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THE ASSESSMENT OF RESEARCH AND TECHNICAL POTENTIAL IN THE FRAMEWORK OF INNOVATIVE MODEL OF DEVELOPMENT OF REGIONAL ECONOMY

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This article considers the research and technological potential and the innovative activity in a specific region of Russia — the Kaliningrad region. The authors assess its research and technological potential, and the achieved level of innovative activity in the Kaliningrad region as prerequisites necessary for the implementation of an innovative model of economy. This work identifies the problems of the research and technological potential development of the region, as well as a low level of development of the innovative activity in the Kaliningrad region in general and compared to the Baltic Sea region states. The authors also focus on the prerequisites for the development of research and technological cooperation between the Kaliningrad region and the Baltic Sea region countries. Special attention is paid to the opportunities for the creation of innovative clusters in the Baltic region states.

Key words: research and technological potential, innovation activity, regional economy, innovative infrastructure, human capital

The current situation in the global economic development is characterized by a tendency towards scientific and technological potential building, and innovative activity growth in many countries, which is the major factor in the national economy competitiveness and functions as a new model of economic development. It involves formation of a radically new image of a region as a territory for innovations.

Transition to the innovative way of development is possible only on conditions that the existing problems of innovative and business activity are solved. It presupposes an increase in demand for innovations from the business entities that belong to the main economic spheres; a growth of both efficiency and performance in the fundamental and applied science. It also requires the creation

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and development of regional innovative infrastructure. In its turn, this new regional economic model, based on innovations, is impossible without powerful and dynamic research and technological potential. Thus, it is important to carry out a study and assessment of the research and technological potential that will contribute both to a further innovative activity growth, and research and technological development in the regions of the Russian Federation as well as in the countries of the Baltic Sea region. The issue is becoming even more important for the Kaliningrad region with regard to its enclave location in Europe, as well as its restraints in resources, geo-location and institutional jurisdiction.

A general evaluation of the research and technological potential of the Kaliningrad region [3; 5; 12] has been carried out there for several years. M. Nikitin and others researchers [5, p. 8; 8] came to a convincing conclusion on the research and technological development in the region, which can be summarized in the following way:

1. The Kaliningrad region has a relatively high level of human resources in the research spheres of marine industry, instrument-making, food industry and information technology.

2. Innovative efficiency of the research and technological potential is lower in the region in comparison to the technologically leading countries, though it corresponds to the average level in Russia.

3. The main reasons of low efficiency in the research, technological and innovative spheres are the following: sparse funding of the scientific research and a dumping state policy in relation to this important sector; a lack of demand for new research insights and their development from the business entities; deficiency in innovative infrastructure that supports small-scale ground-breaking research enterprises (research and technology parks, innovative centres, etc.)

Since it is necessary to introduce amendments and corrections to the regional innovative policy with a view to raising its effectiveness, it is important to study the situation in the research, technological and innovative activity in the Kaliningrad region and to assess it in comparison with the Baltic Sea region countries.

For the last two decades in Russian and foreign science there have appeared a remarkable number of assessment methods and comparative analyses of the innovative potential of a territory (a region, or a country in general). Among the most outstanding approaches to assessment of the innovative, and research and technological potential are provided by the following institutions: World Bank (IBRD), the US National Science Foundation, World Economic Forum (WEF), Organization for Economic Cooperation and Development (OECD), Maastricht Economic Research Institute on Innovation and Technology (MERIT), Commission of the European Communities, (CEC), Institute of Economics of the Russian Academy of Sciences, Russian Independent Institute for Social Policy, Centre for Strategic Research "North-West", Expert RA Rating Agency. Also, there are methods elaborated by S. V. Kortov, T. A. Shtertzer, E. P. Amosenok, N. Y. Bazhanova, A. E. Varshavskiy, A. B. Gusev, V. K. Zausaev, S. P. Bystritskiy and N. Y. Krivoruchko, V. G. Matveikin and C. I. Dvoretskiy, O. S. Moskvina, E. V. Akinfeeva [2].

Having applied methodological approaches to the analysis of the research, technological and innovation potential, we carried out a comprehensive assessment of the performance of research institutions in the Kaliningrad region, human resources, science and innovation financing, innovation activity rate and advanced manufacturing technology.

In the Kaliningrad region within the period 2002—2019 the number of research organizations decreased twice [7, p.6] as a result of numerous close-ups: in 2010 there were only two planning and surveying-and-engineering organizations left compared to five in 2002; in 2010 there were five research and technological institutions left compared to six in 2002 [6, p. 7]. Also, there is a negative tendency as the main facilities and funds are worn out and dilapidated since investments into the capital fell. In 2010 depreciation constituted 65.9% in science research, 44.7% in computation and IT, 62.2% in software development and consulting, 44.2% in database and information resources design [7, p.5—6].

In the Kaliningrad region the research and technical personnel is represented by researchers in the field of technology, natural and geosciences (70—80%), agricultural sciences (7—8%), and chemistry, biology, social studies and the humanities are the rest (2—3%) [6; 7]. Generally, this distribution of the researchers in the region corresponds to the regional industry structure, where the main industries are manufacturing and transportation. Agribusiness industry is not very much developed and it reflects the economic situation in the region, though it does not correspond to its potential as about 47% of the lands intended for agriculture were withdrawn. The number of the researchers in the sphere of geosciences fell from 232 in 2008 to 27 in 2010, which can be explained by the fact that the qualified personnel left for other related fields because of the market conditions in the sphere of research.

Taking into consideration the categories of the personnel working in the research and science development sphere in the Kaliningrad region, they are not typical either of the regions of Russia or of the Baltic Sea countries. More than a half of them constitute supporting personnel. Although, the number of researchers and professional staff who develop new products, methods or systems decreases annually. Such inadequate proportion shows how unbalanced the structure is, which hinders the research and technological development in the region. Moreover, the age of the researchers indirectly threatens the competitive advantages in the innovation sector of the regional economy and functions as an institutional barrier on the way to a new regional economic model based on innovations (the statistics show that in 2010 there were 68.6% of researchers whose age was over 40; the average age of a researcher in the region is 47; the average age of a PhD researcher is 53; the average age of a Doctor of sciences is 57) [7, c. 9].

A study on the main trend of costs on research and development in research and design-and-engineering organizations of the region showed their gradual growth (from 199.9 m. rub. in 2000 to 1,125 m. rub. in 2010 [7]), which proves positive dynamics as it demonstrates added value growth in this sphere. On the other hand, in 2010 about 75.9% of combined internal costs on scientific research and development were covered by the budget funds of all levels (950,811.3 rub.). The business sector funds were next in

the list (102,313 rub.), although they lagged behind a lot the budget funding and constituted 10.76% of its total volume [7]. The analysis indicates that the state support of the research sphere provides a basis for the financing of the research sector in the regional economy. The business sector supports highly profitable capital investment in the short-term period because businesses are ready to support only those projects which are fully ready for commercial implementation and usage. This can be proved by the distribution of funds for research activities grouped by the types of work: development activities/projects (1st place), applied research (2nd place) and fundamental studies (3rd place). We can trace this tendency since 2000 when the market agents (the state, businesses, and corresponding funds of the research organizations) got money to finance scientific research which reached its maximum in 2007 — it was the most successful period in terms of macroeconomics in the pre-crisis time. In 2010 there was a growth of the absolute index of financing both development activities and applied research, whereas the absolute index of fundamental studies financing fell (to 21.9%). Generally speaking, this common tendency in developed countries, though quite new for Russia, can be explained by a decreasing interest from clients (usually from the businesses in fundamental research) because they do not see any practical application of the results in the short-term period. The negative factor in the innovative model of the regional economy development is a decrease in the number of organizations involved in innovation activity; over five years (2006—2010) their number fell three times, from 36 to 11 [9—11]. This fact also reflects a decrease in the innovative activity in the region. This tendency is the result of a low interest in research and technological projects and innovations, which are produced by the organizations in the Kaliningrad region. There was a sudden drop of the total volume in innovative goods and services: the volume of innovative goods and services produced in 2010 was 82 times less than in 2006 [6, p. 25].

It should be pointed that with the decrease in the technological innovation production, the corresponding costs decreased sharply: in 2006 allocations for technological innovations reached 2417.6 mln roubles, in 2010 they equalled 164 mln roubles (15 times less). First, reduction of the total costs occurred because of the closing up of research and development of new goods, services and methods of their production. Costs on new software and programming reduced 33 times. Over the past five years we have seen high volatility of costs of business projecting, design, and research in new goods and services. During 2006—20019 there were relatively fixed costs on purchasing machinery and equipment, which reached its minimum in 2010 (160.6 mln rub.). In 2010 the basic costs on technological innovations were connected to the businesses which produced food (including drinks), cellulose, wood, paper, carton and their sub-products, and also ready-made metal goods. In 2010 99% of costs constituted the costs on food production and innovation. The businesses working out technological innovations had two major financial sources in 2010: their own means (regional businesses) and loans (businesses in Kaliningrad). As for a production cycle, a big part of businesses (74%) were working out technological innovations with the average production cycle which meant the span from 2 to10 years. Other 13% of the organizations had the innovations with a one-year production cycle.

Thus, about 90 % of the regional business entities produced innovative goods and services if they had short-term benefit. Besides, in 2010 50 % of all the organizations, which had completed technological innovations for the last three years, applied the innovations provided by other organizations, and other 25 % implemented them in cooperation with others [6; 7].

A steady decrease in the number of research organizations shows reduced demand for innovations in the market. It is reflected in the number of advanced technologies created — five in 2006 and only one in 2010. Moreover the number of applied technologies diminished drastically — less than 0.1 %. This situation indicates only one thing: the economy of the Kaliningrad region being the reflection of the Russian economy does not generate its own innovations but only gets access to them through the innovation diffusion mechanism [3, p.136].

Unlike other regions in Russia where we can see a growth in the sphere of advanced technologies, there is a different situation in the Kaliningrad market: demand for research and technological achievements of specialized organizations is falling. In 2006—2010 there was a decrease in the number of advanced productive technologies. It hit its top in the pre-crisis 2007. If we speak about the structure, then over the last five years a lot has been done in the spheres of "production, processing, assembling" (36 %) and "projecting and engineering (36 %). The lowest demand for experienced technologies is recorded in the spheres of "manufacturing information systems" (4.5 %) and "communications and control" (4.5 %) [6, p. 26].

The structure of advanced manufacturing technologies which has been applied did not change over the period of 2006—2010. The main part (over 40 %) constituted the projecting and engineering technologies. A significant part is constituted by production, processing and assembling technologies as well as communications and control technologies. The least popular technologies among the businesses were the ones connected with the integrated monitoring and control. Besides, in 2010 in the Kaliningrad region we could observe unbalanced export-import relations in the technology-exchange sphere. The number of export agreements exceeded twice the number of import agreements; the cost of the former was 5 time higher than the cost of the latter. Moreover, it should be pointed out the main export innovative production was the industrial models (89 % of total cost of the export agreements). Whereas the import agreements concerned engineering services (95.6 %). This structure speaks about insufficient development in the sector of engineering services in the region. The imbalance on the export-import scale did not allow providing enough inflow of the innovations to the regional market [6, p.28]. If we consider the exchange of the technologies from the point of view of the purpose object sphere in the agreement, we could see that technologies in the processing sphere were exported, and the imported technologies related to medicine, measure, monitoring, control and testing, photo and cinema equipment, clocks and watches.

The development stage of the information and communications technologies in the region plays an important role in the transition process towards the innovative model of economy. Being equipped with the information and communications technologies makes it quite possible to solve business tasks and allows businesses to use the information area more effec-

tively. More than 92% of the monitored enterprises and organizations of different form of ownership in the Kaliningrad region made use of information and communication technologies in 2010. Among them 91.8% of the businesses were equipped with personal computers, 62.8% — local data-processing networks, 36.4% — dedicated channels. In its turn it provided access to information and communications technologies in the region. In 2010 97.7% of the personnel had access to the Internet, 41.3% — to other global nets, 97.4% used electronic mail, 70.6% — used dedicated channels. [6; 7].

Statistical analysis of the current situation and development in the innovation sphere as well as in the sphere of research, technology and innovation shows that in the Kaliningrad region there is still functioning the research and technological infrastructure, set up mostly in the Soviet period. It includes some elements of a state-of-the-art innovative infrastructure, but a single system of the innovative pattern for the development of the regional economy has not been formed yet. This results in a low level of the research and technological development in the Kaliningrad region in comparison to the Baltic Sea region countries (for example, compared to Denmark and Sweden). As a result, it was found out, that in the Kaliningrad region human resources, and material and technical facilities dominate in the research and technological potential, whereas a research component and its growth potential is not realized to a full extent[1].

Taking into account the above-mentioned findings (i.e., a low degree of research-and-technological and innovation development in the Kaliningrad region; its position in terms of human resources, and material and technical facilities in the innovative sphere; significant socio-economic potential of the region), we conclude that one of the perspective ways of development of the Kaliningrad region is promotion of its cooperation in research and technology with the neighbouring countries in the Baltic Sea regions. Mutual cooperation of the countries is conditioned by the possibilities to accumulate knowledge, to produce innovative goods applying the available potential and its further dissemination to European and Russian markets. Fast economic growth and economy diversification by means of competitiveness growth of businesses, suppliers of equipment, research and educational organizations is possible thanks to the development of such innovative forms of business activity as geographical, industrial and innovative clusters in the Baltic Sea region. Besides it is considered to be perspective to establish common innovative clusters in the Baltic Sea region, which would unite different components of the innovative potential of all the participants, especially if we take into account the difference in the development of research and technological

[1] In the method of comparative assessment of research and technological potential at the regional level, the *human resources component* means the number of researchers involved in technologically advanced production; the *material and technical component* measures the degree of material and technical equipment in the innovative sphere; the *research and technological component* shows the degree of efficiency in production and application of the research insights and innovations; *transforming capacity of research and technological potential* characterizes an increase in capacity system (technical, technological, informational, qualifying, intellectual, monitoring and controlling, etc.)

potential of the regions. It will contribute to the synergy effect and realization of the strategic model of economic growth based on intellectual resources, advanced technologies and its further integration into research and manufacturing spheres in the frames of the emerging global innovative economy.

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