for scientific and education activity and a threefold increase in hi-tech production output;
- new mechanisms were tested to support the integration of science and education and collaboration between higher education institutions and scientific research organizations, on the one hand, and public authorities and economic agents, on the other; mechanisms were tested that focused on the establishment of the regional and interdepartmental infrastructure, contributing to the achievement of education, scien-

Table 2. Aggregated SWOT-analysis for a megacity

Strengths	*Weaknesses*
Administrative resource	Absence of legislation supporting development of megacities
Highly concentrated research and education potential	Lack of own energy and food resources
Relatively high standards of living among population	Limited territory
High level of education among population	High population density
Presence of large financial institutions	High concentration of hazardous technological facilities
Presence of global heritage objects	High environmental load
Investment attractiveness	Underdeveloped transport network
Advanced trade and services system	Lack of intrinsic labor resources
Social welfare support	Population stratification by income and social welfare
Availability of high-paying jobs	High cost of land, residential, and commercial housing
Advanced IT penetration	
Threats	*Possible implications in case of inaction*
Environmental degradation	Decline in economic growth
Rise in criminality	Declining primary indicators of safety and security
Transport problems	Decline in quality of life due to environmental degradation
Rising probability of technological accidents	Growing number of social and national conflicts
Uncontrolled population increase due to immigration	

Source: [1].

tific and technological, and innovation objectives, which are common to various regions.

The development of the regional innovation system was completed by 2008. New approaches to solving problems of local innovative development were validated during the implementation of the program. These methods were later applied in other federal subjects.

MEGACITIES AS ELEMENTS OF THE SPATIAL STRUCTURE OF THE NATIONAL INNOVATION SYSTEM

The urbanization and formation of megacities and urban agglomerations (settlements with a population size of more than 10 mln people) is a global trend. In the context of globalization, megacities play an important role as key financial and economic structures, and scientific, education, and cultural centers[6]. Knowledge potential is the major development resource and a competitive advantage of megacities (Table 2). In parallel, industrial production in metropolitan areas has been steadily declining, which determines their rapid transition to a postindustrial economy. Essentially, modern megacities form the spatial structure of the postindustrial economy. The related development mechanisms should be investigated.

[6] Note the trend toward relocating scientific and education centers outside megacities.

The increasing population density in megacities requires new approaches to life safety and, hence, to new technologies as one of the factors of sustainable development.

The concept of a global city has become quite common. The city acts as a force driving national and regional socioeconomic growth. It represents an important element of the global economic system and has a significant impact on large regions of the planet. Nearly one-third of Russia's population lives in the 13 largest cities with populations of more than 1 mln people. At present, plans to develop agglomerations based on the association of large regional centers and their satellites are being discussed. For example, it is expected to consolidate Vladivostok, Nahodka, and Ussuriisk in the Far East. Irkutsk, Angarsk, and Shelekhov will become part of one megacity in Siberia. Furthermore, it is foreseen to create the Greater Sochi resort agglomeration in the Southern Federal District. Another project in this district is the Greater Rostov urban agglomeration comprising Rostov-on-Don, Novocherkassk, Taganrog, Aksai, Bataisk, and Azov. In the Urals, Tyumen will become a million-plus city by 2020. Thus, about 20 cities and agglomerations accounting for up to 40% of the country's population will emerge in Russia by 2020.

According to Article 65 of the Constitution of the Russian Federation, the cities of Moscow and St. Petersburg are federal subjects. Other big cities are capitals of federal subjects and act as administrative

and political centers of federal districts[7]. Moscow and St. Petersburg account for 20 and 4% of the country's total GRP, respectively. Russia's research and education potential is concentrated in megacities. The biggest research centers of the Russian Academy of Sciences are based in Moscow, St. Petersburg, Yekaterinburg, Novosibirsk, and Vladivostok. Furthermore, the majority of top Russian universities and state scientific centers are located in these big cities. The development of Moscow and St. Petersburg follows the postindustrial economy path given their highly concentrated scientific and education potential and the availability of knowledge-based industries in these cities, as well as a high share of services in their GRP structure (84 and 63%, respectively).

The development of megacities is of particular importance for Russia. Their success is one of the key factors in the transition to an innovation economy, which has a direct impact on improved competitiveness of the Russian economy. The development vector of a megacity is defined by its specific features, which include not only a highly concentrated population and a relatively high quality of life, but also limited territory, lack of intrinsic natural resources, and high environmental load.

Megacities are territorial structures that serve as a prototype for the postindustrial economy. The development trends of such cities form new working conditions for city authorities. The latter are supposed to pursue increasingly complex socially oriented innovation policies in order to ensure the development of a city as a postindustrial economic center. Modern innovation policy for a megacity should combine innovation support and the preservation of its social fabric by means of effective interaction between society, business, and federal, regional, and municipal authorities.

TERRITORIES WITH HIGHLY CONCENTRATED SCIENTIFIC, TECHNOLOGICAL, AND EDUCATION POTENTIAL

In accordance with the structure and directions of research and development and types of products manufactured, territories with highly concentrated scientific and technological potential can be divided into monoprofile areas, where scientific and/or industrial enterprises are engaged in R&D and/or production in one field only, and comprehensive areas. The practice whereby research and production facilities were created in small cities in order to perform advanced research solve major scientific and technological problems and organize the manufacture of hi-tech products, was already tested in the Soviet Union.

In the post-Soviet period, the first attempts to support the innovative development of territories with highly concentrated scientific and technological potential were made with regard to science cities—municipal units, the city-forming system of which included scientific organizations[8]. It was particularly necessary to address the problems facing these territories because of a sharp decline in funding allocated for R&D, including military research, in the early 1990s. Thus, the research organizations and territories concerned lost their main source of financing, primarily, public funding. The science cities were on the brink of survival.

The developmental ideology of science cities is based on the use of their scientific, technological, and education potential as a competitive advantage, ensuring the development of the municipal unit and improving the living standard of the population. The state policy, legal, and regulatory framework for the development of science cities[9] was elaborated in the period of 1996–2001. The target program method was selected as the main mechanism to implement this policy[10].

The Presidential Decree of November 7, 1997, "On measures to Develop Science Cities as Cities of Science and High Technology" codified the term "science city" and defined the measures of state support to ensure the development of innovative processes in them. This was virtually the first state document to declare the policy of an economic shift to the innovative development path and provided the basis for the Russian innovation system. The federal law on the science city status and the Russian Government's implementation decree [11] legally regulated science city status, defined the criteria and procedures of acquiring this status, and established the procedures for state support of such territories, etc. The involvement of authorities at various levels in implementing the development program of a science city was regulated by an agreement between the Russian Federation Government, the government of a federal subject, and municipal authorities. Thus, the mechanism enabling interaction between authorities at various levels was implemented for the first time in Russia in line with federal state principles.

[7] Note that megacities do not necessarily serve as national political centers. For example, in some countries, capitals are relocated to small cities with a special status (e.g., Washington, DC, in the United States and Astana in Kazakhstan).

[8] V.V. Ivanov and V.I. Matriko, *Science Cities in Russia: Methodology and Practice*. (Moscow: Skanrus, 2001).

[9] Federal Law No 70-FZ of April 07, 1999, "On Science City Status in the Russian Federation."

[10] V.V. Ivanov, National Innovation Systems: Theory and Practice of Formation.

[11] Decree of the Government of the Russian Federation No. 1072 of September 22, 1999, "On the Adoption of Criteria Endowing Municipalities with Science City Status and Procedures of Reviewing Proposals to Assign Science City Status to Municipalities and Termination of Such Status."

Obninsk in Kaluga oblast became Russia's first science city[12]. At present, 14 other cities have science city status: Korolev, Dubna, Reutov, Fryazino, Pushchino, Troitsk, Zhukovskii, Chernogolovka (Moscow oblast), Kol'tsovo (Novosibirsk oblast), Michurinsk (Tambov oblast), Peterhof (St. Petersburg), Biisk (Altai krai), and Dimitrovgrad (Ul'yanovsk oblast).

The state policy for science cities implemented in the period of 1997–2001 allowed Russia to overcome negative development trends and accelerate its pace of innovation. However, in 2004, several amendments made to the then legislation on science cities significantly distorted its original content. The state has virtually withdrawn from further development of science cities, despite the fact that the enterprises based in science cities primarily focus on solving major problems facing the country, including national defense.

Special economic zones represent another type of innovative development territory. Procedures determining their development are regulated by dedicated federal legislation[13]. According to this federal law, "a special economic zone is defined by the Russian Federation Government as a part of the Russian Federation's territory endowed with a special regime of entrepreneurship." In other words, special conditions for economic activity are put in place for a confined territory. Typically, such benefits involve tax and customs regulations.

The development of special economic zones primarily targets manufacturing and hi-tech industries, as well as the manufacturing of new kinds of products and transport infrastructure. Four types of special economic zones were legally defined: technology development, industrial manufacturing, port, and tourism and recreation zones.

CONCLUSIONS

The development of a new kind of innovation-based economy requires the establishment of new institutional structures, primarily in the form of a national innovation system. The main subsystems of the national innovation system include legislation on the implementation mechanisms of innovation policy and economic development priorities, the subsystem of knowledge generation and dissemination, professional education, hi-tech manufacturing, and innovation infrastructure. The scientific and technological base of the national innovation system is provided by organizations conducting basic and applied research and development, and corporations involved in mass production of hi-tech products, as well as small hi-tech enterprises, whose existence primarily depends on large corporations.

The spatial structure of the national innovation system is formed by connecting single TIDs into communication networks. At the same time, a local innovation system should be developed individually for each of these territories.

The main methodological problem facing the national innovation system is following the industrial development path, whereas other countries are switching to the postindustrial trajectory of development, particularly oriented toward human development. Therefore, various approaches to the development of the national innovation system should prioritize human development. Given the fact that quality of life is shaped at the level of local territories, territorial development should be of equal priority as compared to the development of the innovative research and production complex.

[12] Decree of the President of the Russian Federation No. 821 as of May 06, 2001.

[13] Federal Law of the Russian Federation No. 116-FZ of July 22, 2005, "On Special Economic Zones."

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