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Innovation potential of the Arctic economic systems

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Abstract. Innovation potential is of a high priority in territorial economic systems in ensuring sustainable economic growth. Assessment of innovation potential of Arctic systems allows integrating the efforts of federal and regional executive authorities and local governments to activate the innovative development of industrial enterprises. Various scenarios for implementation of the strategy of innovation development, methodological principles and recommendations for evaluating the innovation potential were considered. An assessment of the innovation potential in four regions that are fully related to Russian Arctic was carried out. Innovative profiles of the considered regions were formulated. It is shown that the Murmansk region has the most rational innovation profile close in form to an equilateral pentagon. Based on the assessment of the innovation potential efficiency of using various resources that contribute to the innovative development of the Arctic regions is determined. The Murmansk region has the greatest potential for innovative development. An assessment of the innovation potential of the Arctic regions which allows determining the effectiveness of the use of various resources for the innovative development of regions is performed. The Yamalo-Nenets Autonomous District demonstrated the greatest potential compared to other Arctic regions and accordingly the most rational use of resources for innovative and technological development what is the basis for recommending the use of the scenario of leadership achievement of innovative development in the medium and long term

1. Introduction

Innovation potential is of a high priority in territorial economic systems in ensuring sustainable economic growth. According to foreign scientists, at the present stage scientific and technological achievements and innovations affect the level of economic growth of countries by 60-90% and increase competitive advantages at national and international markets [1].

The state regional policy aimed at increasing the innovation potential of the Arctic territories of Russia as well as creating and developing innovation infrastructure are a definite mechanism that allows reducing the impact of negative factors of economic growth.

Monitoring of the innovation potential of the Arctic economic systems is the basis for organizing the formation of innovative activities taking into account the features of the macroregion.

Various authors have proposed many definitions of innovation potential [2-4]. Under the innovation potential the authors understand a complex of various resources, including material, financial, intellectual, informational, scientific, technical, personnel, infrastructural, as well as other resources necessary for implementation of innovative activities [5].

Assessment of innovation potential allows integrating the efforts of federal and regional executive authorities and local governments to activate the innovative development of industrial enterprises. The



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level of innovation potential has both positive and negative dynamics. In this regard it requires continuous evaluation. Various aspects of the innovation potential necessitate the study of a variety of indicators. To analyze the state of the innovation potential it is necessary to form an integrated comprehensive assessment for a certain period of time. [6, 7].

2. Materials and Methods

The basis of the research includes theoretical and methodological assessment of the innovation potential as well as scientific substantiation of various scenarios of the long-term strategy of scientific and technological development. To assess the innovation potential four regions that are fully related to the Russian Arctic: Nenets Autonomous District, Murmansk region, Yamalo-Nenets Autonomous District, Chukotka Autonomous District and were selected [8].

Various scenarios for implementation of the strategy of innovation development, methodological principles and recommendations for evaluating the innovation potential were considered, including:

- methods of the Meiji University, the World Bank, the World Economic Forum, the Organization for Economic Development and Cooperation, the Commission of the European Communities [9-13];
- methodologies of the Center for Strategic Research “North-West”, the Higher School of Economics, the National Association of Innovation and Information Technology Development, “Expert RA” rating agency, the Financial University under the Russian Government, the Russian Association of Innovative Regions [14-19];
- methods of foreign experts, including M. Fisher, K. Freeman B. Lundvall, R. Nelson and others [20-23];
- methods of domestic scientists such as A.E. Varshavskiy, M.A. Bendikov, V.V. Fauzer, A.V. Chugunov, T.A. Shtertser, Y. Bogachev, V. Vinokurov, K.A. Zadumkin, I.A. Kondakov, V.V. Razuvaev, N.S. Oleinik, Ya.A. Makarova, Ya.A. Flud, S.V. Kortov, A.A. Bykova, M.A. Molodchik, S. Gutman, A.V. Kozlov and others [24-39].

For the information base of the study indicators of the Federal State Statistics Service of Russia were used [40].

Basing on the study of foreign and domestic methods for analyzing the innovation potential it is required to compare the innovation profiles of the regions. For these purposes the method by K.A. Zadumkina and I.A. Kondakova was chosen [41] taking into account the possibilities of obtaining information to determine the following indicators:

- number of organizations preparing higher education specialists per 10,000 people;
- number of postgraduate students per 10,000 people;
- number of doctoral students per 10,000 people;
- number of issued copyright certificates and patents per 10,000 people associated with in development and research;
- volume of innovative products per 100 rubles of technological innovation costs.

In accordance with the methodology innovative profiles were calculated according to the normalized indicators:

$$x = \frac{x_i - x_{\min}}{x_{\max} - x_{\min}} \quad (1),$$

where x - normalized indicator, x_i - actual value of the indicator; $x_{\max}$ - highest value of the indicator, $x_{\min}$ - least value of the indicator.

The most rational innovation profile is close to an equilateral pentagon.

On the basis of the method by N.S. Oleynik [32] an assessment of the innovation potential, that allows determining the efficiency of using various resources of the Arctic regions for their innovative development was carried out.

In accordance with the methodology potential and real indices of innovative development are calculated. Potential index is analyzed basing on the following indicators:

- innovation activity;

- share of technological innovation costs in GRP;
- investments in fixed assets;
- number of students enrolled in middle management programs as well as undergraduate and graduate programs;
- number of applications for inventions and patents;
- number of personnel associated with in development and research;
- value of fixed assets;
- degree of workability of fixed assets;
- number of researchers with academic degrees.

Real index is analyzed on the basis of the following indicators:

- developed advanced manufacturing technologies;
- advanced manufacturing technologies in use;
- volume of innovative goods, works, services;
- technological innovation costs;
- innovation activity;
- innovative products as a percentage of the volume of products shipped

Each indicator was normalized to the maximal value. The potential and real indices were calculated as average values of indicators.

3. Results

As a result of the research innovative profiles of the Arctic regions were formed (Figure 1).

The analysis showed that the Nenets Autonomous District profile is the most distant from the rational innovation profile.

The Murmansk region has the most rational innovation profile and is distinguished by such indicators as the number of postgraduate and doctoral students (per 10 thousand people).

The Yamalo-Nenets Autonomous District has the best indicators in the number of patents and certificates issued (per 10 thousand people engaged in research and development).

The profile of the Chukotka Autonomous District is characterized by the number of organizations preparing higher education specialists as well as the best indicators among the Arctic regions by the volume of innovative goods per 100 rubles of technological innovation costs.

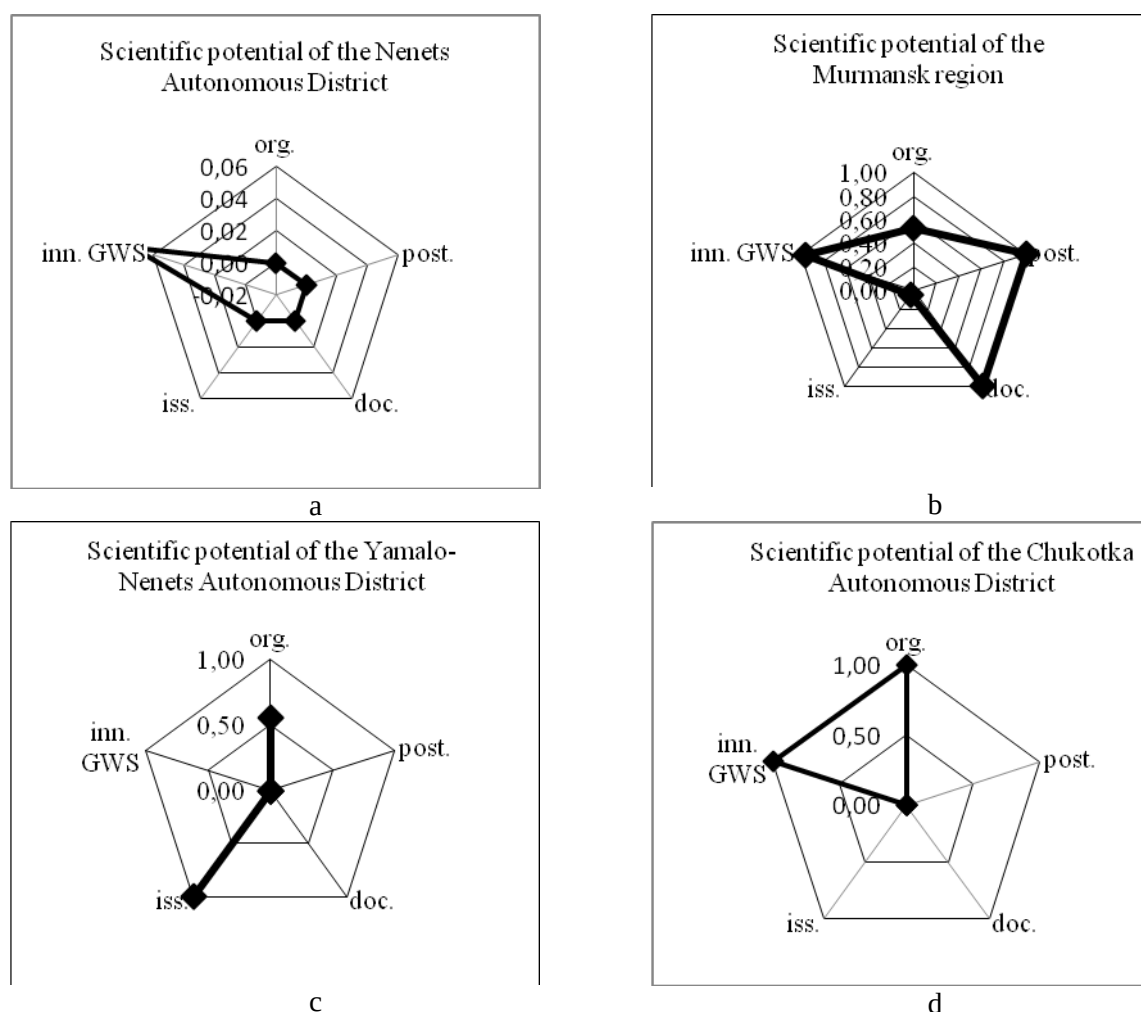
Potential index of innovative development based on the calculations for the period 2014-2017 is shown in table 1.

Table 1. Potential index of innovative development

	2014	2015	2016	2017
Nenets Autonomous District	0.14	0.16	0.26	0.17
Murmansk region	0.59	0.54	0.57	0.56
Yamalo-Nenets Autonomous District	0.41	0.43	0.48	0.49
Chukotka Autonomous District	0.22	0.32	0.23	0.31

For the analyzed period the Murmansk region has the greatest potential for innovative development.

Real index of innovative development is shown in table 2.



Abbreviations:

Org. - number of organizations preparing higher education specialists per 10,000 people;

Post. – number of postgraduate students per 10,000 people;

Doc. – number of doctoral students per 10,000 people;

Iss. - number of issued copyright certificates and patents per 10,000 people associated with in development and research;

Inn. GWS - innovative products as a percentage of the volume of products shipped.

Figure 1. Innovative Profiles of the Arctic regions

Table 2. Real index of the innovation development

		2014	2015	2016	2017
Nenets	Autonomous				
District		0.03	0.08	0.14	0.07
Murmansk region		0.54	0.37	0.30	0.39
Yamalo-Nenets					
Autonomous District		0.46	0.60	0.55	0.60
Chukotka	Autonomous				
District		0.21	0.28	0.16	0.32

The Murmansk region and Yamalo-Nenets Autonomous District are characterized by the best indicators of real index of innovative development.

Figure 2 shows the excess of real over potential index of innovative development.

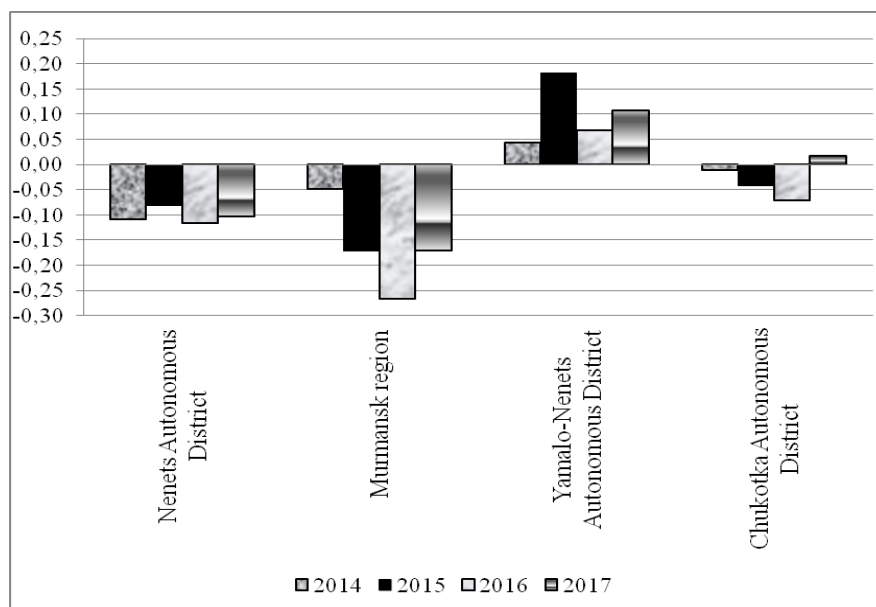


Figure 2. Excess of real over potential index of innovative development

The analysis showed that resources are most efficiently used for innovative development in the Yamalo-Nenets Autonomous District, to which in the medium and long term the scenario of achieving leadership in innovative development, which provides for the generation and implementation of innovative projects can be recommended. For other regions the scenario of inertial development involving adoption of advanced innovative technologies is recommended.

4. Conclusions

An assessment of the innovation potential of the Arctic regions which allows determining the effectiveness of the use of various resources for the innovative development of regions is performed. The Yamalo-Nenets Autonomous District demonstrated the greatest potential compared to other Arctic regions and accordingly the most rational use of resources for innovative and technological development what is the basis for recommending the use of the scenario of leadership achievement of innovative development in the medium and long term.

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