



THE MECHANISM OF INNOVATIVE DEVELOPMENT OF THE RUSSIAN ARCTIC ZONE

Alina Aleksandrovna Ilinova and Diana Mikhailovna Dmitrieva

Saint-Petersburg Mining University, Vasil'evsky Ostrov, 21 liniya 2, #
Saint-Petersburg, 199106, Russia

ABSTRACT

Russia is one of the most important players in the Arctic zone with significant economic, security, and political interests in the region. Russia's economic interests in the Arctic generally are based on two things - natural resources and maritime transport. This paper is focused on natural resources and an innovative approach to its usage, and on innovation infrastructure to promote the innovative development of the Russian Arctic. In the article, the strategic importance of the Russian Arctic Zone as a wealth of petroleum and mineral resources is determined. Main challenges of the Arctic development and existent infrastructure as the basis for the innovative development of the Arctic were identified. The main approaches to the development of innovation infrastructure in the Arctic zone of Russia are presented. The negative factors preventing the innovative development of the Arctic region are identified. It is determined that to prevent the negative factors it is necessary to focus on creating a powerful infrastructure complex in the region, which will provide economic, innovative and social effects. An approach to the realization of innovative strategy of the Arctic mineral resources complex is suggested and mechanism of the Russian Arctic zone innovative development is elaborated. The conclusions related to the innovative development of the Russian Arctic are made on the basis of the conducted research.

Keywords: Russian Arctic, Arctic zone, innovative development, mineral resources, infrastructure, innovations, policy regulation.

Cite this Article: Alina Aleksandrovna Ilinova and Diana Mikhailovna Dmitrieva, The Mechanism of Innovative Development of the Russian Arctic Zone, International Journal of Mechanical Engineering and Technology, 9(9), 2018, pp. 1439–1451.
<http://www.iaeme.com/IJMET/issues.asp?JType=IJMET&VType=9&IType=9>

1. INTRODUCTION

The Arctic zone of Russia is the part of the Arctic under the jurisdiction of the Russian Federation. According to the "Strategy of development of the Arctic zone of the Russian Federation and national security for the period up to 2020", complex socio-economic

development of the Russian Arctic zone, realized through the effective progress of science and technology (innovative development), is one of the key directions in development of the Arctic zone of the Russian Federation [1].

The Arctic region is strategically important for Russia due to its unique mineral resources, prospects of the logistics and infrastructure development and other factors. The Arctic contains a wealth of petroleum and mineral resources. The Arctic region produces about 10% of the world's oil and a quarter of its natural gas. The Russian Arctic is the source of about 80% of oil and virtually all of the natural gas. The other countries of the "Arctic pie" - Canada, USA (Alaska) and Norway - are the other leading producers. Denmark also is a producer of oil and gas.

In the US, the oil reserves are estimated at about 15 million barrels, and gas reserves are over 2 trillion cubic meters; 20% of the oil is extracted at Prudhoe Bay Oil Field [2].

In Canada, there are 49 gas and oil fields in Mackenzie River Delta, and 15 fields are situated on the Canadian Arctic Archipelago [2]. Canadian oil reserves total 171 billion barrels, of which 166 billion barrels can be recovered from the oil sands using today's technology [3].

The total Norwegian discovered and undiscovered petroleum resources on the continental shelf are about 14.2 billion cubic meters of oil equivalents. 47% of this has been sold and delivered. Undiscovered resources account for about 38% of total remaining resources [3].

Danish oil and gas reserves amounted to 107 million cubic meters of oil and 37 billion cubic meters of sales gas [4].

The majority of the proven reserves and forecast resources of Russia is located on the Arctic territory. It produces more than 96% of the platinum metals and more than 90% of nickel and cobalt; around 80% of Russian gas, 60% of oil, and about 60% of copper. In different raw materials production (nickel, cobalt, diamonds, platinum metals, oil and gas, rare earth metals, etc.), the Russian Arctic plays a significant role in the world [5].

In the northern part of Russia, the main resources of tantalum, titan, iron, niobium, polymetals, phosphorus, fluorite, chrome, manganese and gold are concentrated [6].

In Table 1, there is a list of the main Arctic mineral resources [7].

Table 1 Main Arctic mineral resources

Groups	Types of resources	Mineral resources
Fuel and energy resources	Solid fuel and energy raw materials	Coal, uranium, combustible shales, methane
	Liquid and gaseous energy resources	Raw energy oil, flammable gases, natural bitumen
Mineral resources: Metallic minerals	Ferrous metals	Iron manganese titanium vanadium chromium
	Metals	Bismuth, aluminum, copper, tin, nickel, cobalt, antimony, selenium, zinc, tellurium, tungsten, mercury, molybdenum
	Precious metals	Silver, gold, platinum, palladium
	Rare metals	Lithium, niobium, tantalum, zirconium, beryllium, the lanthanides
Mineral resources: Non-metallic minerals	Mining and chemical raw materials	Phosphates, mineral salts, apatite
	Mining and technical raw materials	Barite, graphite, arsenic, mica, abrasives
	Crystal and semiprecious stone materials	Gemstones, diamonds
	Organic raw materials	Amber

Special attention today is paid to oil and gas fields. Recent appraisals suggest that a considerable fraction of the world's undiscovered petroleum reserves lie within the Arctic [2]. More than 400 onshore oil and gas fields have been discovered north of the Arctic Circle. About 60 of these are very extensive, but roughly 25% of them are not yet in production. More than two-thirds of the producing fields are located in Russia, primarily in western Siberia [2].

Therefore, the Russian Arctic can become the main producer of hydrocarbons, both for Russia, and for the world market as a whole [8].

In Figure 1, the distribution of undiscovered hydrocarbon reserves in the Arctic countries is presented [9].

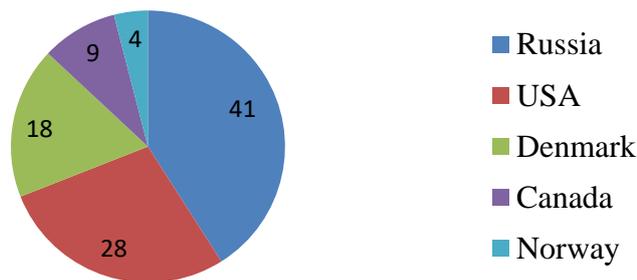


Figure 1 Distribution of undiscovered oil reserves between the Arctic countries, %

Recent appraisals suggest that the total cost of mineral resources of the Russian Arctic exceeds 30 trillion dollars. However, the total cost of explored reserves is only 1,5 – 2 trillion dollars, that proves a low level of deposits' exploration.

The fact that the Arctic contains a wealth of undiscovered resources confirms necessity and strategic importance of the innovative development of the Russian Arctic Zone [10].

The more complex are the conditions for the resources exploration and extraction, the more scientific research and innovations are required [11]. The main goals of Russia in its Arctic policy are to utilize its natural resources, use the seas as a transportation infrastructure in Russia's interests, protect its ecosystems, and ensure that it remains a zone of peace and cooperation with other countries. In addition, an important issue is to ensure the transition to sustainable innovative development in these regions due to the comprehensive development of all spheres: sustainable economic development, environmental protection, social progress, and integrated innovative development. It requires an innovative approach to all spheres.

In this paper, the authors focus on the one of the crucial issues - innovation infrastructure to promote the innovative development of the Russian Arctic.

2. LITERATURE REVIEW

Development of innovation infrastructure is a fundamental part of the innovation process. According to "The concept of the Russian Federation long-term socio-economic development for the period until 2020" and the "Strategy of innovative development of Russia until 2020", the construction of the innovation infrastructure is one of the main tasks for the innovative activities development in Russia, including the Arctic.

Nowadays, there is no unified term for innovation infrastructure in the world and no unanimity among scientists. The authors use such terms as "infrastructure to support open innovation" [12], "innovation support infrastructure" [13], "system of innovation supporting innovation" [14], etc.

However, the meaning is the same – it is some type of support which is necessary for the all phases of innovative process (from research and development (R&D) to production).

In the UK, there is a term "innovation infrastructure" and it is a key source for the effective functioning of innovation and for the economy in general. Standards, design, accreditation, metrology and IP are all deeply embedded in the modes and styles of innovation practice across industry and commerce and in the public sector [15].

Some authors studied innovation infrastructure in the countries aspect. For example, Ian E. Maxwell believes that Russia has a highly educated workforce but need to modernize science and technology foundation and build an innovation infrastructure [15].

Some authors suppose that innovation infrastructure exists in the form of hard organizations, such as technology centers and institutions (either sectoral or functional) and of soft organizations, such as innovations centers etc. [16].

In some European countries, innovation infrastructure is defined as the environment formed in the sphere of information and communication technologies, technical and technological equipment, physical infrastructure, and in the sphere of knowledge infrastructure as well. It is driving force aimed at the business sector restructuring and networking of the subjects of the innovation activity from the academic sector and the economic sector [17].

Russian scientists also pay attention to the effective development of innovation infrastructure [18; 19]. Some of them argue it is the system of the subjects of innovative activity, resources and facilities, serving innovative activity in terms of logistics, organizational, methodical, financial, information, consulting and other support.

In the article, the authors will use the term "innovation infrastructure", which means a complex of organizational and economic institutions that provide conditions for the implementation of innovative processes of economic entities based on the principles of economic efficiency.

There are two different models of innovation process - "technology-push" and "market-pull" [20-22]. So, these approaches can be applied for harmonious and well-functioning innovation infrastructure development.

The approach "technology-push" means that the direction of innovations is determined by the state. In that case, regional innovation are developed not in accordance with the regions' needs, but in accordance with the state needs [23].

The other approach – "market-pull" - implies that the region uses R&D and scientific resources according to its needs. This approach allows achieving results in the short term period. In addition, it is possible to use the "Combined" approach, which is a combination of the two above mentioned approaches.

3. POLICY ENVIRONMENT AND FINANCING FACILITIES IN THE RUSSIAN ARCTIC

The Russian Arctic development is subject to different laws and regulations at the state level. The main document is the "Strategy of development of the Arctic zone of the Russian Federation and national security for the period up to 2020" [1]. There is a set of other acts, such as the state program "Socio-economic development of the Arctic zone of the Russian Federation for the period up to 2020" (was approved in 2014) [8], "Basics of the State policy of the Russian Federation in the Arctic for the period till 2020 and for a further perspective" (adopted in 2008), Federal law "On development of the Arctic zone of the Russian Federation" (a bill), Government directive "On the plan of comprehensive stimulation of

development of hydrocarbon deposits on the continental shelf of the Russian Federation..." and others.

Analyzing the laws and regulations on the Arctic issue, one could be mentioned that the main Acts have more theoretical character rather than practical. For instance, in the "Strategy of Arctic region's development until 2020", like in other documents, the main aims, tasks, methods and directions of the strategy realization are described in a form of thesis, however no particular activities and measures, which could lead to the development of the Russian Arctic, are presented. Moreover, there is no system aimed at both monitoring and control over the strategy realization and at the assignment of people who will be responsible for the achievement of goals and target indicators [24].

4. METHODOLOGY

Some approaches imply that innovation infrastructure can be subdivided into the following functional spheres: technology, financing, information, consulting, personnel and distribution [25; 26; 19].

Effective development of innovative activities of the Arctic zone requires the harmonious development of each sphere of innovation infrastructure. The main spheres of innovation infrastructure of the Arctic zone of Russia were analyzed (Table 2).

As the table shows, the most developed area in the Arctic region is the technological sphere. However, with the presence of a sufficient number of technology parks and innovation centers there is a lack of financial institutions and marketing structures. In addition, the information and consulting sphere needs to be strengthened. This leads to an imbalance in the innovation infrastructure of the region.

Thus, despite the fact that some innovative platforms in the Arctic zone are operating and some of them are projected, there is no comprehensive and systematic approach to the issue of innovation infrastructure development on this territory.

Firstly, there is no clear understanding of the role of projected innovative platforms and institutions in the innovative development of the region. Secondly, it is not clear what are the integration links between them and how the efficiency of their work can be estimated, etc. There is a relatively low level of interaction efficiency and coordination of the innovation system elements in the Arctic zone of Russia.

Table 2 Characteristics of the main spheres of the Russian Arctic zone innovation infrastructure

Sphere	Characteristic	Recourses	Current level of infrastructure
Technology	Provides operational and technical support of innovations' development and implementation process	Techno parks, business-incubators, innovative-technological centers, centers of collective use, etc.	"Technopark of Yamal District" (Salekhard); Murmansk Technopark; Autonomous institution of Khanty-Mansiysk Autonomous Okrug - Yugra "High Technology Park" (Khanty-Mansiysk); Arctic Innovation Center of North-Eastern Federal University in Yakutsk; Innovation cluster of Northern (Arctic) Federal University (Arkhangelsk); Technopark of Tyumen State

The Mechanism of Innovative Development of the Russian Arctic Zone

			University; Arctic Research Center of the Yamal-Nenets autonomous district (Salekhard)
	Projected platforms	Recommended level	Development directions
	The Global Arctic research and innovation complex: Research Centre for the Arctic study, the Centre of the inter-regional expeditions "Arktika", the Arctic high-latitude research scientific laboratory, the Arctic scientific and educational center, National Research of the Yamal-Nenets Autonomous District Development Fund (Salekhard); International multifunctional complex "Energy of the Arctic" (Salekhard); The Arctic Industrial Park (Norilsk)	The level of the developed Northern countries in the sphere of technologies and techniques of mineral resources production and transportation	Improving the efficiency of technology centers' activity, providing cooperation between research centers and private companies for adapted technologies creating
Personnel	Characteristic	Recourses	Current level of infrastructure
	Provides personnel support for the innovation process through training and retraining of qualified personnel	A variety of educational institutions that specialize in personnel training and retraining in innovation management, scientific and technological entrepreneurship, project management, marketing, finance, etc.	Murmansk State University; Gubkin Russian State University of oil and gas; the school of professional technical education "Arktikmorneftegazrazvedka"
	Projected platforms	Recommended level	Development directions
	The Arctic scientific and educational center	Professional and additional education, educational programs on the basis of enterprises, the development of higher education in the far North	A comprehensive study, interaction with employers, increasing the budget places in universities according to preferred directions. Integration of educational and intellectual resources within the Arctic Association of Russian universities; an integrated approach, the involvement of non-budget resources, promotion of labor mobility
Financing	Characteristic	Recourses	Current level of infrastructure
	Provides support and financing of innovative projects in various stages of their development	Budget funds, non-budget funds, venture capital funds, insurance funds, investment funds and other kinds of funds and financial institutions, "business-angels" associations	Technopark "Yakutia", a venture company, agency of innovative business coordination and innovation and technology centers (Yakutsk, Mirny and Neryungri). The allocation of 160 billion rubles from the Federal budget, also 780 million -

			Rosneft company in 2014
	Projected platforms	Recommended level	Development directions
	-	According to the strategy for effective innovative development, about 222 billion in the next 5 years are needed	Attraction of foreign investors, non-budget funds, investment from large companies; the rational allocation of resources, the creation of a unified state program. The development of the tools of subsidies, including through investments of private companies
Distribution	Characteristic	Recourses	Current level of infrastructure
	Provides the process of innovative projects implementation in the sphere of use	Variety of exhibitions, fairs and salons of new technologies, innovations and investments. It also comprises different professional associations and intermediaries	Poorly developed means of communication, the imbalance in regional, local and corporate interests, the high dependence of the region from the state
	Projected platforms	Recommended level	Development directions
	Network of the Northern and Circumpolar Chambers of Commerce and Industry and Business Associations "CCI KhMADYugra" (Khanty-Mansiysk)	The creation of a Network of Northern and Circumpolar Chambers of Commerce and Business Associations	The finishing of the internal geographic zoning to create an effective transport system and housing services and utilities, the creation of trade unions
Information and consulting	Characteristic	Recourses	Current level of infrastructure
	Provides support for innovation activities process on the protection of intellectual property, as well as providing advice on other issues	The centers of commercialization and technology transfer, innovation centers; regional system of state scientific and technical information centers, regional information networks etc.	Technopark "Yakutia", a venture company, agency of innovative business coordination and innovation and technology centers (Yakutsk, Mirny and Neryungri)
	Projected platforms	Recommended level	Development directions
	-	The development of information and consulting infrastructure and expand the range of activities that make efficient use of advanced information technologies	The development of a unified information-analytical system, operating in the interests of all segments of the regional innovation activities

The authors suggest analyzing the main approaches to the creation of innovation infrastructure for making policy recommendations for the Arctic zone of Russia. In Table 3 the main advantages and disadvantages of the approaches for the Arctic zone of Russia are presented.

Table 3 The main approaches to the development of innovation infrastructure in the Arctic zone of Russia

Approach	Advantages	Disadvantages
"Technology-push"	<ul style="list-style-type: none"> - Efficient use of R&D and scientific resources - Stimulation of innovation infrastructure facilities to speed up R&D - A unified development strategy, which corresponds to the projects of regional innovation and research centers 	<ul style="list-style-type: none"> - Possible obstacles to the implementation created by the objects of regional infrastructure - Possible loss of developments of regional research and innovation infrastructure objects
"Market-pull"	<ul style="list-style-type: none"> -Research and innovation centers in the regions focus on projects relevant to their region leading to an improvement of innovation activity -High flexibility of the innovation infrastructure objects 	<ul style="list-style-type: none"> - Possible inconsistency of the regional research projects with the state innovative strategy -The need for effective coordination of objects at all levels -The possibility of innovative activity development in the too specialized field
"Combined"	Has the advantages of each approach and the possibility of flexible management depending on the goals	<ul style="list-style-type: none"> -The complexity of building the balanced infrastructure of innovations development - Significant capital intensity of the coordination and management of innovation infrastructure objects

As already noted, the developed innovation infrastructure is a key factor of effective innovation activity in the country and the region.

Prospects of the Arctic development are directly connected with the strategy of innovative development realization. It should be noted that for the already balanced innovation infrastructure "Combined" approach would be most beneficial for its further development. However, the implementation of this approach requires substantial investment and established harmonious infrastructure.

As described earlier, the innovation infrastructure of the Arctic is still not perfect. The "technology- push" model is mainly used for its development, which means that the purpose of technology creation is defined not by the end consumer but a researcher. This situation leads to the development of areas that have no economic demand.

Initially, it is necessary to identify a priority of technology development and only then proceed to the innovation cycle (applied research – R&D and technological solutions – production and output to market). It is possible by using of "market-pull" model. This model allows strengthening the competitiveness of Russian technologies and products on the market.

5. RESULTS

Thus, an innovative approach today is the basis for the further effective development of the Russian Arctic [27].

Innovative development of the region is interfered by such negative factors as:

- adverse climatic conditions of the region and, as a result, low population density [28];
- undeveloped infrastructure of the Arctic zone (transport, information and telecommunication, market, etc.);
- low profitability of mining operations because of the absence of developed infrastructure and developed power energy system;
- declarative character of laws and regulations and weak control over the implementation of the state strategies and programs;
- low level of monitoring and control over the activities within the state documents;

- Imbalance in economic and innovative development between the separate Arctic territories and regions, etc.

A number of challenges of innovative development of the Arctic zone is connected with the absence of a systematic approach to the innovation infrastructure [29].

A critical issue is also the creation and operating of a powerful innovation-oriented infrastructure complex in the region, based on the principles of transparency and systematic functioning.

As it was noted above, the significant mineral resources in the region determine the strategic importance of the Russian Arctic. As one of the results of conducted research, the authors suggest the following general scheme of realization of innovative strategy of the mineral resources complex of the Russian Arctic, which is the primary complex of the region (Figure 2).



Figure 2 The general scheme of realization of innovative strategy of the Arctic mineral complex

In the context of the innovative development of the regional mineral complex, it is necessary to pay attention to the existing mining, oil and gas companies and to intensify attracting investments, equipment upgrading, attracting of highly qualified personnel, etc.

In the current market conditions of the various sanctions use, it is important to support companies through a policy of import substitution.

A good example in this direction is the creation and support of the so-called "Aluminum valley" by the Russian government in the Arctic region, which involved a considerable margin of "RUSAL" company and other producers of the aluminum industry in the country.

Figure 3 shows a variant of the mechanism of the Russian Arctic innovative development, which is aimed at strengthening and enhancing the strategic positions of the region.

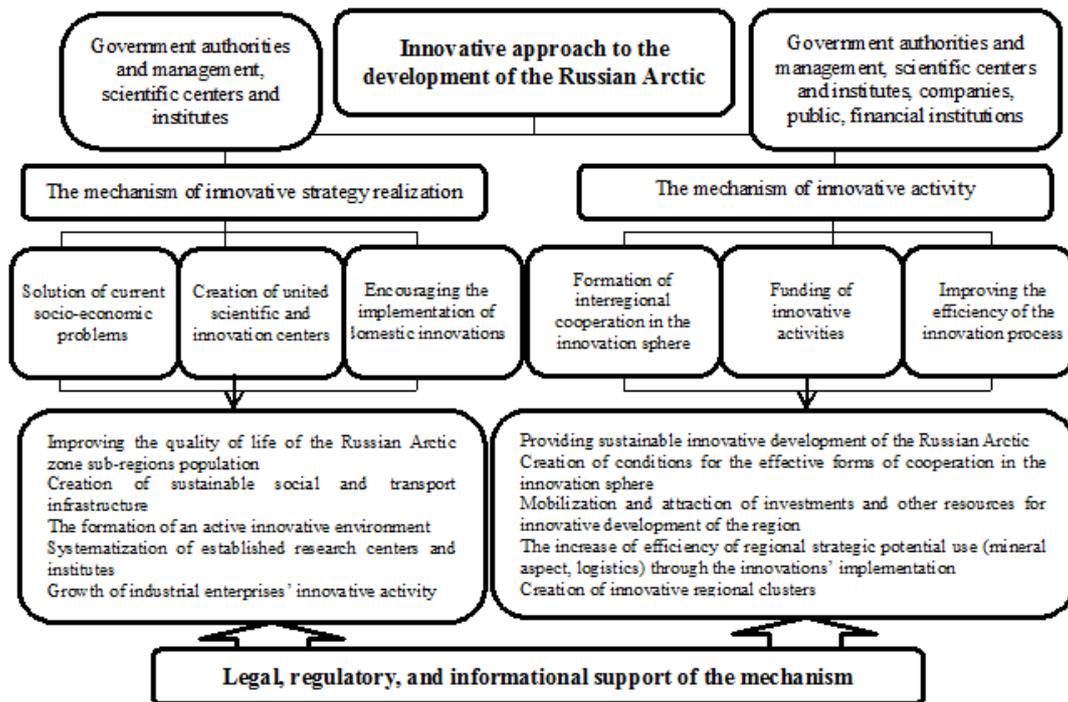


Figure 3 Mechanism of the Russian Arctic innovative development

The main issues in the proposed mechanism are:

- The creation of a positive innovation background, as well as research and technological environment;
- Providing sustainable innovative development of the region;
- The complexity of innovation support;
- Active funding of innovative activities;
- Realization of informational, legal, and regulatory support;
- Identifying and mobilizing the necessary resources;
- Increasing the efficiency of investment projects implementation;
- Creation of innovative regional clusters.

6. CONCLUSIONS

For the effective development of the Arctic region, it is necessary to create a powerful infrastructure complex in the region to support innovations, which will allow providing economic and innovative, as well as social component.

There are many reasons that hinder the development of an effective support infrastructure in the Russian Arctic. The most negative impact is exerted by such factors as the uneven economic development of the region, the poor transport infrastructure, the lack of a common methodological base for the formation of innovation systems, etc.

Each of these factors leads to various risks for the development of the region as a whole. So, for example, uneven economic development means the considerable distance of the region from major industrial centers, which leads to the communities' dependency on supply from the other regions. This situation proves the necessity of developed transport infrastructure.

As for transport infrastructure, it is necessary to lay out priorities in the development of marine and ground transport system to promote the economic growth of the region. The low

level of roads availability does not allow establishing stable communication even within the region. In this paper, the authors focus on innovation infrastructure and innovative development of the Russian Arctic.

The strategic importance of the Arctic zone innovative development for economic development of the Russian Federation due to the presence of a significant amount of mineral reserves of various kinds is justified. The distribution of undiscovered oil reserves between the Arctic countries causing significant role of the Russian Federation in the development of fuel-energy complex of the Arctic zone is shown. The most promising regions of the Arctic zone for the development of mineral resources base are defined. It is proved that only development and implementation of effective legal basis supported by particular plans, system of monitoring and control, as well as effective use of significant investments, aimed at the comprehensive development of the region, can make the achievement of effective development possible.

The effective development of the region requires the adoption and justification of specific activities and measures, taking into account all the geographical, climatic, demographic, economic and social conditions of the separate entities of the Russian Federation Arctic region. Tightening of the state control over the innovative policies in the territorial entities, especially in cases of financial resources distribution is a prerequisite.

The basic spheres of innovation infrastructure of the Russian Arctic with the allocation of existing and recommended level of its development are analyzed. Their role in the innovative development of the region is defined. It is determined that despite a sufficient number of technology parks and innovation centers there is a lack of financial institutions and marketing structures in the Arctic region of the Russian Federation.

The scheme of realization of innovative strategy of the Arctic region mineral complex is suggested. During its implementation, it is necessary to pay attention to the existing mining and oil and gas companies and to intensify the process of attracting investments, upgrade equipment, attract highly qualified personnel, etc.

The mechanism of innovative development of the Russian Arctic zone, which is aimed at enhancing and strengthening the strategic position of the region, is suggested.

ACKNOWLEDGEMENTS

The paper is based on research carried out with the financial support of the grant of the Russian Science Foundation (Project No. 14-38- 00009, the program-targeted management of the Russian Arctic zone development). Peter the Great St. Petersburg Polytechnic University.

REFERENCES

- [1] Strategy of development of the Arctic zone of the Russian Federation and ensuring national security for the period up to 2020, No Pr -232, adopted by the President of the Russian Federation on February 8, 2013. <http://government.ru/info/18360/>
- [2] Information portal "The Arctic" <http://arctic.ru/resources/>
- [3] The official website of Canadian Association of Petroleum Producers <http://www.capp.ca/>
- [4] Oil and gas production in Denmark 2013. Report of the Danish Energy Agency https://ens.dk/sites/ens.dk/files/energistyrelsen/Nyheder/2014/oil_and_gas_production_in_denmark_2013_uk.pdf
- [5] Pavlenko, V. I. Arctic zone of the Russian Federation in the system of national interests of the country. Arctic: ecology and economy, 4(12), 2013, pp. 16-25.
- [6] Bortnikov, N. S. Strategic mineral resources of the Russian Arctic and problems of its development. Scientific and technical problems of the Arctic development, Scientific

- session of the General Meeting of the members of the RAS December 16, 2014, The Russian Academy of Sciences. Moscow: Nauka, 2014, pp. 40-47.
- [7] Dodin, D. A., Kaminsky, V. D., Zoloev, K. K. and Koroteev, V. A. Strategy for the development and study of mineral resources of the Russian Arctic and subarctic region in conditions of transition to sustainable development. *Lithosphere*, 6, 2010, pp. 3-24.
- [8] State program of the Russian Federation. "Socio-economic development of the Arctic zone of the Russian Federation for the period up to 2020" (approved Government directive, 21.04.2014 No. 366). <http://government.ru/docs/11967>.
- [9] Ivanter, V. V. (Ed.). *The Arctic space of Russia in the XXI century: development factors, management*, St. Petersburg: Nauka, 2016, p. 630-655.
- [10] Cherepovitsyn, A. E., Lipina, S. A. and Evseeva, O. O. Innovative approach to the development of mineral raw materials of the Arctic zone of the Russian Federation. *Journal of Mining Institute*, 232(4), 2018, pp. 438-444. doi: <http://dx.doi.org/10.31897/pmi.2018.4.438>.
- [11] Cherepovitsyn, A.E., Ilinova, A.A., Smirnova, N.V. Key stakeholders in the development of transboundary hydrocarbon deposits: The interaction potential and the degree of influence. *Academy of Strategic Management Journal*, 16(2), 2017. <https://www.abacademies.org/articles/key-stakeholders-in-the-development-of-transboundary-hydrocarbon-deposits-the-interaction-potential-and-the-degree-of-influence-6850.html>.
- [12] Minshall, T., Kouris, S., Mortara, L., Schmithausen, P., and Weiss, D. Developing infrastructure to support open innovation: case studies from the East of England. *International Journal of Innovation and Technology Management*, 11, 1440006, 2014, <https://www.worldscientific.com/doi/abs/10.1142/S0219877014400069>.
- [13] Altvater, E., Prunskienė, K. *Intellectual Property Rights in Central and Eastern Europe: The Creation of Favourable Legal and Market Precondition*. IOS Press, 1998, 187 p.
- [14] Hall, B. and Rosenberg, N. (Eds.). *Handbook of the Economics of Innovation*. Volume 2. Elsevier, 2010, 1256 p.
- [15] Maxwell, I. E. *Managing Sustainable Innovation: The Driver for Global Growth*. Springer: Science & Business Media, 2009.
- [16] Edquist, Ch. *Systems of Innovation: Technologies, Institutions and Organizations* Routledge. Pinter Publisher Ltd, 1997, 408 p.
- [17] The official website of European Commission <http://ec.europa.eu/growth/>
- [18] Evseyev, O. S. and Konovalova, M. E. Development of innovation infrastructure in conditions of modernization of the national economy. *Fundamental research*, 9(1), 2012, pp. 220-224.
- [19] Sokolov, D. S. and Tomilina, N. S. Innovation infrastructure in modern Russia: the concept, content, features. *Innovative science*, 1-1, 2016, pp. 172-177.
- [20] Walsh, S. T., Kirchhoff, B. A. and Newbert, S. Differentiating market strategies for disruptive technologies. *IEEE Transactions on Engineering Management*, 49(4), 2002, pp. 341-351.
- [21] Burgelman, R. A., Sayles, L. R. Transforming invention into innovation: the conceptualization stage. In: Christensen, C.M., Wheelwright, S.C., Eds., *Strategic Management of Technology and Innovation*. Boston: McGraw-Hill, 2004, 682-690.
- [22] Brem, A. *The Boundaries of Innovation and Entrepreneurship: Conceptual Background and Essays on Selected Theoretical and Empirical Aspects*. Publisher Gabler, 2008, pp. 39-50.
- [23] Ivanova, V. V. and Ivanova, N. I. (Eds.) *National innovation system in Russia and the EU*. Moscow: TsIPRAN RAN, 2006.

- [24] Dmitrieva D. M. and Ilinova, A. A. Development of the Russian Arctic Zone: The Role of Innovation Infrastructure and Legal Regulation. *International Journal of Applied Engineering Research*, 12(19), 2017, pp. 8179-8187.
- [25] Limareva, D.A. Analysis of the national innovation system in Russia and directions of its development. *SCI-ARTICLE.RU*, 3, 2013. http://sci-article.ru/stat.php?i=analiz_sostoyaniya_nacionalnoy_innovacionnoy_sistemy_rossii_i_na_pravleniya_ee_razvitiya
- [26] Reichlina, A.V. Formation and development of infrastructure of innovation activity. *Economics, Statistics and Informatics*, 2, 2013, pp. 59-62.
- [27] Shabalov, M.Yu. and Dmitrieva, D.M., Implementation of Cluster Scenario Approach for Economic Development of The Arctic Zone of The Russian Federation. *International Journal of Applied Business and Economic Research*, 15(4), 2017, pp. 281-289.
- [28] Ilinova, A. and Dmitrieva, D. Sustainable development of the Arctic zone of the Russian Federation: ecological aspect. *Biosciences Biotechnology Research Asia*, 13(4), 2016, pp. 2101-2106.
- [29] Ilinova, A. and Dmitrieva, D. Strategic development of the Russian Arctic: socioecological approach. *International Multidisciplinary Scientific GeoConference Surveying Geology and Mining Ecology Management, SGEM 17, Ecology, Economics, Education and Legislation*, 17(52), 2017, pp. 851-858. doi: 10.5593/sgem2017/52/S20.109.