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Analyzing Trends in Training Highly Qualified Personnel in the Interests of Strategic Development of the Arctic Zone of the Russian Federation



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Abstract. The research urgency is caused by implementing the investment projects for the development of raw material base and transport infrastructure, solution of the long-term goals of socio-economic development, ensuring national security of the Russian Arctic which are provided by the Basic Principles of Russian Federation State Policy in the Arctic to 2035 and the Strategy for the Development of the Arctic Zone of the Russian Federation up to 2020. One of the priorities is training of highly qualified personnel for work in the extreme natural and economic conditions of the Arctic, which will increase the efficiency of labor results and ensure comprehensive safety of the population. The purpose of the study is a quantitative and qualitative analysis of highly qualified personnel training in the interests of the development of the Russian Arctic in 2015–2018. The scientific novelty and theoretical significance of the article is due to the fact that the implementation of the so-called “Arctic” educational programs by Russian universities, including those belonging to the National Arctic Scientific and Educational Consortium, is monitored using sociological and analytical methods. Based on the results of the study and the existing experience, the authors propose the ways to improve the quality of training, including updating educational standards, using network forms of higher education, developing targeted training and innovative research infrastructure, and creating a world-class research and education center based on the universities in the Arctic zone of the Russian Federation. The researchers make a conclusion about the possibility of using the study results when developing the measures of regional labor management policy, as well as the formation of expert and analytical opinion on the issues of highly qualified personnel training at the institutes of higher education in the Arctic zone of the Russian Federation. The materials of the article have been repeatedly tested and can be used in the educational process at universities. A further scientific search may be associated with an attempt to compare the features of personnel training at the universities of the Arctic zone of the Russian Federation and the University of the Arctic.

Key words: Arctic zone of the Russian Federation, higher education, labor resources.

Introduction

The Arctic problem has been remaining relevant for several decades. One of the reasons for this is related to the irreversible changes taking place in the Arctic region, which require consideration. Climate transformations determine the Arctic countries’ attempts to change their geopolitical position, contribute to the activation of their economic activities in the Arctic, and also touch upon the risks of managing the Arctic (northern) territories by many states that are difficult to calculate in the ultra-long term perspective (from 50 to 100 years).

The relevance of the study is based on the fact that Russia is forming the policy of managing the socio-economic development of the Arctic zone of the Russian Federation (hereinafter – the Russian Arctic, the Arctic Zone) in the 21st century.

The Russian Arctic strategy implies innovative modernization of the economy and social sphere taking into account the use of intellectual resources and the formation of advanced knowledge¹. The Basic Principles of Russian Federation State Policy in the Arctic to 2035 (approved by the Executive Order of the President of Russia in March 2020) develop the provisions of the Basic Principles of Russian Federation State Policy in the Arctic to 2020 and the further perspective². Human capital development, personnel training in the system

¹ Strategy for the development of the Arctic zone of the Russian Federation and national security up to 2020. Available at: <http://government.ru/info/> (accessed: February 22, 2019).

² Basic principles of Russian Federation state policy in the Arctic to 2035: approved by the Executive Order of the President of Russia no. 164, dated March 5, 2020. Available at: <http://government.ru/info/> (accessed: March 25, 2020).

of higher education (hereinafter – HE) and secondary vocational education (hereinafter – SVE), indigenous population included, the preservation of social guarantees and compensations for people working and residing in the Russian Arctic are the priorities of Russian policy in the Arctic. “Acceleration of the economic development of the RF Arctic zone territories” was declared one of the goals of this policy in 2020³. At the state level, it is necessary to focus on the elements usage of which will provide a synergistic effect in the implementation of the priorities of the Russian Arctic development. One of these elements is the training of personnel in the HE system. With the start of large-scale investment projects for the development of mineral resources and transport infrastructure in the Russian Arctic (hereinafter – megaprojects), resource and transport corporations, government agencies, educational and research organizations of the Russian Arctic face a shortage of highly qualified specialists who are able to live and work effectively in the extreme conditions of the Arctic. Their lack is a consequence of the population outflow, the weak involvement of businesses in targeted training and professional development of employees, the weakness of the scientific and educational space (there are no institutions of higher education in some territories of the Russian Arctic – in the Nenets Autonomous Okrug in particular) and information and analytical support for its functioning [1].

The issues of personnel training in the entities of the Russian Arctic are actively analyzed by many researchers. With the participation of Russian experts, the Arctic Council publishes a report on the state, socio-economic, and demographic characteristics of human capital in the Arctic [1]. B.A. Revich, T.L. Khar’kova, E.A. Kvasha [2]

assess the demographic situation and the quality of human resources in the subjects of the Northern Economic Region. N.G. Men’shikh notes that the shortage of personnel hinders the sustainable socio-economic development of not only the Far North and the Arctic but the entire state. The quantitative and qualitative imbalance in the labor market threatens the implementation of megaprojects and national projects in the Arctic zone. The problem of personnel shortage is not solved by means of specialists’ inflow from other regions of the country and abroad. The author differentiates two groups of tasks necessary to solve the problem of personnel training in the interests of the Russian Arctic. “The first group includes ensuring the innovative nature of basic education, updating the structure of educational institutions network, formation of integrated scientific and educational structures; provision of a competence-based approach adopted due to strengthening the relationship between theoretical knowledge and practical skills; development of educational programs variability, including the creation of an applied bachelor’s degree system. The second group of tasks involves creation of a system of continuing education, training and retraining of personnel, including a system to support consumers of continuing professional education services; supporting corporate programs for training and retraining of professional personnel; creation of a support system for organizations providing continuing professional education services” [3, p. 98].

A.V. Simakova, I.S. Stepus’, and E.A. Pitukhin analyze universities’ potential for training personnel for the development of the Russian Arctic and the results of a survey of employers in key sectors of the Russian Arctic economy. According to the survey results, the authors formed a list of popular professions, most of them belonging to the SVE system. However, the subjects of the Russian Arctic do not have training in many of these areas. Using expert methods, the authors assess the coverage of

³ Basic principles of Russian Federation state policy in the Arctic to 2035: approved by the Executive Order of the President of Russia no. 164, dated March 5, 2020. Available at: <http://government.ru/info/> (accessed: March 25, 2020).

employers' needs for highly qualified labor resources both in general and in the context of specialties and training areas. The researchers pay attention to the problem of graduates' migration outside the Arctic region and its impact on the personnel potential of the territory. The research proves that it is advisable to develop international cooperation within the Barents Euro-Arctic region in order to form advanced professional competencies among Russian graduates based on the experience of universities and enterprises of the Republic of Karelia [4; 5; 6; 7].

O.M. Ostrovskaya emphasizes that the mission of Russian universities is "to build up the intellectual potential for the country's development", to provide society with a constant inflow of modern-minded and socially responsible young citizens. The author compares the personnel training processes in the higher education sphere during the Soviet and current time periods. The researcher considers the conditions that do not always contribute to improving the quality and accessibility of education, but which should be taken into account by universities in educational process and when promoting their graduates' employment. The research presents the current forms of training and cooperation between universities, enterprises, science, and government bodies. The author makes conclusions about the need to break the distance between the content of training at the university and the prospective personnel needs of the economy [8].

M.V. Ivanova and O.V. Shabalina consider the interconnection between higher education and the possibilities of implementing state policy in the North and in the Russian Arctic at the present stage. According to the authors, the factors hindering the effective training of personnel in the Arctic regions include the imbalance between supply and demand in territorial and professional terms. There are mutually exclusive trends in the labor market: on the one hand, there is a shortage of labor, on the other – there are difficulties in

finding a job. The reform of higher education did not fully solve the problem of securing young people in the northern regions and meeting the needs of regional labor markets. The article presents the historical experience of involving young people in the development of the Arctic showing the importance of higher education, which began in the Soviet period. "The training of specialists who improved the theoretical, material and technical base of Russian science and accumulated empirical data ... allowed Russia to implement a large number of state tasks in order to protect its economic and geopolitical interests in the Arctic in the 18th – early 20th centuries" [9, p. 200].

V.P. Ignatiev, A.P. Bogushevich, and A.A. Darmaeva consider the issues related to training personnel for the Arctic zone of the Republic of Sakha (Yakutia) and believe that a systematic approach should be used in the development of the territory. To train personnel capable of working in the extreme conditions of the Arctic, it is necessary to update (or create in some places) educational and professional standards with the participation of employers, to develop disciplines that form special competencies necessary for working in the Arctic. The authors offer a list of such competencies, as well as examples of HE educational programs for training specialists, including online forms [10].

O.V. Budzinskaya notes that the projects on deposits development, most of which have not yet been released to the real economy, are short of specialists skilled in robot systems settings, upgrading (or creating) information and telecommunication technologies on the land territories of the Russian Arctic. The analysis showed that the Russian Arctic is characterized by the most extensive and deep network in the Arctic region for training specialists in the institutions of secondary vocational education and higher education [11].

Smyaglikova E.A. and Kostylev I.I. [12; 13] analyze the features of the Arctic labor market

and personnel training for the development of cargo transportation via the Northern Sea Route (hereinafter – NSR). V.G. Tsuprik, A.B. Afonin, P.A. Garibin emphasize that, in the entities of the Russian Arctic, training is in demand due to the activity of Russia and foreign countries for the extraction of resources in the shelf seas of the Arctic ocean, construction of infrastructure, and NSR development. The authors provide examples of partnerships at the national and international levels in the field of personnel support for sustainable socio-economic development of the northern territories [14].

Foreign experts and researchers do not consider the problems of higher education and training in the Far North as widely as their Russian colleagues do. They are attracted to private aspects, such as the industry standards of secondary and higher education. The use of sociological methods to study the education system is often limited to school education; researchers analyze the opinions of adolescents and teachers on the organization and prospects of education and upbringing. Much attention is paid to the analysis of the educational space among indigenous peoples. We should note that Russian sources lack such comparisons as “education – consolidation in the North – geopolitics”, which are common in foreign publications [15; 16]. Researchers from the Estonian University of Applied Sciences and Entrepreneurship, analyzing the process of training at universities, formed a list of specific skills and studied the students’ opinion about the role of “northern” skills in the curriculum. They revealed that students highly appreciate the importance of these skills and focus on the need for their acquisition and development in the process of their studies [17].

The articles [18; 19] present the experience of forming a list of professions taking into account the priorities of the Arctic development and criteria formed on the basis of data from the monitoring

of vacancies of employment services and the forecast of the employers’ personnel needs. S. Moller explores the models of decentralized nursing education in the circumpolar North, considering educational programs at the University of Greenland [20]. M. Salo analyzes the creation of a high-tech “Oulu Technopark” in the Far North of Finland, which is one of the first in the North of Europe based on the collaboration of the state, the University of Oulu, and Nokia Corporation [21]. O.A. Misund [22] approaches the importance of preserving and developing higher education in Svalbard from the standpoint of securing Norway on it and implementing the provisions of the national Arctic strategy. J. McDonnell, J. Kohut, O. Schofield, and others [23] focus on the Polar ICE platform (www.polar-ice.org), a comprehensive educational and information program to provide virtual access to the Polar Regions for high school teachers and university scientists to improve their understanding of polar science. E.V. Bania and S.E. Kvermo [24] study the mental health characteristics of indigenous Sami and non-indigenous youth in the socio-cultural space of rural and urban areas of the Far North of Norway. The purpose of K. Black’s article [25] is to analyze the features of the development of postgraduate education in the Western and Eastern Arctic in 1945–1990 and clarify the role of Canadian universities in the implementation of socio-economic goals of nation-building in northern Canada.

This article continues the research that the authors started in 2016–2017, but it does not aim at comparing the results of the two studies in detail. We have found that the deployment of megaprojects and the emigration of the working-age population from the subjects of the Russian Arctic can be considered as factors contributing to the formation of the need for labor resources [26]. One of our conclusions reveals that there is a need to improve the state policy in the field of personnel training for the implementation of the Arctic strategy of Russia.

This makes the task of organizing and conducting research on the system of training personnel with higher education to work in the Russian Arctic relevant.

In 2018, we carried out a study aimed at quantitative and qualitative analysis of highly qualified personnel training in the interests of the development of the Russian Arctic in 2015–2018. Quantitative analysis implied the establishment of a number of offered educational programs with the Arctic focus and their distribution across the education levels (bachelor, specialist, master, and post-graduate studies); a number of educational programs graduates including those enrolled in the target training contracts; distribution of educational programs by some integrated groups of training areas (hereinafter – IGTA) and thematic groups defined by the Strategy of Scientific and Technological Development of the Russian Federation, in the HE organizations that participated in the monitoring for the 2015–2018 period⁴. The qualitative analysis assumed establishing the areas within which personnel training is carried out in the interests of the development of the Russian Arctic by the HE organizations that participated in the monitoring.

The study covered 121 HE organizations, including the National Arctic Research and Educational Consortium (hereinafter – NAREC). NAREC was established in 2016 on the basis of the Northern (Arctic) Federal University named after M.V. Lomonosov (hereinafter – NArFU). The purpose of the association is to consolidate public and private resources (including scientific initiatives) in the field of scientific and personnel support for sustainable socio-economic development of the Arctic and northern territories of the Russian Federation. “NAREC is focused on creating a unified scientific and educational

space that provides information and analytical support for the development projects of the Russian Arctic, including the coordination of research and educational activities”⁵. Scientific research of the association covers fundamental and applied aspects of natural, social, humanitarian and engineering sciences. NAREC is a co-organizer of the scientific and educational expedition “Arctic Floating University” (organized by NArFU, Russian Geographical Society, Roshydromet, Russian and foreign research and educational institutions); it supports talented students (the annual All-Russian competition of student research papers on Arctic), student mobility (annual research internships of the winners of this competition), information exchange development (monitoring and publishing news on the NAREC website), mass open online courses (MOOC) on Arctic, development of professional educational and industry standards for the training of highly qualified specialists⁶.

Research methodology. The main research methods involve sociological survey and system analysis. As far as there is no federal statistics data on the considered problem, the authors relied on the results of the state assignments of the Ministry of Education and Science (hereinafter – MES), implemented by NArFU in 2016–2018, in order to identify the universities offering Arctic focused programs⁷.

⁵ National Arctic Research and Educational Consortium. Available at: <http://arctic-union.ru/contacts/> (accessed: March 28, 2020).

⁶ National Arctic Research and Educational Consortium. Available at: <http://arctic-union.ru/contacts/> (accessed: March 28, 2020).

⁷ MES State Assignment no. 27.262.2016/HM “Information and analytical support of scientific and educational space of the Arctic zone of the Russian Federation” (2016), MES State Assignment no. 27.9701.2017/HM “Development of a monitoring system of training of specialists with higher education for working and conducting research in the Arctic zone of the Russian Federation” (2017), MES State Assignment no. 27.12661.2018/12.1 “Expert-analytical support of the implementation of state policy in the field of training for work in the Arctic zone of the Russian Federation and international cooperation in the framework of the University of the Arctic” (2018).

⁴ On the scientific and technological development strategy of the Russian Federation: Executive Order no. 642, dated December 1, 2016. Available at: <http://kremlin.ru/acts/bank/41449> (accessed: March 10, 2020).

The methodological basis of the study was the structural and functional approach, which allowed considering the system of training highly qualified personnel through a set of implemented functions and activities. Using the analytical method and systematic approach, we analyzed educational and methodical documentation of the universities (curricula, basic professional educational programs, working programs of subjects), regulatory documents (Federal State Educational Standards, hereinafter – FSES, professional and industry standards). Using the methods of generalization and analysis helped us to evaluate the content of a few foreign and Russian statistical, information and scientific sources on the studied topic.

The research program included designing a questionnaire that allowed identifying the HE organizations implementing Arctic focused educational programs, as well as determining the quantitative and qualitative characteristics of training personnel to work in the Arctic. The data was collected remotely via the Internet.

Preparation of the list of scientific areas implemented by universities and scientific organizations in the interests of the Russian Arctic included several stages. At the first stage, we compiled a list of education areas on the basis of the scientific and technical information category and the nomenclature of training areas and specialties. Next stage included expert assessment of the thematic field of the projects carried out by universities and scientific organizations, which made it possible to classify and systematize them.

The monitoring covered 121 HE organizations, including NAREC universities. The criteria that determine the Arctic focus of the educational program include the following parameters:

- partner organizations carrying out economic activities in the territory of the Russian Arctic are involved in the implementation of the educational program;

- provision of students' internships in such organizations (an agreement on organizing and doing the internship);

- doing research, participation in projects on Arctic in cooperation with Russian and international partners;

- availability of basic departments on the basis of universities and enterprises of the Russian Arctic;

- availability of “Arctic focused” skills and competencies in the main educational programs, work programs of subjects, evaluation funds in the analyzed areas of training (for example, in NArFU there is a profile of “Polar Meteorology” within the training areas 05.03.04 Hydrometeorology, a profile of “Natural resource potential of the Arctic” within the training area 05.03.06 Ecology and Nature Management, and others).

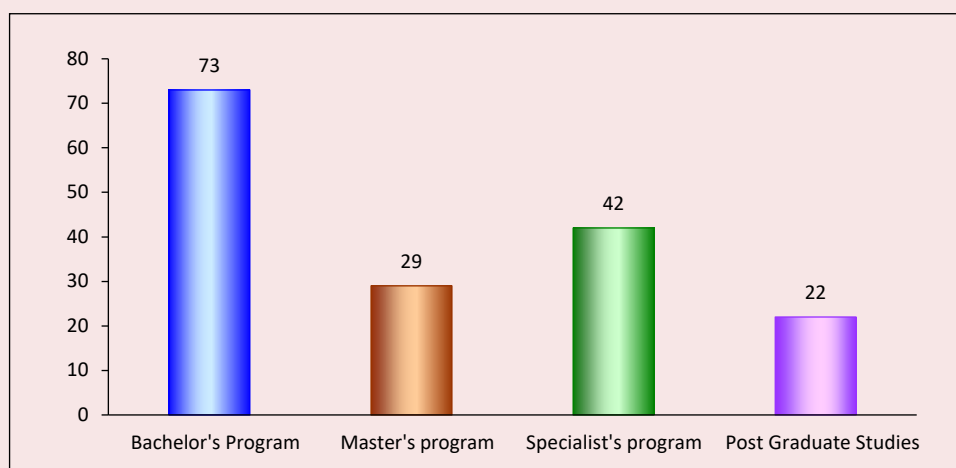
Results and discussion. According to the results of the 2018 monitoring, we have found out that 32 HE organizations out of 121 (13 are part of NAREC) implement Arctic focused programs. Totally the universities of the Russian Arctic implement 166 Arctic focused training programs. Their distribution by level of training is shown in *figure 1*.

The following *table* shows the distribution of educational programs for some IGTA.

The monitoring results showed that 92% of the Arctic focused educational programs include Arctic modules or subjects. Students' research works of 83% of the master's programs of the educational organizations included in NAREC reflect the Arctic specifics.

More than 90% (more than 360 units) of Arctic educational programs are implemented in the areas defined by the Strategy of Scientific and Technological Development of the Russian Federation. 52.4% (218 units) are related to training personnel for the implementation of the transition to digital, intelligent production technologies, the use of robotic systems, machine learning and artificial intelligence, big data processing

Figure 1. Distribution of Arctic focused educational programs by levels of personnel training in the HE organizations, 2018, units



Compiled by: monitoring data.

Distribution of Arctic focused educational programs in some IGTA, 2018

IGTA	Number of educational programs by level of education, units.			
	Bachelor's program	Specialist's program	Master's program	Post Graduate studies
08.00.00 Construction Methods and Technologies	17	6	10	–
21.00.00 Applied Geology, Mining, Oil and Gas and Geodesy	15	12	4	–
44.00.00 Education and Pedagogical Sciences	27	–	–	–
15.00.00 Mechanical Engineering	19	20	6	–
05.00.00 Earth Sciences	5	–	7	6
06.00.00 Biological Sciences	6	–	6	4
31.00.00 Clinical Medicine	–	4	–	5
13.00.00 Electric and Heat Power Engineering	5	–	3	–
20.00.00 Technosphere Safety and Environmental Management	6	–	–	–
26.00.00 Methods and Technologies of Shipbuilding and Water Transport	6	–	–	–

Compiled by: monitoring data.

systems. 11.8% (49 units) are aimed at forming an effective response of society to global challenges arising from the interaction of man, technology and the environment, the development of social institutions, including using the methods of the humanities and social sciences. 10.6% (44 units) are focused on the transition to environmentally friendly and resource-saving energy, improving the efficiency of mining and deep processing of

mineral raw materials, creating new energy sources, methods of its transportation and storage. More than 50% (more than 200 units) of Arctic focused educational programs are in the field of engineering. They are distributed according to the IGTA in the following way: 08.00.00 Construction methods and technologies (17.1%, 35 programs), 21.00.00 Applied Geology, Mining, Oil and Gas, and Geodesy (16.2%, 30 programs), 13.00.00 Electric

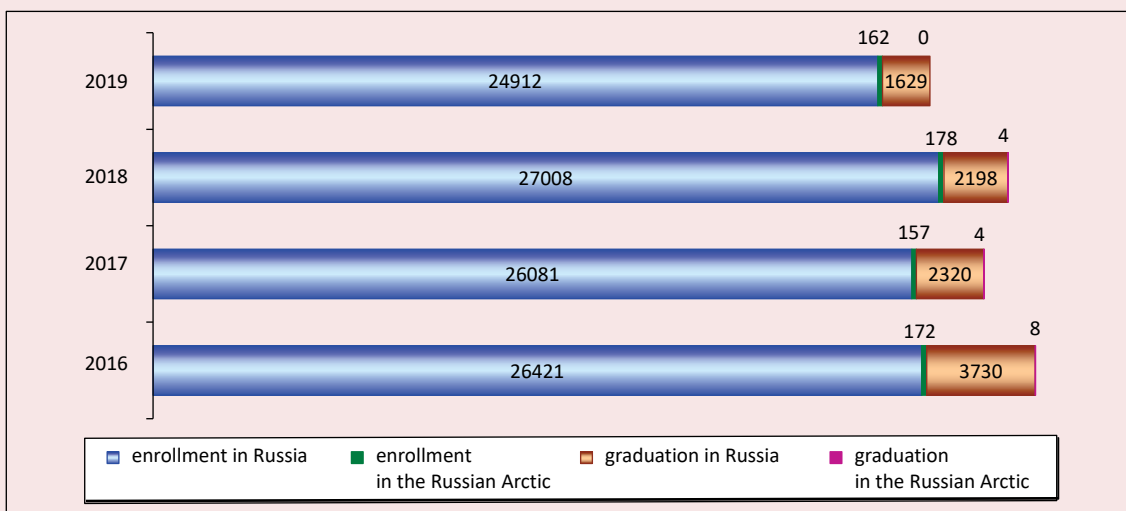
and Heat Power Engineering (8.3%, 18 programs), 26.00.00 Methods and Technologies of Shipbuilding and Water Transport (6.9%, 15 programs), 09.00.00 Computer Science and Engineering (3.7%, 8 programs), 23.00.00 Land Transport Engineering and Technology (3.7%, 8 programs), 15.00.00 Mechanical Engineering (3.7%, 8 programs).

A total number of graduates of the Arctic focused educational programs in the HE organizations in 2015–2018 was 23,871 people. They included 760 people studied under targeted training contracts: 40% in the bachelor’s programs, 5.2% in the specialist’s programs, 2.5% in the master’s programs. Thus, about 3% of a total number of graduates of the Arctic focused educational programs were trained under targeted training contracts, including 62% at the universities belonging to the Russian Arctic. These results allow us to conclude that the HE organizations do not sufficiently use the capabilities of business enterprises for the implementation of educational programs in the organization of targeted training. The surveys have shown that the implementation of

more than 90% of the Arctic focused educational programs provides for the possibility of internships at enterprises engaged in economic activities in the territory of the Russian Arctic.

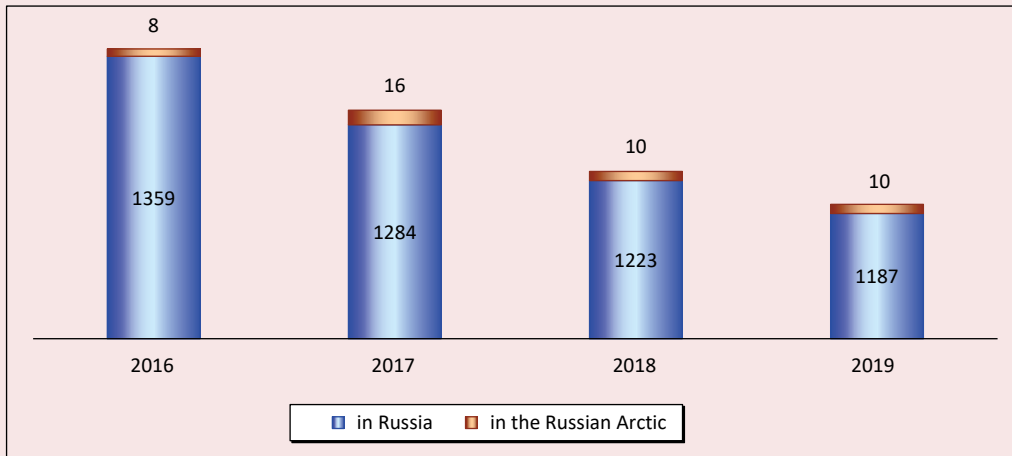
We can analyze some qualitative indicators of training of highly qualified personnel for work in universities and research organizations of the Russian Federation and its Arctic zone by means of the official statistics (Fig. 2–5). Without comparing the indicators with the all-Russian ones, we should note that almost all of them show negative dynamics in the entities of the Russian Arctic. This factor may affect the fact that the share of high-tech innovative goods, works (services) of organizations in a total volume of goods shipped, works (services) performed in entities of the Russian Arctic is three to five times lower than an average Russian level. The volume of innovative goods, works, and services produced at the enterprises of the Russian Arctic decreases. Against this background, the internal running costs of research and development (hereinafter – R&D) in the entities of the Russian Arctic increased insignificantly: from 4272.5 million

Figure 2. Number of candidates enrolled at and graduated from post-graduate studies, 2016–2019, people



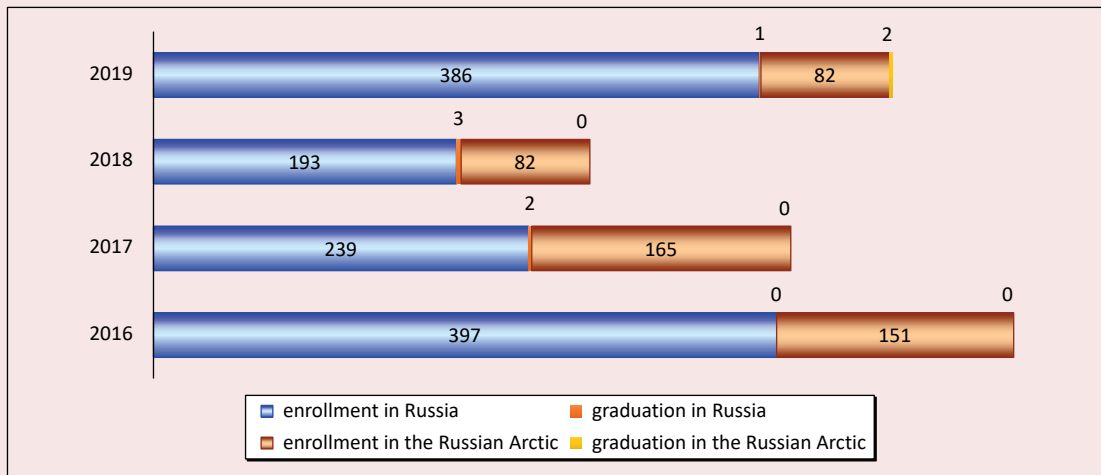
Calculated by: Regional statistics. Arctic zone of the Russian Federation. Available at: <https://www.gks.ru/regional-statistics> (accessed: March 30, 2020).

Figure 3. Number of organizations with post-graduate studies in the Russian Federation and the Russian Arctic, 2016–2019, units



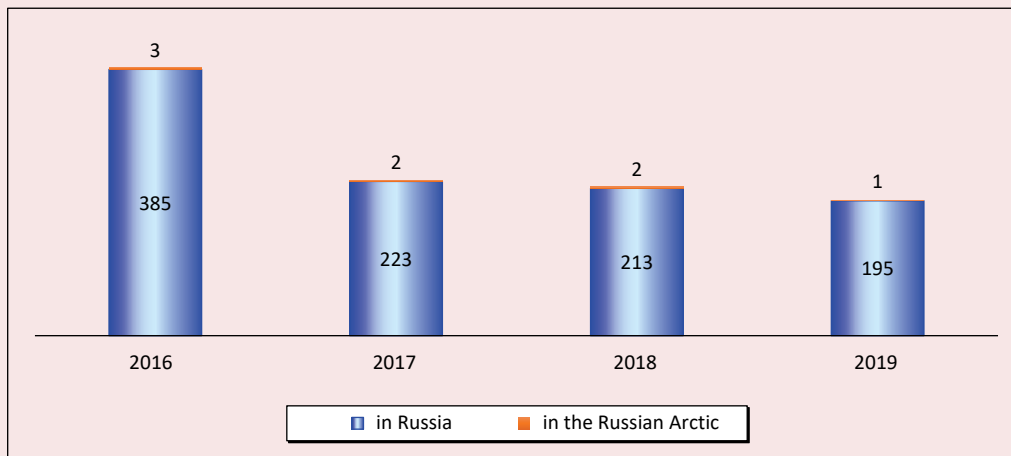
Calculated by: Regional statistics. Arctic zone of the Russian Federation. Available at: <https://www.gks.ru/regional-statistics> (accessed: March 30, 2020).

Figure 4. Number of candidates enrolled at and graduated from doctoral studies, 2016–2019, people



Calculated by: Regional statistics. Arctic zone of the Russian Federation. Available at: <https://www.gks.ru/regional-statistics> (accessed: March 30, 2020).

Figure 5. Number of organizations with doctoral studies in the Russian Federation and the Russian Arctic, 2016–2019, units



Calculated by: Regional statistics. Arctic zone of the Russian Federation. Available at: <https://www.gks.ru/regional-statistics> (accessed: March 30, 2020).

rubles in 2016 (the Russian figure is 873878.9 million rubles) to 4579.9 million rubles in 2018 (the Russian figure is 960667.9 million rubles). The costs for technological innovations in the subjects of the Russian Arctic increased approximately fivefold in 2016–2018⁸.

Conclusions and recommendations. Based on the results of the study, we can draw the following conclusions. As we noted earlier: “The current need for labor resources with higher education is 6,198 people (including 3,680 with bachelor’s degree, 1,364 specialists, 1,145 with master’s degree). The medium-term (until 2022) need is 8,261 people (including 4,658 with bachelor’s degree, 1,836 specialists, 1,753 with master’s degree). In the regional context, the greatest demand for labor resources was shown by the Murmansk Oblast, the Yamalo-Nenets Autonomous Okrug, and the Komi Republic. The Nenets and Chukotka Autonomous

⁸ Regional statistics. Arctic zone of the Russian Federation. Available at: http://www.gks.ru/free_doc/new_site/region_stat/arc_zona.html (accessed: March 10, 2020).

okrugs and the Republic of Sakha (Yakutia) demonstrated the lowest indicators of personnel needs” [26, p. 189]. Comparing these data with those obtained as the results of this study (the number of graduates of Arctic focused educational programs in the HE organizations in 2015–2018 is 23,871 people), we can argue that, in quantitative terms, a number of the HE organizations’ graduates is several times higher than the personnel required for them. This may contribute to unemployment growth, outflow of able-bodied population, including highly qualified labor resources. These factors may ultimately lead to a further delay in the megaprojects implementation envisaged by the Russian Arctic strategy, and negatively affect the pace of the socio-economic development of the entities of the Russian Arctic. At the same time, employers are not always satisfied with the quality of the young professionals’ training; they often have to “complete their studies” in the workplace [26]. In this regard, based on the results of the study and on the existing experience, in order to improve the

quality of training of highly qualified personnel for work in the Russian Arctic, we consider it appropriate to apply the following measures:

1. *FSES update*. Since 2017, the Ministry of Education and Science of the Russian Federation has been working on the inclusion of requirements of professional standards in the universities' educational practice. However, such standards are not approved for all IGTA: for example, they are not available for hydrometeorology (IGTA group 05.00.00). It could be of practical interest if the Russian Arctic Federal University (NArFU) developed its own educational standards. This would increase the share of the applied bachelor's degree programs, and purposefully respond to the employers' requests. The authors of the research have experience in such activities.

2. *Modernizing targeted training tools*. Since 2016, the Ministry of Education and Science has been developing a new form of contract for targeted admission and training between the university, the customer (employer) and the applicant⁹. The state approach assumes mutual responsibility of all parties, including graduates' "serving out" at the enterprise or paying a penalty for non-performance of this obligation. Institutions of targeted admission and training can be developed with the participation of enterprises and businesses in fundamental and applied scientific research. In this case, there is a practical benefit both for the university and the enterprise, who are interested in the research.

3. *Development of basic departments*. The task of the basic department is to bring the educational process closer to the needs of the enterprise, to reduce the period of young specialists' "completing studies" at the workplace. Basic departments appeared in Russia in the early 2000s. In 2013, it became possible to organize them at enterprises for

the implementation of practice-oriented training (applied bachelor's degree). Since 2017, MES has been using a special approach to licensing the educational activities of organizations that create basic departments. In particular, it fixed the possibility of licensing such structural units within the university, which removes excessive requirements for basic units in terms of the need to implement an educational program on their sites. Heads of enterprises on the basis of which they are created will be allowed to the management of such departments the [8, p. 66].

4. *Organization of educational activities using network forms*. As O.M. Ostrovsкая notes, network form, according to the definition of the Ministry of Education and Science, involves the organization of training using the resources of not only educational organizations, including the foreign one, but, if necessary, other organizations. "...The network form is used to improve the quality of education, expand students' access to modern educational technologies and training tools, provide an opportunity to choose training profiles and specializations, in-depth study of training modules / disciplines, form and develop professional competencies by studying the experience of leading educational and industrial organizations, increase the competitiveness of graduates in the Russian and international markets of educational services and labor..." [8, p. 60]. Based on the published recommendations of the Ministry of Education and Science, several such educational programs are being implemented in NArFU at all levels of training.

5. *Innovative infrastructure development*. The foundation for building the knowledge economy of the Russian Arctic is an innovative infrastructure, which is represented by technology parks, business incubators, venture capital companies, universities, federal research centers, and colleges (as experimental sites for pilot projects). It contributes to the sustainable functioning of the scientific and

⁹ On improving the effectiveness of targeted training and targeted admission. Available at: <http://government.ru/news/24903/> (accessed: March 10, 2020).

educational space, is used to create a system of intellectual presence in the Arctic in the long term, and provides a relevant level of scientific research and project expertise.

6. In modern conditions, a university is an organization "... which accumulates material, economic, scientific and technical, financial, information, intellectual resources and transforms them into the final product – general cultural and professional competencies of graduates, innovative educational programs, R&D..." [3, p. 101]. M.K. Yeseev addresses the issue of creating a research and educational center (REC) in the Arkhangelsk Oblast but on the interregional basis (for example, in cooperation with educational organizations and industrial enterprises of the Murmansk Oblast and other entities of the Russian Federation) [27]. RECs appearing in accordance with the goals of national projects should compete with the leading foreign universities and research organizations by 2024 on a competitive basis¹⁰. Russian RECs should link the selection of talented applicants, their training, the formation of advanced Arctic focused professional competencies, the organization and conduct of breakthrough scientific research, including the form of expeditions, and the accelerated implementation of R&D in the real sector of the economy. The development of the Arctic is a strategic goal of the Russian Federation's long-term development, so the introduction of new convergent technologies into the HE system, the use of adaptive materials and means of training and production, and the conduct of world-class research will have decisive importance for the sustainable socio-economic development of the Arctic. RECs can help creating a favorable image of universities at the international, federal and regional levels,

¹⁰ On national goals and strategic objectives of the Russian Federation through to 2024: Executive Order no. 204, dated May 7, 2018 (p.10). Available at: <http://www.kremlin.ru/acts/bank/43027/page/2> (accessed: April 8, 2020); World-class research and educational centers. Available at: <https://www.ноц.рф/about> (accessed: April 8, 2020).

which will contribute to the growth of interest in universities from applicants and the professional community.

The study elaborates the idea of training highly qualified workforce for the development of the Russian Arctic. For the first time, data from NAREC were used. The comparison of the material can only be carried out in a meaningful context with the expert and analytical materials of the University of the Arctic, the Arctic Council, the working group on Education and Science of the Council of the Barents Euro-Arctic region. They, however, do not differ in the completeness of the characteristics of the Russian Arctic. This is the novelty of the study.

The materials of the article are of theoretical significance; they have been repeatedly tested and can be used in the scientific and educational process in universities.

The monitoring allowed us to obtain the following practical results:

- identify the universities that implement Arctic focused educational programs;
 - analyze the Arctic focused educational programs in the educational institutions of NAREC;
 - create a list of skills and competencies for specialists in demand for work in the Arctic conditions;
 - analyze the volume and structure of targeted admission and targeted training of students in 2018 for Arctic focused educational programs;
- as well as others that are not considered in this article due to its limited size:
- identify the contribution of the regions of the Russian Federation to the implementation of scientific research in the interests of the development of the Russian Arctic;
 - create a list of research directions implemented by universities and research organizations in the interests of the development of the Russian Arctic.

The research conclusions can be recommended for usage by executive authorities (including those

at the interregional level, for example, between the Arkhangelsk Oblast and the Nenets Autonomous Okrug) when developing education policy, organizing research activities, managing scientific and educational space, training to meet the personnel needs of the Arctic zone subjects. The research can help fill the gap in statistical and analytical information in order to monitor the socio-economic development of the Russian Arctic. Based on its results, we have created information and analytical database, including a list and map of higher education organizations engaged in training and research in the interests of

the development of the Russian Arctic¹¹, as well as database of employers in the Russian Arctic¹².

The future scientific research within the chosen topic may be aimed at the analysis of training for key sectors of the economy in the territories of the foreign Arctic (e.g., the University of the Arctic – UArctic), comparing this information with Russian counterparts, providing the rationale for the development of international cooperation in the scientific-educational sphere and exchange experience in personnel training in universities and colleges in the Arctic region.

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¹¹ Territorial map of educational institutions and educational programs implemented in the universities of the Russian Arctic. Available at: <http://arctic-union.ru/napravleniya/base> (accessed: December 7, 2019).

¹² Territorial map of enterprises conducting economic activities in the Russian Arctic. Available at: <http://arctic-union.ru/napravleniya/kompanii-rabotodateli> (accessed: December 7, 2019).

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