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TÍTULO: Uso de los resultados de la evaluación de la actividad innovadora de las regiones para el desarrollo de políticas de clusters nacionales.

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RESUMEN: El objetivo principal del trabajo es aclarar y ampliar enfoques metodológicos para evaluar y registrar la actividad innovadora de la región para el desarrollo de la política nacional de clústeres. Se utilizaron métodos de investigación teóricos y empíricos, la revisión de la literatura y un análisis de enfoques metodológicos existentes para la evaluación de la actividad innovadora de las regiones. Sugerimos el sistema de indicadores agrupados por entrada, parámetros intermedios y de salida, según el cual se compiló la clasificación de las regiones rusas en referencia al desarrollo de actividades innovadoras. La importancia de los resultados obtenidos está en determinar la orientación

innovadora del desarrollo de la región, de sistemas y de medidas estratégicas para la revitalización de actividades de innovación en regiones menos desarrolladas.

PALABRAS CLAVES: actividad de innovación, enfoque metódico, índice compuesto, análisis de conglomerados, política de conglomerados.

TITLE: Usage of regions' innovative activity assessment results for the National Cluster Policy development

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ABSTRACT: The main objective of the work is to clarify and expand methodological approaches to evaluate and register the innovative activity of the region for the development of the national cluster policy. Theoretical and empirical research methods were used, the literature review and an analysis of existing methodological approaches for the evaluation of the innovative activity of the regions. We suggest the system of indicators grouped by input, intermediate and output parameters, according to which the classification of the Russian regions was compiled in reference to the development of innovative activities. The importance of the results obtained is to determine the innovative orientation of the development of the region, of systems and of strategic measures for the revitalization of innovation activities in less developed regions.

KEY WORDS: innovation activity, methodical approach, composite index, cluster analysis, cluster policy.

INTRODUCTION.

Today a technological structure dictates compliance requirement, along with socio-economic stability and boost economic growth in innovation that can serve as a more rapid exit from the current crisis in the country.

In the modern trend of global production development, increasing attention is paid to the concept of compatible and continuous development of the economy in territories, the environment and society, which is impossible to achieve without the introduction of innovations.

The era of globalization generates not only dependence one country from another, but it also causes the need for intensive use of scientific and technical progress elements (Oreshina, Povorina & Vinogradova, 2017; Kvon et al., 2017; Wang et al., 2018). This problem is multifaceted, and by the end of the twentieth century, its solution was formed after long-term attempts at scientific approaches and studies, in the sustainable development concept form. In this regard, the obvious need in conducting research is expressed to promote innovative products in various industries, in the direction of building a "green economy", respecting the principle of maximizing economic growth without affecting the quantity and quality of natural assets and using the resources of the base and accumulated potential, which served as the main task. This issue increases the innovation activity of the region due to the need for translation production processes of the regions to a new stage, which would increase profitability and would provide society with quality and goods and services in required amount (Davoudi et al., 2018; Fartash et al., 2018; Tastan et al., 2018; Mendoza & Mendoza, 2018).

However, despite so much attention to the problem of national cluster policy formation in works of domestic and foreign scientists, (Yang, Hao & Cai, 2015; Falck, Heblich & Kipar, 2010; Drozd, 2010; Naizabekov & Bozhko, 2018), points of cluster policy control, which takes into account the result of comprehensive evaluation of the regions' innovation activity is under-researched.

DEVELOPMENT.

Methodological framework.

According to the methodology of experts of the World Economic Forum, the possibility of achieving sustainable economic growth in the medium- and long-term perspective equally depends on three categories of variables: the macroeconomic environment, state institutions and technologies.

In the world of scientific practice, there are enough approaches to the study of regions' innovation activity level. Therefore, a developed classification of indicators for the introduction of innovations by the Commission of the European Community it seems interesting. It is based on a system of indicators that are suggested.

The methodology for estimating innovation activity in comparison with competitiveness indicators deserves attention, since it is only possible for organizations to survive in the current dynamic conditions if they are adapted and continuously adapted to changes in the environment. This can be achieved with the help of innovation policy in terms of improving the competitiveness of the market entity.

In order to evaluate innovative activity in regions, the authors used a system of indicators presented in **Table 1**.

Table 1. Indicators of innovative activity of the regions.

Groups	Indicators
Input indicators (I. I.)	
Development indicators	The proportion of the employed population 25-64 years old, with higher education in the number of employment of this age group. The level of development of broadband telecommunications (the number of broad lines for 100 people). The share of innovation- active organizations in the total share of economic entities, %.
Promotion of innovation	Government spending on research and development, % of GDP. Domestic research and development costs, mln, rub. The share of university spending on research and development, finance driven by the private sector. The volume of attracted investments from the federal budget and budgets of federal development institutions to the innovation sector of the regional economy (infrastructure projects and regional investment projects) per 1 million rubles.
	Intermediate Indicators (I.A**.)**
Entrepreneurship	Domestic costs of research, mln. rub. Share of expenses for marketing, technological innovations in GRP, %. The proportion of innovations in the total volume of goods and services produced.
	Output indicators (O.I.)
Application	Exports of high-tech products to the share in total exports, %. Used advanced technology, units.
Intellectual property	Developed advanced technology, units. Filing of patent applications and issuance of security documents, units.

To obtain a general assessment, a composite index is determined based on the determination of the arithmetic average of the proposed subgroup of indicators. The aggregated estimate is obtained with the ratio of each applicant to the reference value for each index and for indicators. At the first stage, it is advisable to obtain initial information on all selected regional systems. In this initial information is compiled in a matrix in rows wherein the rows fit numeric values of selected indicators (i = 1, 2 ...., n), and the columns - compared territorial unit (j = 1, 2 .... , m).

Moreover, similar criteria correlated with the corresponding indicators of the regions (the best in the industry, the reference) by the formula:

$$X_{ij} = \frac{a_{ij}}{a_{ijmax}}$$

Further, for the analyzed region, the value of the rating at the end of the time period is determined by the formula:

$$R_j = \sqrt[n]{X_{1+} X_{2+} \dots X_n}$$

where R_j - rating score at j-subject; X_1 X_2 ... X_n - the relative indicators of the j analyzed region .

The value of the indicator, which shows an increase of negative tendencies is calculated:

$$I = \frac{RV_i}{i_{fact}}$$

where is RV_i - admissible value of the indicator;

i_{fact} - the value of the actual indicator for the region.

Regions are ranked in descending order of rating. The maximum rating has a region with the best values.

Results.

Evaluation of the Development of Innovation Regions of the World Economy.

Currently, there is a strong differentiation in the level of innovative activity in regional systems of the world economy. Bloomberg Innovation Index published a rating of 50 countries and regions of the world for innovations development (table 2), the first place in which has been taken by South Korea for several years, the last positions are Morocco, Argentina, Kazakhstan. Russia occupies 26th place and in 2018 indicators of innovation activity significantly decreased as a result of the study.

The existence of a global technological gap in the world is expressed in the numerical values of technology creation, the spread of innovation, the quality of professional scientific personnel. The activities of international organizations are aimed at bridging this gap.

More than twenty years ago, almost 60 % African states had an attempt to create large-scale institutional mechanisms for the development policies in the direction of the new technological order. Some countries organized new directions in training and designing with the help of higher educational institutions. On a scale of the All-African Scientific Union, a Program for the preparation and assessment of scientific achievements was introduced, which has become an international multilateral local treaty in the movement towards a new technological order. It should also be noted that as the main goal of the UN in the concept of sustainable development, paragraph 9.5 emphasizes the importance of stimulating and expanding scientific human resources by 2030 in the design and research fields.

Table 2. Rating of innovation regions of the world economy 2017-201 6 years.

Region	Place in 2018	Place in 2017	Place in 2016	The Intensity of research and development 2018/17	The density of high technology 2018/17	Effects in higher education 2018/17	Research concentration 2018/17
South Korea	1	1	1	2/1	4/4	3/2	4/4
Sweden	2	2	3	4/5	7/7	18/18	5/5
Singapore	3	6	6	15/14	21/17	1/1	7/6
Germany	4	3	2	9/9	3/5	28/12	19/16
Switzerland	5	4	5	7/8	9/11	11/16	17/14
Japan	6	7	4	3/3	8/8	34/27	10/9
Finland	7	5	7	8/4	13/15	19/5	6/3
Denmark	8	8	9	6/6	15	26	2
France	9	11	10	12/12	2/2	10/10	21/18
Israel	10	10	11	1/2	5/3	41/20	1/1
Russia	2 6	25	12	32/31	22/24	5/3	28/27

Source: https://theworldonly.org/rejting-innovatsionnyh-ekonomik-2018/

The presented results indicate a significant lag in innovation activity of the Russian Federation from the most technologically advanced post-industrial countries. In addition, a decrease of 14 positions in 2018 compared with 2012 confirms the need to find new directions to revitalize the innovation economy, in particular the increase in qualified researchers in this field.

Cluster Analysis of Regions in the Russian Federation on the level of Innovation Activity.

Within a single country, there is a significant differentiation of administrative-territorial entities in terms of innovative activity level. Innovation activity assessment of Russian regions was performed using systems of indicators presented in Table 1. To obtain an aggregated estimate, a composite index was calculated by determining the arithmetic average for the proposed subgroup of indicators. Aggregate values calculated by the administrative districts of the Russian Federation are shown in Table 3. As can be seen from the data, major innovation activity is observed in the central Federal District table 3.

Table 3. Rating of regions by the level of innovative activity, 2018

Region	**Indicators (I.I.)**	**Indicators (I.A.)**	**Indicators (O.I.)**	**Rating**
CFD	1,00	1,00	0,82	1
SZFD	0,87	0,31	0,32	4
SFD	0,81	0,18	0,29	6
NCFD	0,61	0,01	0,05	8
PFD	0,86	0,74	0,56	2
UFD	0,82	0,41	0,24	5
SFD	0,74	0,29	0,60	3
DFD	0,75	0,13	0,09	7

In general, as studies have shown, the distribution of the technological structure across the country's territories is very uneven. Regions central federal district have more developed innovation infrastructure and a specific release of new technologies in the total amount of goods and services sold.

Further, referring to the obtained results of the innovation activity rating in the regions, using the software product Statistical 13.0, the regions were clustered based on the following innovation activity criteria:

Y 1 - the specific weight of innovation- active organizations in the total share of economic entities, %.

Y 2 - the proportion of the employed population of 25 -64 years old, with higher education in the number of employments of this age group, %.

Y 3 - in- house expenses for research and development, mln rubles.

Y 4 - the share of internal costs for research and development in GRP, %.

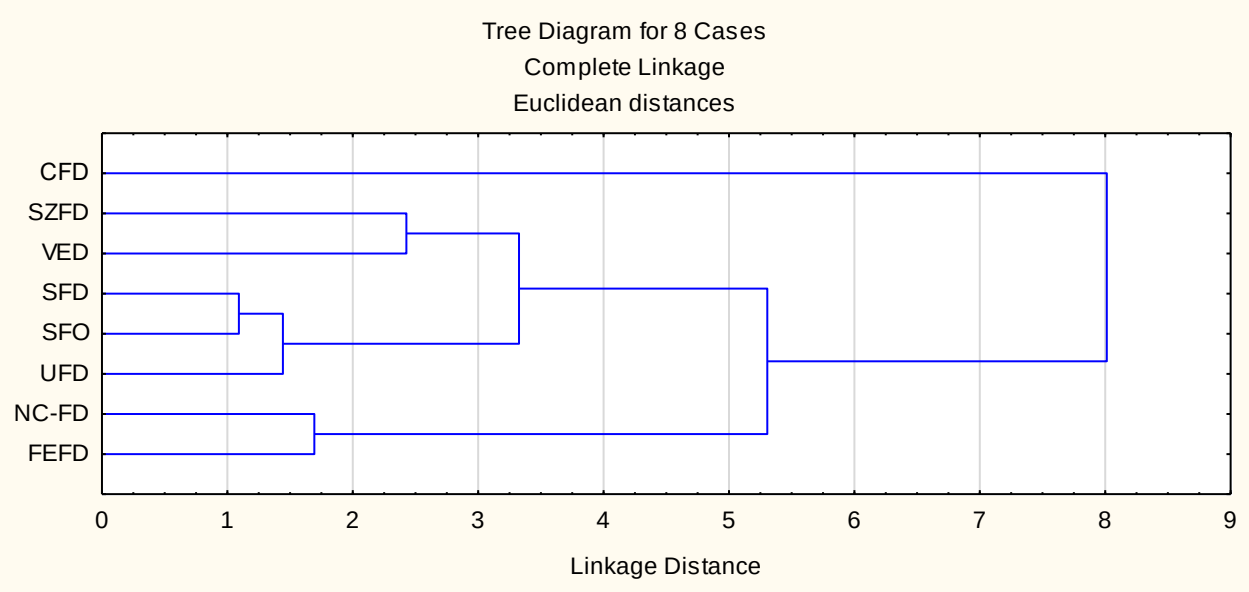
Y 5 - Costs of technological innovations, mln. Rub.

Y 6 - advanced technology units.

Y 7 - used advanced technologies, units.

Y 8 - input patent applications and issue of security documents, units.

Figure 1. Cluster analysis of regions by the level of innovative activity for 2018.



Thus, based on the data obtained, it can be seen that the regions can be combined into three clusters. The Central federal district is most developed in the innovation sphere. The second cluster includes the Northwestern and Volga federal districts. The third group consisted of the South, North Caucasus, Far Eastern, Ural, and Siberian federal districts.

Developing a National Cluster Policy based on the Innovative Activity Level.

To obtain the maximum multiplicative effect of joint communication activities between all participants of innovative activities are invited to use the cluster approach.

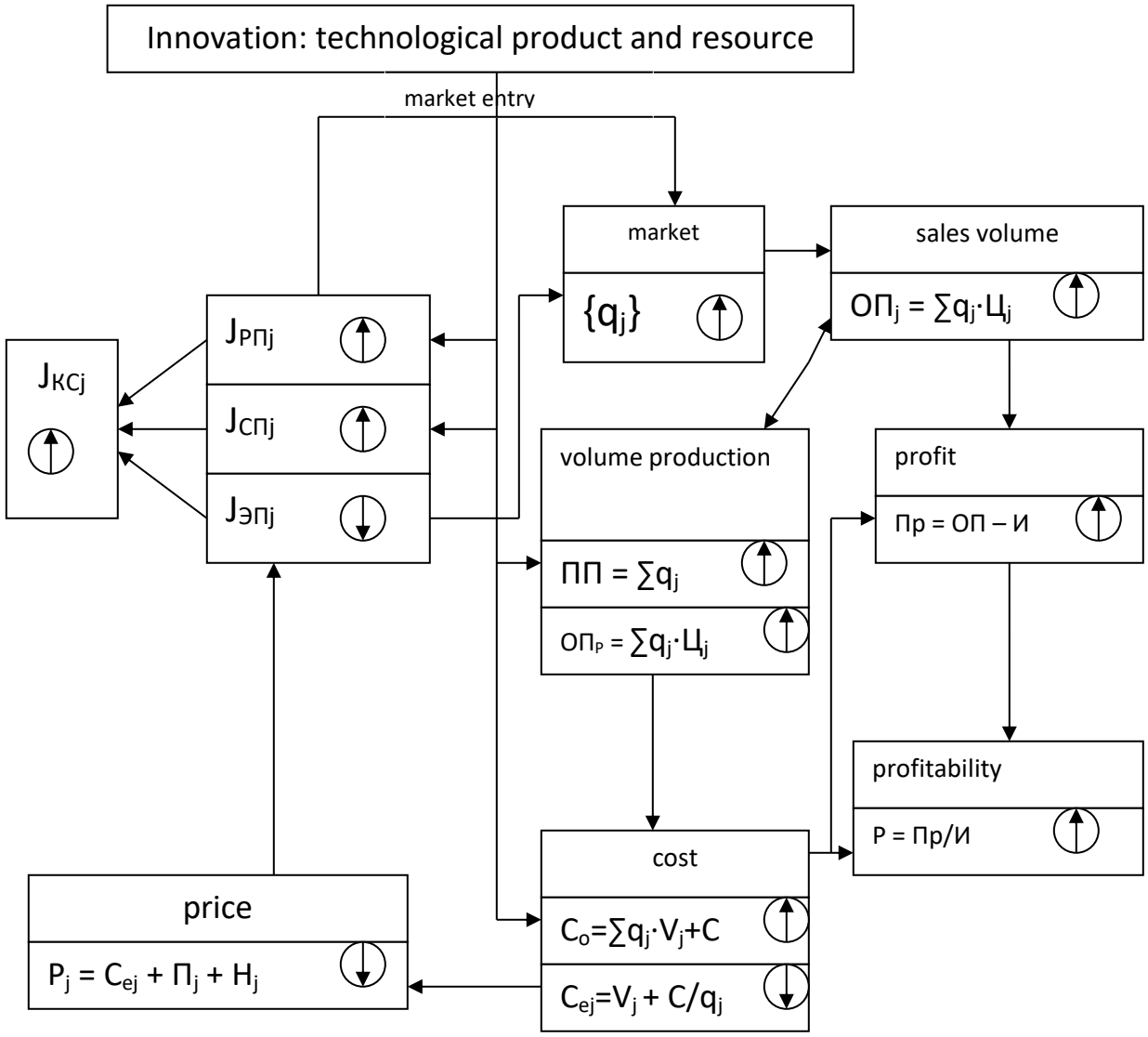
The application of this approach is determined by the fact that the cluster policy is a proven practice factor in increasing the level of socio-economic development of the region and increasing its competitiveness; for example, in the study M. Piątkowski (2015), it is noted that clusters and sets and enterprises have become an integral part of the economic development and strategies alignment of the EU member states.

Generalizing opinions of economists, we note that a cluster is a geographically concentrated group of complementary enterprises, specialized suppliers, as well as non-profit organizations and institutions associated with their activities that compete, but also complement each other. Intensification of innovation activity is aimed at improving the competitiveness of the enterprise fig. 2.

As a result, an increase in the innovation activity of a separate enterprise, an increase in the region's innovation activity, respectively, an increase in its competitiveness.

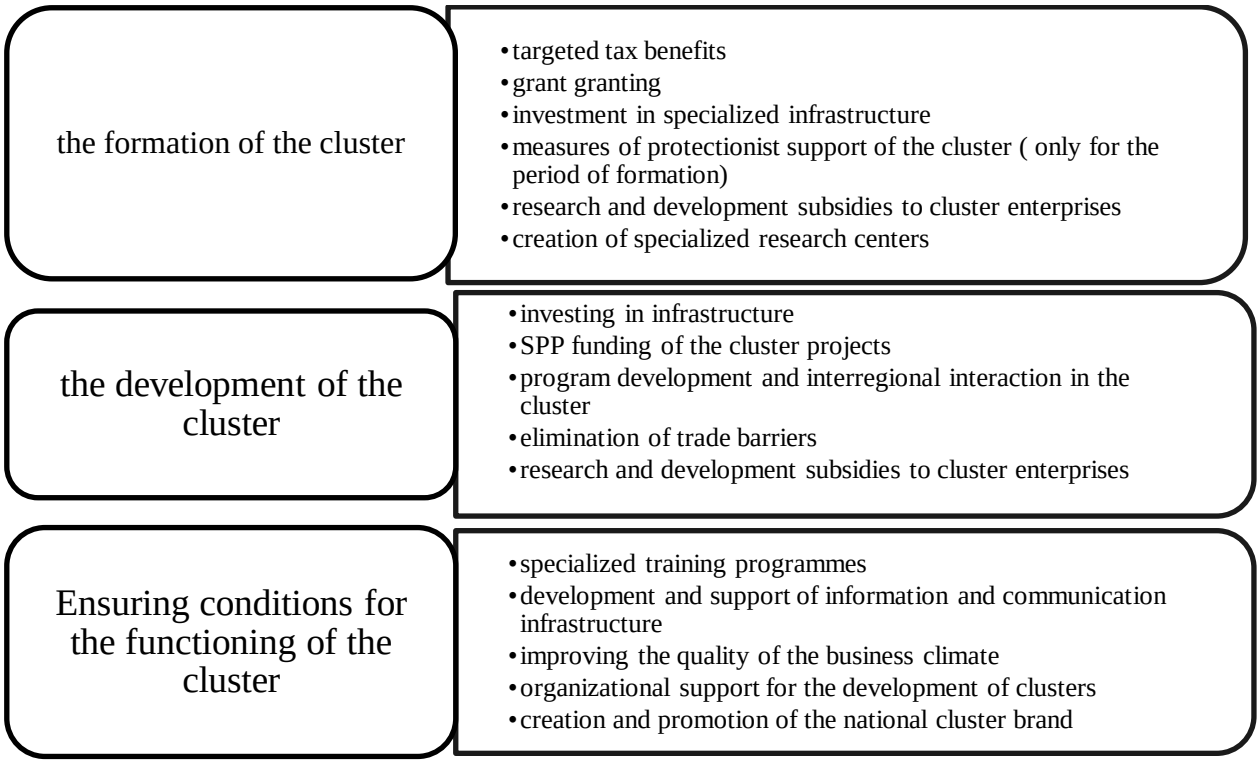
As research in the field of regional management shows, the cluster approach is a long-term resource, ensuring the competitiveness of the region.

Figure 2. A mechanism for assessing innovation impact on competitiveness and economic performance of an enterprise.



Based on the results obtained from the cluster analysis of regions in terms of innovation activity for 2018, the author proposed to allocate such priority areas of the national cluster policy in view of the level of innovative activity in the region as the formation of clusters, cluster development and providing conditions of cluster operation. The content of national cluster policy components is presented in Fig. 3 Each direction in the national cluster policy corresponds to a specific set of implementation tools.

Figure 3. Priority areas and instruments of national cluster policy taking into account the level of innovation activity of the region



For the most developed regions in the innovation sphere, issues of ensuring the sustainable functioning and development of the cluster come to the fore, for regions with low innovation activity, the formation of a cluster.

CONCLUSIONS.

Fundamental principles and basic concepts are reflected in scientific works by foreign authors: S. Myers and D. Marquis (1969), B. Santo (1990), R. Kanter and H. Nystrom (1993), B. Twiss (1989), J. Schumpeter (1982), K. Smith (2009), etc. Among Russian authors, studies are directed to the issues of innovation and innovation distinguish: G.A. Bezdudnyi, O.D. Smirnova and O.D. Nechayeva (1998).

In modern scientific literature, considerable attention is paid to questions about pricing and innovation activity. N.E. Egorov et al. (2015) offer to use econometric method of quantitative assessment of

economic entities' innovation activity in the region on different levels referring to an innovative spatial-spatial model, allowing to evaluate the role of each participant in the innovative development as a whole, as well as by specific municipalities, sectors of the real economy, territorial-innovative clusters, etc., aspects of forecasting the dynamics of innovation activity in industries based on data changes in the structure and intensity of competition discussed in the article by R.V. Akhmetzianov and V.I. Kosachev (2016), in trade; A.N. Mayorova et al. (2018). The issues of innovation activity at the enterprise level are considered in the work J. Stiebale (2016), the authors analyze the impact of cross-border mergers and acquisitions (M & A) on the innovations of European firms.

A large number of works is devoted to study in various aspects of cluster initiatives development of territorial economic systems and the state. In a study (Falck, Heblich & Kipar, 2010), the authors provide evaluation cluster -oriented policy introduced in Bavaria, Germany in 1999.

In addition, the second article has previously repeatedly addressed in its research the topic of innovation activity, both in general and in relation to individual sectors and sectors of the economy. The article S.M. Reznichenko et al. (2018), investigated the methodological aspects of assessing the factors influencing the sustainable development of the region. In the article O.V. Takhumova et al. (2018) suggests ways to increase the investment attractiveness of the regions in the Russian Federation in the context of institutional transformations. The development of the regional economy is considered by S.V. Veretekhina et al. (2016), a toolkit for assessing the prerequisites for interregional economic interaction was studied in M.M. Butakova et al. (2018).

According to the authors, development and implementation of a national cluster policy is a driver of innovation growth in activity, as a region and as a whole, for the Russian economy.

The most important condition for a qualitative and quantitative breakthrough in the production activities of the regions is the activation of its innovative component. This is especially true during the economic recession associated with the consequences of overcoming the global financial crisis. As the results of ISS research the situation is ambiguous on the level of individual territorial entities, is particularly problematic for the peripheral areas, with insufficient level of infrastructure development, and complex geopolitical situation. It seems appropriate to enhance and develop innovation in the regions. It is proposed to strengthen the role of national cluster policy in the process of spatial organization of regions.

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