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Analysis of Scientific and Educational Space of the Arctic Zone of the Russian Federation and its Contribution to Social and Economic Development

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Abstract

Strategic documents on Russia's development define a transition to a knowledge economy and balanced spatial development, based on innovation and highly skilled human resources. At the present stage of the world economy development, various forms of ties in the scientific, educational, cultural and production spheres that form the scientific and educational space of the territory make a significant economic effect on the restoration and formation of the intellectual potential of the regions. The article describes the scientific and educational space of the Arctic zone of Russia. Specific examples show that in the subjects of the Russian Federation, science and education are unevenly developed. Formation of the scientific and educational space in the Russian Arctic continues. The analysis of this process is of great scientific and practical interest. The meaning of the study is to draw the attention of research organizations and industrial enterprises located both in the Russian Arctic and outside it to the possibility of common use of human, organizational and technical resources within clusters and other forms of interaction. The results of this study may be used by scientific and educational organizations, enterprises of the real sector of the economy, federal and regional executive authorities of the Arctic for the management solutions of the scientific and educational process, training personnel for the real sector of the economy, monitoring the current and prospective staffing needs of the Russian Arctic territories.

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1. Introduction

Throughout the history of mankind, knowledge has been one of the factors of the economic development. The availability of qualifying resources is considered when choosing the location of enterprises in most sectors of the economy. New means of processing, transmitting and delivering information, communication networks and distance education have made procedures that seemed revolutionary 20 - 30 years ago routines. The terms "knowledge economy", "innovation economy", "knowledge society" and "information society" are used to determine the economy with a decisive role of knowledge and the introduction of research results is a source of social and economic development and technological progress.

In the Concept of Social and Economic Development of the Russian Federation for the period up to 2020, the transition to an innovative economic development and balanced spatial development is defined as a target. Intellectual potential is among the key factors of the transition: "The formation of an innovative economy means the transformation of the intellect, the creative potential of a man into the leading factor of economic growth and national competitiveness" (Koncepciya, ... 2008). At the moment, Russia at the beginning of the way to organizing the system that is supposed to stimulate the innovative development of the country. Education and organizing scientific research is of decisive importance. Meanwhile, Russia accounts for less than 2 % of global spending on research and development (R&D) at purchasing power parity. In terms of R&D expenditures, Russia spends 17 times less than the US, 12 times less than the EU, 6 times less than China, and 1.5 less than India. In terms of public R&D expenditures per capita (US $ 86), Russia spends 4–5 times less compare to the leaders, and as for private expenses ($ 40), it is 15–20 times. The effectiveness of Russian research organizations is much lower than in the leading countries (the US, Japan, China and the Republic of Korea). The share of innovative products in the total output is 8–9 %. The weak interaction of innovative development and research sector and the real sector of the economy remains. Almost no transfer of knowledge and technologies between the defense-industrial and civil sectors of the economy is observed. This hinders the use of high technology products of dual purpose (Leonidova, 2010). The accumulated organizational, financial and economic problems require an immediate solution.

2. Relevance

The Arctic issues of the first third of the 21st century remain in demand in the scientific, economic, social, humanitarian and political spheres. The Arctic is facing important changes that are global, long-term and multidirectional. They are developing against the backdrop of a lack of our knowledge of their nature and consequences. Is is especially true for the climate change and its resulting threat of the spatial development transformation of the vast Arctic macro-region.

Russia has made a significant contribution to the scientifically-based development of natural resources in the Far North and the Arctic. In the USSR, the development of the Arctic territories was started 30–40 years earlier than in other circumpolar countries. The expeditions organized in the USSR contributed to the solving the fundamental development tasks of the Earth and were used for the scientific and operational support of economic and defense activities in the Arctic.

After the collapse of the Soviet Union, due to the reduction of funding, staff shortages and depreciation of production funds, Russia lost the primacy in research made in the interests of social and economic development of the Far North. Expedition projects were frozen, funding for exploration and mining programs was cut, the renewal of the research fleet was stopped for a long time, and the infrastructure of scientific centers and weather stations – the key links in the weather monitoring in the Arctic – declined (Zaikov et al., 2016).

Restoration of the social and economic potential of the Arctic is the main goal of the Russian Arctic strategy adopted in 2013 (Strategiya razvitiya, 2013). The document is focused on increasing and concentrating competitive scientific knowledge, investments and production potential in the most promising areas, in centers that form the focus of social and economic efficiency in the Arctic zone of the Russian Federation (hereinafter – the Arctic zone, AZRF). The innovative scenario of the Strategy presupposes the modernization of the scientific and technical institutional environment, the development of knowledge-intensive infrastructure, the creation of production

for deep processing of natural resources aimed at obtaining products with high added value. According to this scenario, the pace of development of the Russian Arctic is supposed to be higher than the national average due to the megaprojects in the resource use, transport and communication spheres and high-skilled Arctic labor (Zajkov et al., 2017). It could be said that effective development of the Arctic zone of Russia is possible due to the integration of educational, scientific, technical and technological potentials into a single scientific and educational space (hereinafter – "SES").

3. Materials and methods

The methodological bases of the study are the works of Russian and foreign scientists in the field of study of the features of the territorial organization of science and education in Russia and the materials of surveys of heads of enterprises and educational institutions in the subjects of the Russian Arctic.

As a scientific term and an objective entity, space is an object of study for natural, humanitarian, economic and social sciences. The term "space" is associated with the definition of "territory". "The general scientific interpretation of the concept of "space"... is formulated within the framework of philosophy ... Space ... is understood as the universal form of being, inseparable from ... time ..." (Chistobaev, Gladkij, 2003). Theoretical aspects of spatial development are considered in the writings of British economists A. Smith and D. Riccardo. The scientific foundations of the spatial organization of the economy, the principles and factors of the location of productive forces are discussed by I. Thünen, A. Weber, F. Perroux, A.G. Granberg and P.A. Minaker. A significant stage in the study of spatial development was the work on determining the competitiveness factors of the countries by M. Porter, published at the turn of the 20th – 21st centuries. A definition by A.I. Chistobayev: "The dynamic social sphere, or socio-geographical space, considered as a time-space combination of social objects, phenomena and processes in conjunction with environment is especially distinguished ... So, the concept of "geographic space" integrates the territory and its social and economic content" (Mashbic, 1998). Geographical space is most often treated as a philosophic concept, as an objective, a universal and cognitive form of existence of geographic formations and objects within the geosphere (Chistobaev, Gladkij, 2003).

It should be noted that the universally recognized definition of SES does not exist. Such kind of issues are often addressed at the level of interstate and interregional categories. V.F. Baynev, V.A. Danilov, V.K. Shapovalov and D.A. Yagofarov prioritized the theoretical and applied aspects of the educational space. Its tasks are the formation and transfer of primary knowledge and the formation of a harmoniously developed personality. "In fact, the educational space is all the physical and legal persons of the region, the whole region, but in a certain aspect – in relation to education" (Novikov, 2000).

In the Russian scientific literature, the tasks of the scientific space include (Leonidova, 2010):

- fundamental and applied scientific research;
- use and evaluation of scientific knowledge for the purpose of social and economic development and improving the safety of the population;
- coordination of research programs for the development of a unified educational and scientific policy;
- promotion of knowledge as a method of solving global social, economic and environmental problems.

The scientific and educational spaces are determined by geographic, natural and climatic features of the territory, depending on the level of their development, the composition of the population, its educational needs, culture, traditions and income level. Both types of spaces function at different levels: from local (municipal) to global and transboundary levels and have social functions. The degree of formation of these spaces is used to assess the state and trends of competitive development of countries and their regions (Leonidova, 2010).

The authors separate "educational space", "scientific space" and "scientific and educational space" for the purposes of the study. In relation to the theme of the article, different aspects depend on the perspective and disciplines they are subjected to. We consider SES from the position of its significance for the sustainable social and economic development of the Russian Arctic.

SES is a multi-level system. Levels are defined by the semantic context and the identification of elements related to each other, and include (Leonidova, 2010):

- educational bodies: general education, secondary vocational education (SVE), and higher professional education (HPE);
- research institutions;
- state bodies for the educational and scientific policy;
- enterprises – research customers, interacting with the SVE and HPE institutions, providing opportunities for internships and employment of graduates;
- innovation institutions (technology parks, business incubators, and implementation centers);
- cultural and educational institutions (museums and libraries).

The components of SES are characterized by specific approaches to training, scientific research, use of immovables and equipment localized on a certain territory. Such an understanding is primary and simplistic, because at the same time, the degree of interconnectedness of the elements and their cooperative effects are not determined. The elements are united by the commonality of their location. Transition to a higher level of SES research makes it important to analyze and consider specific factors, links and mechanisms of interaction between subjects that cause a synergistic effect from the development of the scientific and educational space. This level of development demonstrates the existence of clusters.

The main principles of SES are (Leonidova, 2010):

- coherence of actions of educational institutions of all levels located in the region;
- the continuity of education, ensuring the coordination of forms, types and technologies of instruction;
- a combination of theoretical and applied training (the applied bachelor study programs), focused on the current and future needs of the regional development;
- interrelation of educational and methodological support of training and research developments;
- the use of corporate principles in the regional educational space.

We define SES a highly organized type of environment consisting of interrelated components of the educational and scientific spaces, serving their infrastructure and elements of the production sector involved in the science and education, and using its results in the interests of sustainable social and economic development of a particular territory.

The study of SES in the Russian Arctic was carried out by the North (Arctic) Federal University named after M.V. Lomonosov (NArFU) in 2015–2016. The purpose of the study was to analyze the scientific and educational spaces in the Russian Arctic and to contribute to the information-analytical and methodological support of decision-making for the development of the state policy of Russia in the field of training and research activity in the Arctic.

In the study, we used the structural and functional approach and considered SES a multi-level system dependent on social, economic and demographic processes in the Arctic on national and international levels. In our opinion, the dependence is mutual.

The study of the SES in the Russian Arctic was carried out through the SES monitoring in the subjects of Russia that have a legal status of the land areas of the Arctic Zone of the Russian Federation in the Decree of the President of Russia (O suhoputnyh territoriyah, 2014). The study involved 203 educational institutions. 30 of them have Arctic study programs. Among these 30 institutions: 5 universities and 1 branch university are located on the territory of the Russian Arctic. The target group of the study: students of the Arctic graduate and undergraduate programs at the universities located in the Russian Arctic: the NArFU and the Northern State Medical University (NSMU, Arkhangelsk), the Murmansk Arctic State University (MASU) and the Murmansk State Technical University (MSTU). 3000 respondents participated in the questionnaire: 1500 1-year students and 1500 4–5-year bachelor or master students. The goal of the interviewers was to find the representatives for the target group, to invite them to participate in the survey, to complete it and to collect results.

To reduce the intersubjectivity in developing recommendations for executive bodies on scientific and personnel policy in the Russian Arctic in 2015–2016, several roundtables and seminars had been held within the framework of international and All-Russian scientific conferences in the NArFU: “Monitoring and Evaluation of the Development of the Arctic Territories”, “Training for the Arctic: From Problems to Solutions”, “The Arctic – National

Megaproject: manpower and scientific support", and international scientific forum "The Arctic: Present and Future – 2016".

4. Discussion

Analyzing the SES in the subjects of the Russian Arctic, we can conclude that it is not homogeneous. This is determined by different number of universities, scientific institutions, centers of applied research and consumers of their services. The Russian Arctic includes both entire subjects of the Russian Federation and their parts. This determines the localization of universities, scientific research and R&D, application of management technics, financing and other forms of state support.

Figure 1 shows the number of educational institutions with the Arctic study or research programs. Figure 2 shows Russian universities with the Arctic study programs.

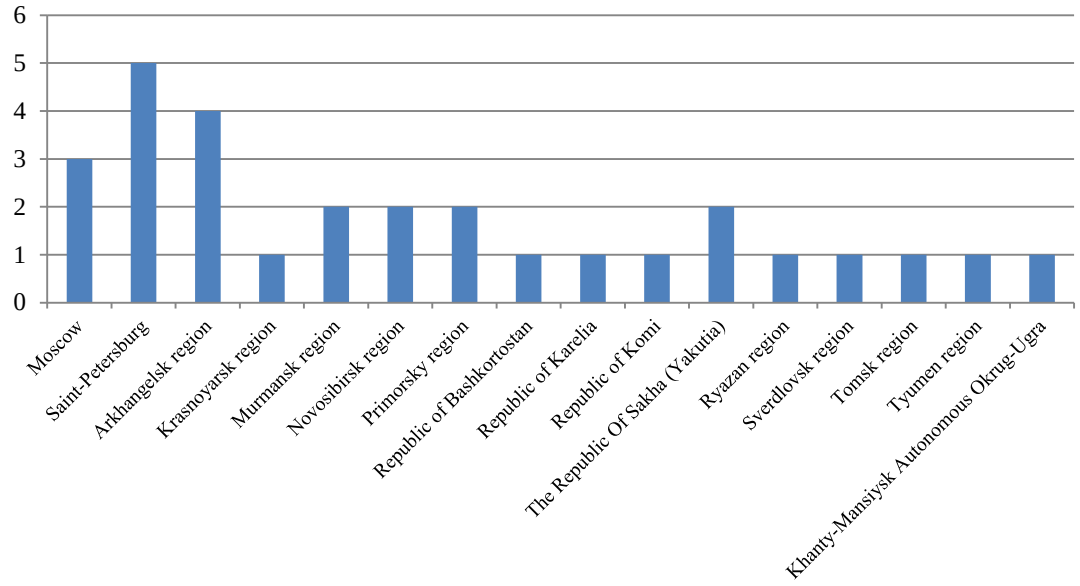

Fig. 1. The number of educational institutions with the Arctic study programs in the subjects of the Russian Federation

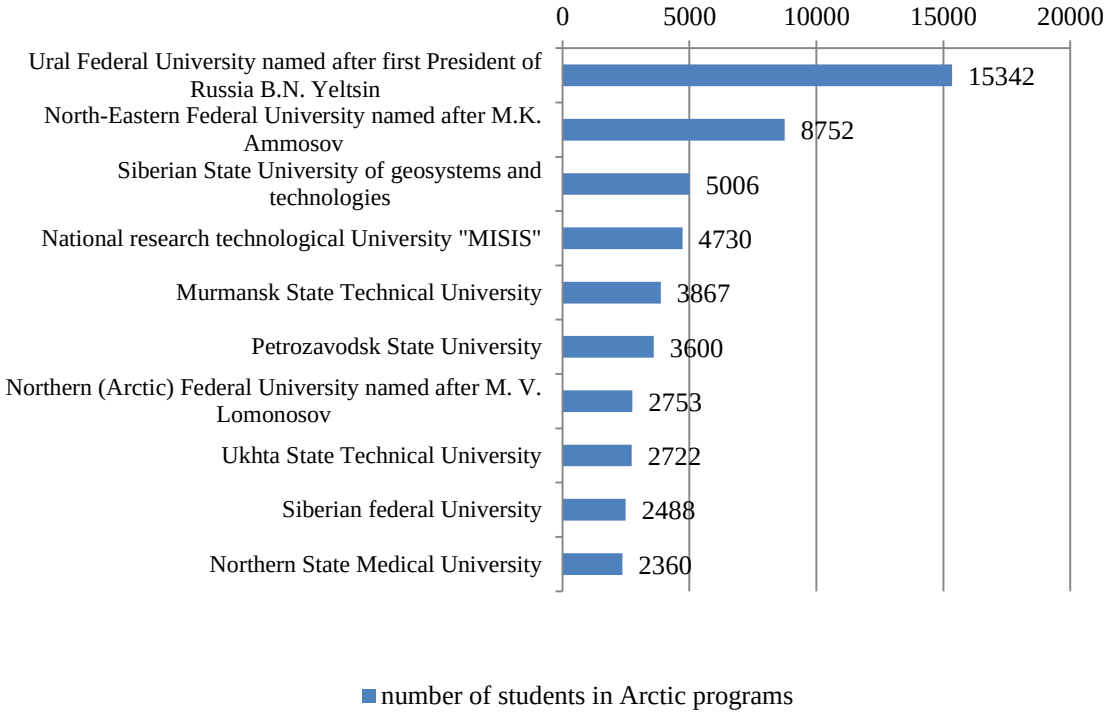

Fig. 2. Russian universities with the Arctic study programs

The total number of students trained within the Arctic study programs in educational institutions of Russia is 61 424 people. 54% are trained on a budgetary basis and 46% on a full-paid basis (See Figure 3).

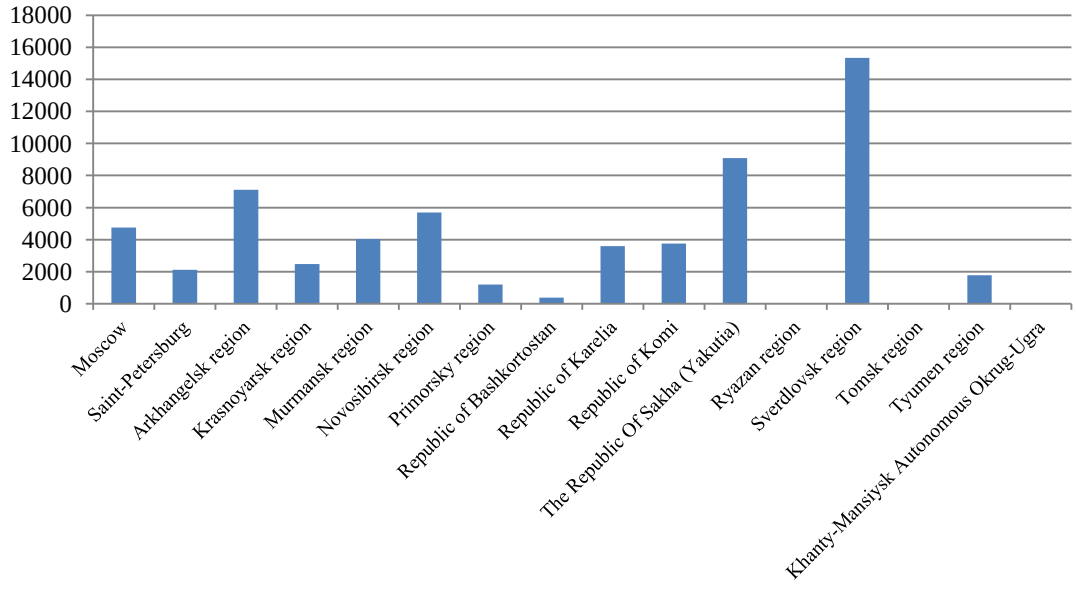

Fig. 3. The number of students trained within the Arctic study programs in the subjects of the Russian Federation

The number of degree programs with the Arctic components is 227 (Figure 4).

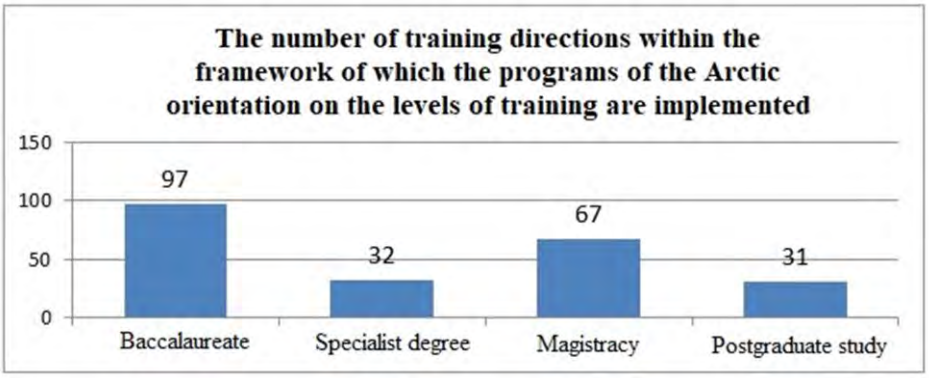

Fig. 4. The number of degree programs with the Arctic components

In the Figure 4, bachelor's degree is the level with the maximum number of the Arctic programs and disciplines compare to the other training levels and the maximum number of students. The bachelor's degree programs are related to construction (4,521 students), oil and gas business (3,700 students), electricity (2095 students), metallurgy (2028 students), applied hydrometeorology (1342 students), pedagogics and jurisprudence (less than 1000 students). If we apply the same criterion to the specialist degree programs, we get the following list of programs with the Arctic component: mining (4977 students), applied geodesy (2858 students), medicine and pediatrics (2342 and 988 students respectively), and navigation (946 students). Master's degree programs with the Arctic component: metallurgy (805 students), oil and gas business (554 students), construction (196 students), ecology and environmental management (161 students), IT (153 students), and economics (128 students). Postgraduate courses with the Arctic focus: geosciences, biological sciences, medicine, geology, exploration and mining, shipbuilding and water transport. They are distinguished by the largest number of profiles and the number of students.

The monitoring showed that only 3.5 % of students within the Arctic study programs were trained under the target admission contracts, 4.3 % of students studied under target enrollment contracts in the universities located in the Russian Arctic. 3.2 % were trained under such admission contracts at the universities located outside the Russian Arctic. Low rates are usually perceived as an alarm. They indicate that educational institutions have little interaction with enterprises on target admission, incl. applied scientific, graduate and undergraduate programs.

According to official statistics, the number of universities, students, scientific institutions and employees differ in the subjects of the Russian Arctic (Table 1).

Table 1. Number of universities and scientific organizations and their quantity in the subjects of the Russian Arctic (incl. the subjects located outside the Russian Arctic)

Subject of the Russian Federation	MO	NAO	ChAO	YaNAO	AO	KK	RS(Ya)	KR
Number of higher educational institutions	2	0	0	0	3	10	7	3
Number of branch higher educational institutions	16	0	2	16	8	29	18	11
Number of graduate and undergraduate students	20,4	0	0,5	5,6	25,7	96,1	30,4	24,5
R&D institutions	29	4	1	4	28	52	24	24
Number of staff engaged in R&D	2342	62	24	109	1045	7543	2250	1981

Note: MO – the Murmansk oblast, AO – the Arkhangelsk oblast, KR – the Komi Republic, RS(Ya) – the Republic of Sakha (Yakutiya), KK – the Krasnoyarsk krai, NAO – the Nenets Autonomous District, ChAO – the Chukchi Autonomous District, YaNAO – the Yamal-Nenets Autonomous District.

The data in Table 1 proves the absence of higher educational institution in autonomous districts. The Nenets Autonomous District only has a branch institution of the NArFU. Therefore, training "on the ground" in order to meet the needs of local extractive industries is almost absent. In these subjects, a small number of R&D institutions are represented, compare to the other parts of the Arctic zone.

Even more noticeable is the differentiation of the Arctic territories in terms of the SES quantitative parameters. Table 2 presents calculated density indices of the scientific and educational space in relation to the area of the Russian Arctic.

Table 2. The density of some of the SES indexes of the subjects of the Russian Federation in relation to the territories of the Russian Arctic

Subject of the Russian Federation	Number of higher educational institutions and their branches per 1000 km²	Number of graduate and undergraduate students per 1000 km²	Number of R&D institutions per 1000 km²	Number of staff engaged in R&D per 1000 km²
The Murmansk oblast	0,138	140,78	0,200	16,16
The Arkhangelsk oblast	0,029	62,21	0,068	2,53
NAO	0,000	0,00	0,023	0,35
ChAO	0,003	0,69	0,001	0,03
YaNAO	0,021	7,28	0,005	0,14
The Krasnoyarsk krai	0,016	40,60	0,022	3,19
The Republic of Sakha (Yakutia)	0,008	9,86	0,008	0,73
The Komi Republic	0,034	58,78	0,058	4,75

Table 2 represents the differentiation level of the scientific and educational space varies hundreds of times. E.g., between the autonomous districts and the Murmansk Oblast. It can be concluded that SES in the subjects of the Russian Arctic exists in the Murmansk oblast, the Arkhangelsk oblast, the Komi Republic and the Sakha (Yakutia). In all autonomous districts, it does not exist.

In order to analyze the next SES level, it is necessary to determine the conditions and mechanisms of interaction between the subjects.

72 % of the Arctic educational programs developed by the SVE and HPE institutions (not discussed here) use the resources of enterprises and other institutions (9%); management practices (73.6 %); and cooperation agreements (23.3 %) (Table 3).

Table 3. The Arctic educational programs in network interaction with companies

University	Number of the Arctic study programs	Number of the Arctic study programs that use the resources of the basic departments	Number of the Arctic study programs that use internship agreements	Number of the Arctic study programs that use other types of contracts and agreements
NArFU	8	13	132	21
Murmansk State Technical University	-	-	35	10
North-East Federal University named after M.K. Ammosov (NEFU)	-	-	139	-
MASU	-	-	-	10

Universities research in the interests of the employer. 45 % of the research topics are in the natural sciences, 41 % – technical, and 14 % – humanities. Nevertheless, a survey of the Russian Arctic enterprises revealed dissatisfaction with the cooperation in the training: enterprises are partners in 22 % of scientific projects (more than 40 % of scientific projects are completed together with the other universities (network projects) and 38 % – with the RAS institutions), 36% of the projects in higher education institutions are linked to megaprojects.

One of the effective forms of interaction between the education and enterprises is a network of applied programs. In the Russian Arctic, 12 universities work on the Arctic programs like that. The other form of interaction is the creation of a basic department. The NArFU branch in Severodvinsk and the enterprises "Arktika" and "Sevmash" organized basis departments of the ship and power engineering and ship life-cycle management with more than 700 students. The Shipyard "Krasnaya Kuznitsa" and "Zvezdochka" Ship Repair Center" support the NArFU Department of Informatics and Computer Technology (246 students). The Arkhangelsk pulp and paper mill (APPM) (Novodvinsk, Arkhangelsk oblast) and Sukhonsky pulp and paper mill (Sokol, Vologda oblast) created a basic department for chemistry students. The program "Technosphere security" is supported by the Federal Fire Service of the Arkhangelsk oblast that contributes to the activities of the Fire and Rescue Department of the university. It seems appropriate to organize the basic departments on hydrometeorology. In addition to the applied aspects of training, various cooperation (incl. expeditions) between the federal university and the territorial agency of Roshydromet could contribute to the assessments of climate change. This will also help the enterprises located both in the Arctic zone and to the south, improve the quality of hydrometeorological support for navigation along the Northern Sea Route, and ensure public safety (Caturov, Klepikov, 2012).

Clusters are the next level of the SES formation. The possibility of scientific and innovative economy based on clusters is proved by the experience of Northern Europe (Severnaya Evropa, 2008). Sweden, Norway and Finland are developing public-private partnerships with industrial enterprises, scientific, educational and public organizations, using international cooperation. The Nordic experience is worthwhile to study and to adopt to the Russian conditions, especially since it is successful (Zajkov et al., 2017). Clusters are being created in various territories of our country. They are based on the integration of educational and scientific organizations, medium and small businesses and resource corporations. Examples are the territorial and branch complex "Export and Import of Education", established in Tomsk in 2014, and a scientific and educational cluster with the participation of the Kazan Federal University.

The state systematically updates the scientific policy in the Arctic zone, bringing it in line with global trends in the development of education and fundamental and applied scientific research. These measures could be used to form clusters on the basis of universities, research centers and on the international basis. The last observation follows from the interdisciplinary nature of scientific research in the Arctic region. Scientific research and applied developments are created in the thematic groups of the University of the Arctic, the International Arctic Science Committee, the Spitsbergen scientific center, the BEAR working groups, the Arctic Council, and the Northern Dimension (Zaikov et al., 2016; The Arctic Council, 2016). Support of scientific and innovative activities is a goal for the RF Government Decree No. 218 April 9, 2010 "On measures of state support for the development of cooperation between Russian educational institutions of higher education, state scientific institutions and organizations implementing complex projects for the creation of high-tech production, within the framework of the subprogram "Institutional development of the research sector" of the state program "Development of science and technology 2013-2020" (Zajkov et al., 2017). Some clusters of the Russian Arctic are presented in Table 4.

Table 4. Some clusters of the Russian Arctic

Cluster	Subject	Key specialization	Number of participants	Number of employees, thousand people	Year	Development level
Innovative territorial forestry cluster of the Arkhangelsk oblast "PomorInnovaLes"	The Arkhangelsk oblast	Forestry and woodworking, pulp and paper industry	31	20110	2014	Medium
Shipbuilding innovative territorial cluster of the Arkhangelsk oblast	The Arkhangelsk oblast	Shipbuilding	23	50417	2012	Medium
Tourist cluster of the Murmansk oblast	The Murmansk oblast	Tourism (entertainment, vacations, arts, sports)	116	-	2015	Initial
Tourist cluster "Severnaya Mozaika"	The Republic of Sakha (Yakutia)	Tourism (entertainment, vacations, arts, sports)	13	88	2011	Initial
Cluster of furniture, woodworking and related industries	The Republic of Sakha (Yakutia)	Forestry and woodworking; pulp and paper production	11	78	2009	Initial

Clusters include educational, scientific organizations and enterprises of the real sector of the economy. The forestry cluster of the Arkhangelsk oblast includes logging, woodworking and pulp-and-paper enterprises of the Arkhangelsk region, OJSC "Northern Maritime Shipping Company", OJSC "Arkhangelsk Commercial Sea Port", JSC "Solombala Machine-Building Plant", the SVE and HPE institutions (NArFU and Novodvinsk industrial school), R&D institutions (The Northern Forestry Research Institute, Arkhangelsk branch of "Roslesinforg" and JSC "Arkhgiprobum"). In 2012 the Arkhangelsk shipbuilding cluster was included in the federal list of innovative territorial clusters. This is the only example among the subjects of the Russian Arctic. The cluster was established in Severodvinsk and is based on the objects of the federal and regional scientific and industrial infrastructure (the SVE and HPE institutions, various research organizations (incl. the RAS institutes), centers for collective use of scientific equipment, and machine-building enterprises). Industrial enterprises design and manufacture devices for oil extraction on the Arctic shelf, testing the energy equipment adapted to the Arctic conditions and used in shipbuilding. Educational and scientific institutions together with the enterprises focus on knowledge-intensive research topics offered by enterprises, develop career-oriented activity, guarantee a workplace for students and graduates during and after training.

Currently, the "Pedagogical Cluster of the Arkhangelsk oblast", the "Social Cluster of the Arkhangelsk oblast" (together with NArFU), and a cluster for the extraction and processing of biological resources in the Arkhangelsk Region are under construction. Professional and educational clusters are considered a form of SES integration. In Yakutia, multidisciplinary research and educational complexes play an important role in the structure of technoparks, venture companies, universities and agencies for coordination of innovation activities. Since 2011, the program "Scientific, Technical and Innovative Development of the Republic of Sakha (Yakutia) 2012-2019" has been in action to form a scientific and innovative system that ensures sustainable social and economic development of the area (Zajkov et al., 2017). The Ministry of Health of Russia had been contributing to the creation of medical clusters in the Russian Arctic since 2015 (Order

No. 844 November 26, 2015 "On the Organization of Work on the Formation of Scientific and Educational Medical Clusters"). E.g., scientific and educational medical clusters of the North-Western Federal District "Severny" (with the NSMU participation) and the Siberian Federal District cluster "Sibirsky". A similar cluster was created on the basis of the Far Eastern Federal District ("Vostochny").

5. Conclusion

We should note the strategic long-term documents for the development of the Arctic zone of the Russian Federation, the Strategy for Scientific and Technological Development of the Russian Federation (approved by the President of Russia in 2016) and etc. define the tasks of transforming science and technology into a driving force of economic development. In other words, it is a transition to a knowledge economy, a balanced spatial development based on innovations, developed infrastructure and highly skilled labor.

The analysis of the monitoring results revealed the inequality of SES in the subjects of the Russian Arctic. It is possible to define the leaders (the Murmansk oblast and the Arkhangelsk oblast) and the outsiders (all autonomous districts) in terms of the SES development. The Arctic educational programs in the subjects of the Russian Arctic function due to the interaction of universities and their branches with companies that operate in the Arctic.

The assessment of the SES of the subjects of the Russian Arctic could be displayed with the help of a strategic management system and the SWOT-analysis in particular. The result of its application for the purposes of our study is presented in Table 5.

Table 5. SWOT- analysis of the SES in the subjects of the Russian Arctic

Competitive advantages (strengths)	Opportunities of the external environment
– special demand for skilled labor at existing enterprises and high-tech industries; – the interest of state authorities in the implementation of cluster policy in the Arctic; – presence of federal universities that develop educational standards and programs with the Arctic focus and a set of the "Arctic" competencies on the territory of the Russian Arctic; – availability of specialized training programs (educational standards); – obtaining the "Arctic" professional competencies and improving skills with the use of distance technologies; – exchange (incl. international) of competencies, technologies, innovations, etc.; – development of a consortium of the Arctic scientific and educational institutions.	– diversification of the Arctic economy of Russia in accordance with the priorities of the world Arctic development; – the emergence of new productions on the territory of the Russian Arctic, incl. high-tech; – involvement of economic entities in the Arctic cluster network; – creation of cluster-forming centers at the universities – integration points of the scientific and educational potential of the region; – development of production sites and business incubators; – additional activation of scientific and educational initiatives with the prospect of creating interregional clusters; – attraction of investments to the region, incl. state programs and public-private partnerships in various sectors; – renovation of the production based on R&D; – infrastructure projects.
Internal constraints (weak sides)	External environmental challenges
– high level of differentiation of SES quantitative characteristics in the subjects of the Russian Arctic;	– deterioration of the foreign policy and economic situation in the Russian Federation;

– professional and qualitative imbalance of supply and demand in the labor market; – lagging behind the training of scientific and pedagogical workers from the requirements of entrepreneurs; – decline in the working-age population; – low activity and interaction of the Arctic scientific research institutions in Russia.	– outflow of highly qualified personnel; – lack of investment in the cluster development of the Arctic; – low innovative activity of business in the areas – parts of the Russian Arctic.

The long-term development of the Russian Arctic continues in the support zones and it will be of a project nature (Pilyasov, 2011). Therefore, it seems advisable to more actively include higher education institutions in the development of equipment and technologies, considering ongoing and promising large-scale mega-projects, as well as plans for the development of support zones and zones of priority state support in the Arctic (Golovchin, Solov'eva, 2012). Today, the universities located in the Russian Arctic keep almost a half of their Arctic programs due to the use of business resources (Petrov et al., 2018).

Cluster policy is of great importance for SES in the Russian Arctic. It is expressed in integration of education, science and industrial enterprises of various profiles: from engineering to the social ones. Such activities are carried out to satisfy the needs of the basic industries in highly qualified personnel capable of ensuring long term sustainable social and economic development of the Russian Arctic, based on innovation and progressive technological solutions (Zamjatina, Piljasov, 2018; Govorova, 2018).

6. Appreciation

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