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Article



Natalya Sergeevna Rumyantseva

Institute of Service Sector and Entrepreneurship (branch) DSTU
Ph.D., Associate Professor

Yulia Igorevna Prokhorova

Institute of Service Sector and Entrepreneurship (branch) DSTU
bachelor

Artur Aleksandrovich Blagorodov

Institute of Service Sector and Entrepreneurship (branch) DSTU
master

Vladimir Timofeevich Prokhorov

Institute of Service Sector and Entrepreneurship (branch) DSTU
Doctor of Technical Sciences, Professor,
Shakhty, Russia

Galina Yurievna Volkova

LLC TsPOSN «Ortomoda»
Doctor of Economics, Professor,
Moscow, Russia

THE EFFECTIVENESS OF STRATEGIC HUMAN RESOURCE MANAGEMENT FOR THE SUCCESSFUL SALE OF DEVELOPMENT PRODUCTS IN THE ARCTIC ZONE OF THE RUSSIAN FEDERATION. MESSAGE 2

Abstract: *in the article, the authors analyze the need to manage labor resources for the development of the Arctic zone, since. The Russian Arctic is a strategically significant macro-region of the Russian Federation for a number of reasons, the most significant of which are colossal proven hydrocarbon reserves that can provide the country with fuel, energy and mineral resources for many years; the economic and geopolitical significance of the Northern Sea Route as potentially one of the largest transport arteries for maritime transport; as well as the significant length of the maritime border of the Russian Federation and the need to ensure its security. In the 1990s. The development of the Arctic has taken a back seat among Russian government priorities. However, since the beginning of the 21st century, regulatory legal acts regulating Russia's policy in the Arctic have allow us to talk about an ever-increasing awareness of the critical importance of this region for achieving the goals and objectives of the development of our country as a whole. Currently, we can talk about a large-scale multi-purpose mega project for the development of the Arctic - perhaps the term "redevelopment" would be more accurate.*

The largest projects included in the modern Arctic mega-project are the exploration and development of oil and gas fields (both on land Arctic territories and on the Arctic shelf), as well as the development of the Northern Sea Route. Both of these projects require a significant amount of qualified human resources - this means that the human resources of enterprises and organizations operating in the Arctic territories play an important role in the development of the Russian Arctic. However, for state corporations of the mineral resource complex, transport companies, scientific and educational institutions of the Arctic zone of the Russian Federation (AZ RF), as well as state executive authorities, there is a significant problem of a shortage of highly qualified specialists, capable of

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living and working effectively in the extreme natural and climatic conditions of the Arctic. At the same time, there is a clearly expressed need not only for specialists with higher education, but also for workers with secondary specialized education in working specialties.

For 2024, the annual need for specialists was estimated at almost 74 thousand people for the entire Arctic zone of the Russian Federation. The possibilities of meeting the existing demand for personnel “on our own” vary from one Arctic region to another, however, it is obvious that this demand cannot be satisfied only by graduates of universities located in the Arctic Zone of the Russian Federation; Additional resources are required, especially if we are talking about narrow-profile specialists in those specialties for which the universities of the Russian Federation do not provide training at all. The problem remains of the migration outflow of youth from the northern regions to study at universities outside the Arctic Zone of the Russian Federation (after which a significant proportion of young people no longer return to the Arctic, but find employment outside of it), as well as the migration outflow of graduates from northern universities, seeking employment opportunities in other regions of the country. The underdeveloped intellectual infrastructure of the Arctic regions provokes an outflow of population.

Key words: forecasting, strategizing, additional resources, Arctic zone, Northern Sea Route, personnel, training, need, graduates, specialists, reproduction, profiles, redevelopment, demand.

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Introduction

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Main part

Strategic management of the development of the Russian Arctic is an important state task, one of the necessary conditions for the solution of which is work on long-term planning of staffing for this process. The Arctic is being developed both traditionally, through the development of permanent settlements, large and small cities, their social, scientific, educational, transport and other infrastructure, and through shifts, locally, using only the most profitable areas of management over a vast territory. The predominance of the second path is associated with the strategic lack of development of the Arctic; the first requires large and constant capital investments. In modern conditions of intensified international competition, the Arctic is becoming a zone of strategic interests of the economically (and militarily) leading countries of the world. This circumstance exacerbates the need to solve the problem of accurately forecasting the socio-economic situation as the basis for national and regional security. In turn, in goal-setting socio-economic development, the key role begins to be played not by economic growth, but by a steady increase in the level of a complex indicator - quality of life. The main goal of Arctic development, therefore, is not maximizing profits from energy sales, but “ensuring human well-being in a sustainable and a safe Arctic.” The central document of strategic planning for Arctic development is Decree of the President of the Russian Federation dated October 26, 2020 No. 645 “On the Strategy for the Development of the Arctic Zone of the Russian Federation and Ensuring National Security for the Period until 2035,”

however, Not all documents at the regional level are brought into compliance with it. In the Murmansk region, the “capital” for the Arctic, as amended in 2017, the Regional Government Decree of December 25, 2013 N 768-PP/20 “On the Strategy for the socio-economic development of the Murmansk region until 2020 and for the period until 2025” is in force, adopted long ago before the current Arctic strategy. As a result, there is a certain disunity in goal-setting of actions at the federal and regional levels. A similar situation occurs with regard to the coupling of sectoral strategies at the level of all of Russia and the Arctic regions; in this regard, we are talking primarily about the Energy Strategy of the Russian Federation for the period until 2035, which largely links the fate of the development of the gas industry with the Arctic. In general, as part of the development of human resources in the Arctic zone of the Russian Federation, it is planned to create more than 182 thousand jobs in 64 specialties by 2035, 140 thousand of them are formed within the framework of almost 200 investment projects, 42 thousand - in accordance with the needs of key employers. However, due to the peculiarities of the current situation with a shortage of personnel throughout the country, even a successful solution to this problem may cause a shortage of personnel in other regions. Traditionally high wages in the Arctic, it turns out, may also be insufficient to retain specialists in the region. Thus, if from 2010 to 2020 average wages in the northern, including the Arctic, regions increased by 2–2.5 times, then on average in Russia their growth was threefold. “Northern surcharge”, known since the times of the USSR, no longer “works” as effectively as during the Soviet period. IN USSR activea network of research organizations and universities in the regions was

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created and developed. It is interesting that this principle of regional development is actively used in the foreign Arctic. Thus, the author’s calculations showed that scientific activity (the number of scientific publications per capita) in Alaska is not inferior to the average level of such activity in the United States. In Russia (also in accordance with the data obtained by the author through a search in the Scopus database), there are only two regions with Arctic territories - the Komi Republic and the Republic of Karelia - that demonstrate a level of scientific activity, expressed in internationally presented publications, above the Russian average. In

Russia, the bulk of Arctic research is not carried out in the Arctic itself, which, of course, has and is actively developing its own scientific centers - universities and institutes - especially in the Murmansk and Arkhangelsk regions, Krasnoyarsk Territory, Yakutia. However, a significant proportion of work on the study of the Arctic is carried out in leading Russian scientific centers - Moscow, St. Petersburg, Yekaterinburg, Novosibirsk. However, it is unclear whether such “remote” exploration of the Arctic can strategically provide an effective outcome.

Table 1. Shares of publications by scientists in the Arctic regions of the Russian Federation, joint with scientists from Moscow and St. Petersburg

	2019	2020	2021	2022	4 year average	The same for 2009 - 2012.
N-SPb	67	100	-	50	56	-
N-Moscow	50	100	-	50	50	100
YAN-Moscow	36	40	34	47	39	17
Ch-Moscow	11	56	27	21	28	47
M-SPb	23	27	24	26	25	11
A-Moscow	24	25	23	26	25	16
M-Moscow	18	19	23	34	23	17
Ch-SPb	22	33	9	28	23	13
Kar-Moscow	19	20	18	26	21	15
Kar-St. Petersburg	20	20	18	18	19	14
Co-Moscow	17	18	19	18	18	17
YAN-SPb	13	19	20	10	16	0
I am Moscow	11	15	16	17	15	12
A-SPb	10	14	15	14	13	6
Ko-SPb	12	13	15	13	13	5
Kr-Moscow	10	9	12	15	11	9
Ya-SPb	8	9	11	9	9	6
Kr-SPb	4	4	6	6	5	2

As can be seen from the data presented in Table 1, the level of involvement of scientists from Moscow and St. Petersburg in Arctic research has increased significantly in recent years, which compensates for the “compression” of the scientific and educational potential of the Arctic itself. However, this cannot fully compensate for the training of personnel directly for the Arctic regions. Currently, not only developed, but also many developing countries are beginning to experience an acute shortage of personnel in a unique situation in global history, when there are fewer young people entering professional life than those retiring (a phenomenon that in Russian scientific research

literature is called the “personnel blow”). It should be noted that in countries such as Germany, Japan, Italy and others, this phenomenon is expressed even more acutely than in Russia. As a result, measures to attract foreign workers have to be expanded. Although Russia has had a positive balance of foreign migration throughout the post-Soviet years, these are migrants from the CIS countries, mainly from Central Asia and Transcaucasia, mostly with a low level of education and qualifications.

Currently, a transition is ripe from the creation of strategies solely through an agreed vision of the future by experts and responsible government

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officials to a pre-calculated system of measures and activities implemented depending on a particular development scenario of the external (primarily) for the managed region (or industry) environment. Strategic management of Arctic development can become a testing ground for testing modern strategizing technologies. Currently, the digitalization of public administration is actively developing at various levels (situational analytical centers, control centers united in a single network). Such management implies the formation of a digital twin of the managed system, the widespread use of mathematical modeling of socio-economic and socio-natural, as well as socio-political processes in the managed region (macro region) and communication models, participants in economic activity. Expanding on the topic of the paragraph, we can conclude that strategizing Arctic development is a challenge for Russian science, while the scientific development of the Arctic macroregion is the key to the successful solution of its strategic tasks.

The state and problems of personnel development in the Arctic need to be clarified both in the context of personnel problems of the entire country, and in the light of global trends and processes, as well as in the light of socio-economic problems of the Arctic macroregion itself. The main content of the problem field is that there is not enough personnel to implement existing and planned Arctic development projects, which can naturally lead to their slowdown.

Table 2 and Figure 1 present data on the dynamics of the absolute population of some constituent entities of the Russian Federation and its percentage change since 2005. As can be seen from Figure 1, if in Russia as a whole there was growth due to an increase in the birth rate, the acquisition of Crimea and traditionally high migration growth, then in a number of federal districts, Arctic regions and regions containing Arctic territories, mixed dynamics are observed - such as a decrease in population, and its rather rapid increase.

Table 2. Population of Russia, some federal districts and regions, including the Arctic and Arctic regions, 2005-2020, thousand people.

	2005	2010	2015	2018	2019	2020
Российская Федерация	143236	142865	146545	146781	146749	146 171
г. Москва	10924	11541	12330	12615	12678	12 655
г. Санкт-Петербург	4713	4899	5226	5384	5398	5 384
Северо-Западный федеральный округ	13716	13626	13854	13972	13982	13942
Уральский федеральный округ	12129	12087	12308	12350	12361	12330
Сибирский федеральный округ	17404	17174	17259	17173	17118	17004
Дальневосточный федеральный округ	8551	8363	8260	8189	8169	8124
Мурманская область	839	794	762	748	741	733
Республика Карелия	676	643	630	618	614	609
Республика Коми	963	899	857	830	821	814
Ненецкий автономный округ	42	42	44	44	44	44
Архангельская область	1240	1183	1130	1100	1092	1083
Ханты-Мансийский автономный округ – Югра	1468	1537	1626	1664	1675	1688
Ямало-Ненецкий автономный округ	517	525	534	541	544	547
Тюменская область без автономных округов	1309	1343	1455	1518	1538	1543
Красноярский край	2869	2829	2866	2874	2866	2856
Республика Саха (Якутия)	954	958	960	967	972	982
Чукотский автономный округ	52	51	50	50	50	49

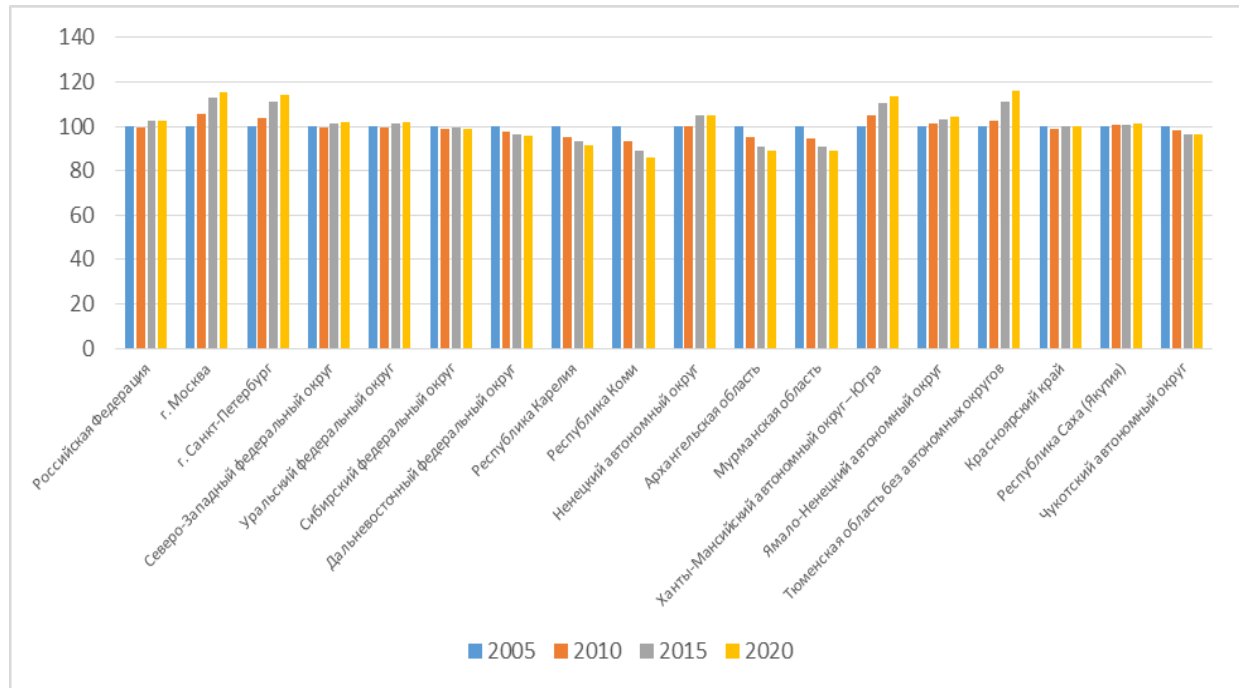
In Russia, “regions have emerged that form a labor core, attracting migration and investment resources, and periphery regions.” Among the demographically shrinking regions are the Komi Republic, Murmansk, Arkhangelsk regions and the Republic of Karelia (the first three regions are in the top 10 in terms of population decline over 15 years), Karelia is 19th in terms of this indicator. The

population in the Chukotka Autonomous Okrug decreased by 6%. Among the successful ones in demographic terms are the Yamal-Nenets Autonomous Okrug and the Nenets Autonomous Okrug, which are among the most successful in population growth, second only to the constituent entities of the South of Russia, the capitals, as well as

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the Khanty-Mansi Autonomous Okrug and the Tyumen region.



Picture 1. Relative dynamics of the population of Russia, some federal districts and regions, including the Arctic and sub-arctic, 2005–2020, % (the 2005 level is taken as 100%)

As can be seen from Figure 2, over 10 years, only the Yamalo-Nenets Autonomous Okrug (among the Arctic and sub-Arctic regions) quite significantly increased the number of employed: from 388 to 471

thousand. In the European regions of the North, there was a significant decrease in the number of employed (up to 20%) from 2010.

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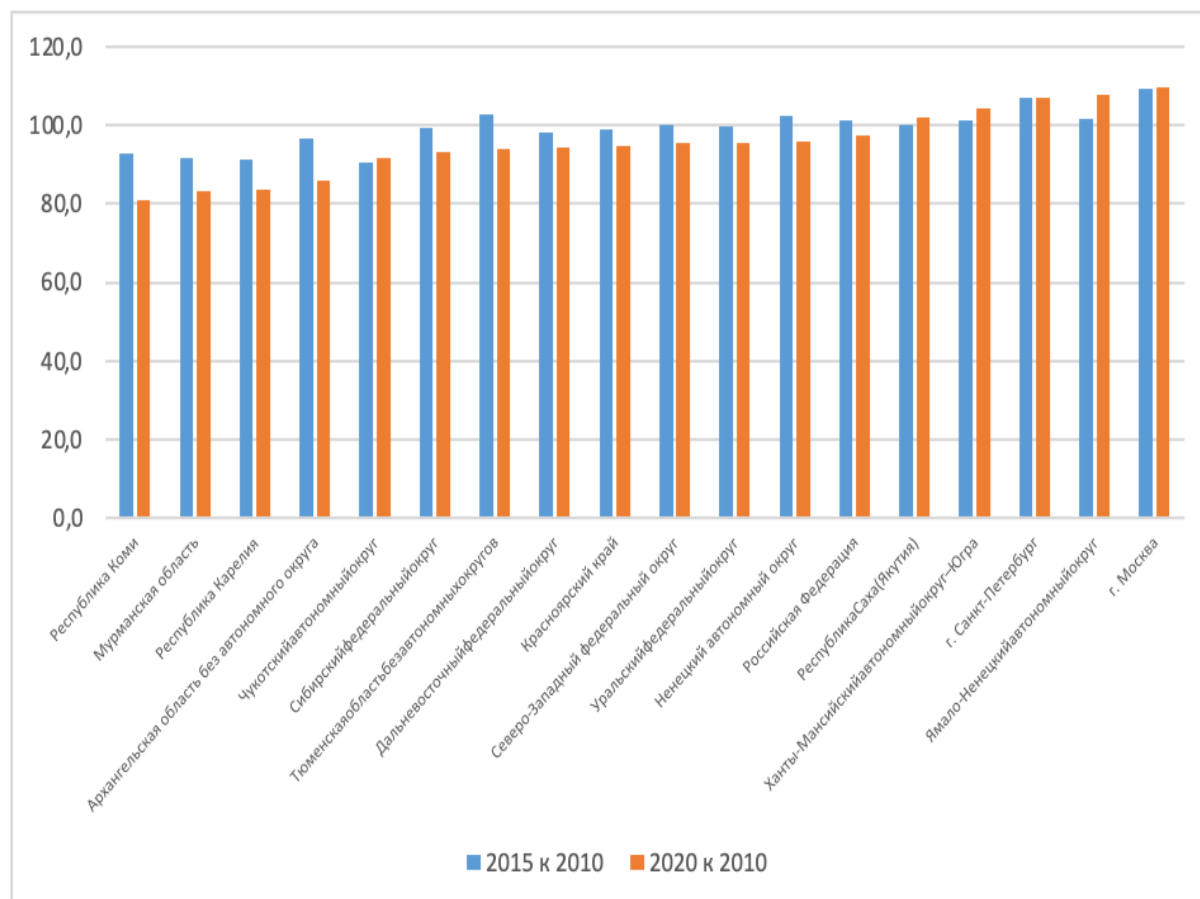


Figure 2. Changes in the number of employed in the Russian Federation and some, including Arctic, regions from 2010 to 2015 and from 2010 to 2020. (2010 level – 100%).

As can be seen from Figure 3, the Arctic regions differ greatly from each other in terms of the level of population involvement in the economy. At the same time, in the past decade, processes of both population aging and an increase in the birth rate obviously occurred, which led to an almost universal decrease in the share of employed people in the population. This

process did not manifest itself only in the actively developing Yamalo-Nenets Okrug. The most important indicator of quality of life is the mortality rate of the working age population, which largely determines the real standard of living in the region.

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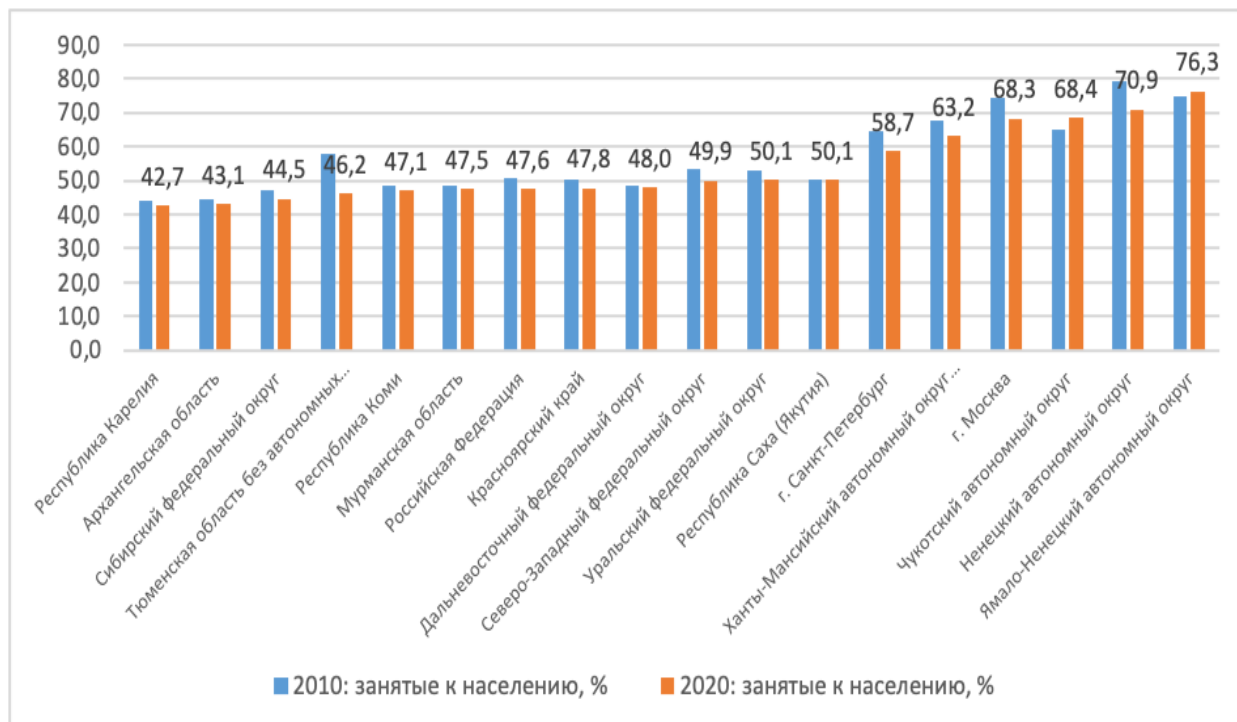


Figure 3. The ratio of the number of people employed in the economy to the population in Russia and some regions, including the northern Arctic and Arctic regions, %, in 2010 and 2020.

As can be seen from the data presented in Table 3, most Arctic and sub-Arctic regions have a mortality rate in working age that is higher than the Russian average, however, Yakutia and the Yamal-Nenets Autonomous Okrug have a significantly lower level. At the same time, the position of the regions relative to the Russian average has remained virtually unchanged since 2005: those regions that had a higher

mortality rate compared to the Russian average generally retained unfavorable positions in the ranking for this indicator. This circumstance is largely determined by the lower quality of life in most of the Arctic regions. It is a marker of the general unattractiveness of the conditions for working and living in them.

Table 3. Mortality of the population of working age (per 100 thousand population of the corresponding age)

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	2005	2010	2015	2018	2019	2020	Изменение в % к 2005 году
Чукотский автономный округ	1030,1	1328,4	865,8	954,6	801,3	853,2	17,2
Республика Карелия	1191,9	908	749,7	677,8	618,7	744,2	37,6
Мурманская область	927,9	689,6	635,4	547,8	556,2	664,1	28,4
Республика Коми	1069,3	796,6	701,1	607,7	608,3	658,3	38,4
Дальневосточный федеральный округ	1014,2	809,3	659,5	589,7	593	649,3	36,0
Сибирский федеральный округ	990,2	733,7	652,6	585,2	568,8	639,8	35,4
Архангельская область без автономного округа	1057	761,7	642,3	570,9	560,7	630,1	40,4
Ненецкий автономный округ	893,9	908,1	590	528,9	578,3	629,2	29,6
Красноярский край	970,7	699,6	621,6	583,4	550,8	624,4	35,7
Уральский федеральный округ	818,2	633,2	598,7	519,8	503,1	579,8	29,1
Северо-Западный федеральный округ	977,3	682,5	558,2	489	476,5	555,4	43,2
Российская Федерация	827,8	634	546,7	482,2	470	548,2	33,8
Тюменская область без автономных округов	795,7	654	559,4	495	463,9	538,5	32,3
Республика Саха (Якутия)	773,6	725,5	552,8	468,8	465,2	538,4	30,4
Ямало-Ненецкий автономный округ	555,2	461,7	427,7	359,9	336	441	20,6
г. Санкт-Петербург	731,8	488,8	414,2	364,5	358,3	440,4	39,8
Ханты-Мансийский автономный округ – Югра	571,5	510,3	432,3	380	360,9	432,1	24,4
г. Москва	485,4	389,3	340,7	317,4	313,5	374	23,0

At the same time, there may be a transformation of employment in the Arctic, a restructuring of the ratio of personnel needs in various sectors of the economy, which, for example, may be associated with the general transformation of the economy in the context of digitalization or with a change in the structure of the regional economies themselves, in conditions of, for example, an increased role mining industry in the GRP of the Arctic and Arctic regions.

Thus, in 2019, the mining industry accounts for 13.5% of gross value added in the Russian Federation as a whole. The Murmansk region for this year had 10.3%, the Republic of Karelia 18.8%, the Arkhangelsk region - 4.4%, the Komi Republic - 43.8%, the Nenets Autonomous Okrug - 79.2%, the Yamal-Nenets Autonomous Okrug - 71.3%, Krasnoyarsk region - 22.4%, Republic of Sakha (Yakutia) 50.8%, Chukotka Autonomous Okrug - 39.6%. At the same time, in 2010, the share of the mining industry in gross value added in the Russian Federation as a whole was 10.4%, in the Republic of Karelia - 12.8%, in the Komi Republic - 34.3%, in the Nenets Autonomous Okrug - 74.3%, in Murmansk region - 10.8%, in the Yamal-Nenets Autonomous Okrug - 61.4%, in the Krasnoyarsk Territory - 3.9%, in the Republic of Sakha (Yakutia) - 39.5%, in the Chukotka Autonomous Okrug - 7.5%. As for the

changes in the economy of the Chukotka Autonomous Okrug, they have occurred in the last decade due to the growth of the mining industry, primarily gold mining sector. The sharp rise in the mining sector in the Krasnoyarsk Territory is associated with the development of the oil and gas industry. Another important area for the Arctic macro region is the transport sector. The transport and communications industry in the Russian Federation accounted for 10.5% of gross value added in 2010, while in the Murmansk region this value was 10.1%, in the Republic of Karelia - 8.5%, in the Komi Republic - 9.8%, in the Arkhangelsk region (with the Nenets Autonomous Okrug) - 13.6%, in the Nenets Autonomous Okrug - 7%, in the Yamal-Nenets Autonomous Okrug - 8.4%, in the Krasnoyarsk Territory - 8.5%, in the Republic of Sakha (Yakutia) - 11.1 %, in ChAO – 5.4%. In 2019, in Russia as a whole, the industries “transportation and storage”, as well as “activities in the field of information and communications” accounted for a total of 10.3% of added value (7.3 and 3.0%, respectively). Wherein, similar values for the Murmansk region were as follows: 8.4 and 1.1% (total - 9.6%), for the Republic of Karelia - 9.4 and 1.6% (total - 11%), in the Komi Republic - 6.6 and 1.1% (total - 7.7%), in the Arkhangelsk region (with Nenets Autonomous

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Okrug) - 9.4 and 0.9% (total - 10.3%), in the Arkhangelsk region (without Nenets Autonomous Okrug) - 11.4 and 1.4% (total - 12.8%), in the Nenets Autonomous Okrug - 5.3 and 0.2% (5.5%, respectively), in the Yamalo-Nenets Autonomous Okrug - 4.1 and 0.4% (4.6% in total), in the Krasnoyarsk Territory - 5.2 and 1.0% (in total - 6.2%), in the Republic of Sakha (Yakutia) - 6.2 and 1.1% (in total - 7.3%), in the Chukotka Autonomous Okrug - 3.9 and 0.6% (total 4.5%). Thus, the transport component of the economies of the Arctic and sub-Arctic regions has decreased slightly overall in percentage terms over the past decade, which may be due both to the general growth of the mining industry, as well as with the lag of transport infrastructure from the development of industry as a whole. The role of the Arctic in the country's economy has grown significantly over the decade, but this has not led to a significant increase in the workforce of the mining industry in the macroregion. Thus, in the leading region of the country in terms of gas production (80% of domestic and 20% of world production in 2020) - the Yamalo-Nenets Autonomous Okrug - from 2015 to 2020, the number of workers in the extractive industry increased slightly - from 86 to 91 thousand people. Due to changes in the division of the economy into industries in domestic statistics, it is correct to compare those periods that are characterized by the same information collection methodology used, which is implemented in the Rosstat regional statistics system for the period from 2018 to 2020. The image of a successful region with a high quality of life in the Russian Federation is personified primarily by Moscow. However, as can be seen from the data presented in the table, in Moscow the share of those employed in education, social sphere and health care is lower than the Russian average, as is the share of energy workers. However, the proportion of those employed in the field of information and communications, as well as in "other" areas, is very high, which means the development of the service sector. At the same time, the service sector in the Arctic and near-Arctic regions is less staffed than the Russian average. In the western Arctic regions of Russia, the share of people employed in education, health care and social services is higher than the national average. In the Yamal-Nenets Autonomous Okrug, on the contrary, it is approaching that in Moscow. In the actively developing Arctic regions - first of all.

Over two years, on average in Russia and in most of the regions shown in Tables 5.1–5.3, the level of employment in trade has decreased (obviously, this is the influence of the pandemic), in addition, the level of employment in agriculture, forestry and fishing has fallen almost everywhere (except for the Republic of Karelia, ChAO). It is interesting that in the Yamal-Nenets Autonomous Okrug, despite the pandemic, the

share of people employed in "other" industries has increased slightly, which is obviously related to the development of the service sector. The share of people employed in ICT increased in many regions, but the greatest growth took place in Moscow, and in a number of Arctic regions, such as the Arkhangelsk region, the Republic of Sakha (Yakutia) and the Chukotka Autonomous Okrug, there was even a slight decrease in the share of workers employed in ICT. In general, therefore, the Arctic and sub-Arctic regions have very different character of personnel development, due to the structure of their economy. However, the western Russian regions and Arctic territories with large cities and relatively large populations are experiencing the opposite trends compared to the progressively developing Moscow. On the contrary, personnel trends in the Yamal-Nenets Autonomous Okrug are often similar to those in Moscow. In general, the key problems of Arctic staffing are discussed in many works and studies usually talk about, namely:

- 1) about the high level of migration from the region of the economically active population;
- 2) about the harsh climate;
- 3) more acute than in other regions of Russia;
- 4) about the general demographic crisis;
- 5) about the lack of personnel trained directly for the Arctic, including those trained at Arctic universities (which are also not enough to provide the macroregion with its own needs for specialists);
- 6) about a decrease (lack) of the optimal level of health care to ensure a high quality of life;
- 7) about the low attractiveness of the macro region for educated and competent youth, etc.

Assessing the socio-economic policy of the Arctic region, the authors include "a high level of morbidity, a decrease in the number of hospitals, small living spaces, high unemployment, and negative migration growth" in the identified imbalances in the region. The Arctic regions differ in their economic functionality, as well as in their mission to ensure the national security of the country, in their natural conditions and opportunities for integration into the life of the country. However, the general personnel situation in the region can be assessed by its migration attractiveness. This may form the basis for strategic monitoring of the personnel situation in the Arctic Zone of the Russian Federation, individual Arctic regions and territories. Of course, the measures taken in recent years have a beneficial effect on the personnel situation in the Arctic. They appeared, including in the process of economic recovery from the pandemic. Thus, in May 2021 (according to HeadHunter), compared to the same "quarantine" period in 2020, the number of vacancies in the Arctic regions increased by 65–141%. The current basis for the implementation of personnel policy in the Arctic are the results of a study by the Russian Ministry of

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Eastern Development, conducted together with Petrozavodsk State University and the Northern (Arctic) Federal University named after M.V. Lomonosov, which showed the need for labor in the Arctic until 2035 in the amount of 182.4 thousand new workers (140 thousand – within the framework of about 200 investment projects and another 42 thousand – from the surveyed 627 Arctic employers). At the same time, we note that taking into account the fact that currently in total about 1 million people work in the organizations of the Russian Federation, that in 10-15 years at least a quarter of them should be naturally renewed. 140 thousand jobs will be created as part of 198 investment projects, and another 42 thousand - within existing production facilities from 627 employers. Thus, the goal can be set not to attract almost 200 thousand new personnel, but to train about half a million workers for the Russian Arctic in the next decade. Obviously, for this it is necessary to ensure a high quality of life in the AZ of the Russian Federation. It is no coincidence that at a meeting on Arctic development in April 2022, the President of the Russian Federation emphasized the importance and priority of “solving social, economic, and infrastructure problems in this most important region” along with the implementation of large-scale investment projects in it. A special specificity of the AZ of the Russian Federation is the high “concentration” of small indigenous peoples in the macroregion. As of 2016, 82.5 thousand representatives of this category lived in the AZ of the Russian Federation (the total number of small indigenous peoples of the North was estimated at that time at 250 thousand people). However, their contribution to the economy is relatively minimal, the share of workers employed in agriculture and fishing in the Arctic and sub-Arctic regions is minimal, and it is lower than the Russian average. Let us repeat that the basis of the Arctic economy is the extraction of minerals, their primary processing, as well as the transport sector. The AZ of the Russian Federation provides a high share of the country's mineral production - 97% of diamonds, 80% of gas, 60% of oil, 90% of nickel and cobalt, 60% of copper are produced there. The Russian Arctic dominates the Arctic world in terms of its share in the total length of the coast - Russia accounts for two-thirds of it. The Northern Sea Route is extremely promising as a new global transport corridor. Since 2019, the Russian Ministry of Eastern Development has been managing the development of the Arctic. Over the past 7 years, investors have invested 2 trillion in projects in the Far East and the Arctic. rubles, created more than 104 thousand jobs. In the AZ of the Russian Federation, starting from 2021, 3 thousand people were allocated free land, and in the Far East, 103 thousand people have already received hectares. An analogue of the Far Eastern Quarter project (quality housing at an

affordable price) could be implemented in the Arctic. Within the framework of the “Children of the Arctic” program, children's holidays were paid for 6 thousand children from the Arctic regions of the Russian Federation. The Far East and Arctic Development Corporation disseminates information about work in the macroregion among applicants and students, showing the trajectory of work in the Russian North. The “Arctic Call” project is being implemented with the Ministry of Defense of the Russian Federation (attracting young people to work in the Arctic after military service). The pilot project in 2021 was implemented together with Norilsk Nickel; 3.5 thousand guys whose service life was expiring received an offer to live and work in the Arctic zone of the Russian Federation, and 40% of them confirmed their interest. In 2022, the project was expanded to cover 25 thousand people, and several dozen employers joined it. In the Murmansk region, the strategic plan “To the North!” is being implemented, formed on the basis of proposals from residents of the region. The main task is to reverse the trend of people leaving the Murmansk region. It is planned that in 2020–2023 the rate of population decline will slow down, in 2024 the situation will stabilize, and from 2025 it is expected that a gradual increase in the region’s population will begin. As part of the “Zemsky Doctor” program, 270 doctors have been attracted to the region, and the “Hectare of the Arctic” and “Governor’s Startup” programs are being implemented. In 2021, the formal migration loss decreased by 1.8 times compared to 2020. In the Murmansk region, the only territory of advanced socio-economic development in the Arctic has been created - the “Capital of the Arctic” (with preferences similar to those in the Far East - the ASEZ was created in accordance with Decree of the Government of the Russian Federation dated May 12, 2020 No. 656). By the beginning of 2022, the region had gained 3 thousand jobs thanks to this, an increase in investment was ensured by 30% (600 billion rubles), an increase in industrial production by 17%, GRP by 16%, and an increase in average wages by 29% (13% real income). Currently, the Murmansk region is among the top 10 subjects in terms of family income; the region plans to strengthen support for youth. In 2020, the region immediately began to provide an additional increase to newly arrived specialists under 35 years of age in the amount of 80% of wages. The regional project “Mom’s Salary” began to be implemented. At the same time, it should be noted that the population size of the Northern regions registered by Rosstat may differ significantly from that in reality. Thus, according to the 2021 population census, the population of the Murmansk region was 668 thousand people, which is 60 thousand less than Murmanskstat data for this year. In Karelia, as of January 1, 2022, the regional statistics body registered 603 thousand

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inhabitants, while according to the census, 533 thousand people permanently reside there. In the Komi Republic, a similar discrepancy between the census and regional statistical office data for 2021 amounted to 803 and 738 thousand inhabitants, respectively. The situation is similar in the Arkhangelsk region. In general, compared with the results of the 2010 census, the republics of Komi and Karelia, as well as the Murmansk and Arkhangelsk regions showed a population decline from 16.1 to 18.1%, becoming the country’s “anti-leaders” in this indicator. Perhaps this difference is explained by the fact that many pensioners, moving to more southern regions, remain registered in the North, despite the fact that the state has actively supported such a move in recent decades. The “Leaders of Russia” competition is also aimed at attracting personnel to the Arctic. Since 2021, the “Russia – Country of Opportunities” platform, together with the Ministry of Science and Higher Education of the Russian Federation, has been implementing the project “Centers for the Assessment and Development of

Management Competencies” to develop professional competencies (soft skills) and develop individual development trajectories. During the year, 42 Competence Centers were created in 22 regions of the country. There are centers in every federal district; their work has already covered more than 60 universities and 120 thousand students. In 2022, Rosmolodezh launched the “More than Work” project, uniting 29 constituent entities, 4 of which are Arctic territories. The project is aimed at developing industrial tourism, internships for young people at enterprises; it was planned that up to 10 thousand people would take part in it in 2022. The project “More, than travel” (together with the platform “Russia - the Land of Opportunities” and Rostourism) on more than three hundred special tourist routes. Currently, Russia and a number of other developed and developing countries are experiencing a personnel challenge, which in the domestic literature is called a “personnel blow.”

Table 4. Shares of the population of young, pension and pre-retirement age groups and assessment of the “personnel blow” to the economy in the coming decades

	20-24	25-29	55-59	60-64	20-24 / 55-59	25-29 / 60-65
2010	8,7	8,4	7,1	4,8	122,5	175,0
2020	4,5	6,1	7,1	6,9	63,4	88,4
2025	4,9	4,6	5,6	7,7	87,5	59,7
2035	6,7	5,9	6,8	6,9	98,5	85,5

Table 5. Shares of residents of different age groups in the population of the Arctic and sub-Arctic regions and the magnitude of the current and upcoming “personnel blow” to the economy

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	20-24	25-29	55-59	60-64	20-24 / 55-59	25-29 / 60-64
Россия	4,7	6,4	7,1	6,9	0,66	0,93
НАО	5,4	5,1	6,9	6,3	0,78	0,81
Архангельская область	4,6	5,3	7,3	7,5	0,63	0,71
Мурманская область	5,2	6	7,1	6,6	0,73	0,91
ЯНАО	5,2	5,9	7,4	5,2	0,70	1,13
Красноярский край	4,8	6,8	6,8	6,5	0,71	1,05
Республика Саха (Якутия)	5,9	7,7	6,8	6,5	0,87	1,18
Чукотский АО	5,6	5,7	7,8	5,9	0,72	0,97

The demands of Arctic workers are broad, they cover an increasingly wide range of problems of ensuring quality of life, which, in turn, requires personnel who will ensure this quality - workers in the public utilities sector, social sphere, education, culture and, of course, healthcare. The level of alcohol consumption by the population plays an important indicative role in assessing the quality of life. In the National Sobriety Rating (2020), most northern and Arctic regions are in the second half or at the end of the list: (28th place - Krasnoyarsk Territory, 32nd - Murmansk Region, 60th place - Republic of Karelia, 63rd place - Republic of Sakha (Yakutia), 65th - Arkhangelsk Region, 75th - Yamal-Nenets Autonomous Okrug, 80th - Nenets Autonomous Okrug, 84th - Chukotka Autonomous Okrug, 85th - Komi Republic. Thus, the personnel blow in Russia as a whole is significantly degree more pronounced (note that its greatest values occur in the central and capital regions of Russia). This leads to the fact that the Arctic regions may in the near future retain their status as a "donor" of personnel for the rest of Russia, which will further complicate the personnel situation in them. Education should be highlighted as the most important component of all categories related to human resources (primarily human resources potential). The 2004 Arctic Human Development Report emphasizes the importance of education for human development in the Arctic, but notes that circumpolar education issues have been under-researched. This paragraph makes an attempt to systematize approaches to the study of human capital in the Arctic, available in domestic and foreign scientific literature, from the point of view of the representation of the educational component in them. Problems of human resources in the Arctic attract considerable attention from researchers. These problems become especially relevant given the

prospects for the implementation of mega projects planned in strategic regulatory documents for the development of the Russian Arctic. Some researchers especially note the problem of staffing the implementation of projects for the development of the Russian Arctic shelf, and this complex task will require a significant number of specialists with both higher and secondary specialized education in working specialties. Workers with secondary specialized education are widely in demand in the Arctic regions, not only in shelf development projects, but also in solving many other problems - for example, I.S. Stephan, having analyzed the pool of vacancies, represented in the employment services of the Arctic regions of Russia, calculated that skilled workers are required for employment in more than 60% of vacancies. Moreover, the share of skilled workers in the personnel needs of the Arctic zone of the Russian Federation will only increase as the projects planned in regulatory strategic documents for the development of the Arctic territories of Russia are deployed - already now "in the forecast of additional personnel needs, 80% of the places are occupied by workers and mid-level specialists." Of significant interest is the work performed by I.S. Stepus forecast the supply of qualified workers for all constituent entities of the Russian Federation, wholly or partially included in the Arctic zone of the Russian Federation - a comparison of the personnel needs stated in strategic documents for planned Arctic development projects, on the one hand, and the projected number of graduates of secondary vocational education institutions, on the other hand, revealed significant differentiation in the projected provision of regions with personnel with secondary vocational education - from 30% in the Yamal-Nenets Autonomous Okrug to 100% in the Chukotka Autonomous Okrug. It should be emphasized, however, that the system of secondary

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vocational education in the Arctic regions is the largest, but not the only supplier of qualified workers - their number can increase due to rotational workers, migrants from other regions of Russia, migrants from abroad, etc. The distribution structure of graduates of secondary vocational education institutions as of 2021 generally corresponded to the priority sectors of development of the Russian Arctic, however, there was a disproportionately high share of humanities and pedagogical specialties, as well as insufficient (only 20–60%) coverage of the personnel needs of the strategic development priorities of the Arctic by graduates of the relevant specialties. Moreover, in some specialties important for the Arctic, institutions of secondary vocational education located in the Arctic Zone of the Russian Federation did not train specialists at all. As the main mechanisms for developing the personnel potential of the Russian Arctic in terms of skilled workers with secondary vocational education, Stepus notes “bringing the professional qualification structure of personnel training in accordance with the forecast of personnel needs of the economy, taking into account the priorities of the strategic development of the territories of the Arctic zone of the Russian Federation” and “the creation of effective mechanisms for transmitting this information, including about professions in demand in the macroregion, for all interested participants in the labor market - applicants and their parents, graduates, businesses, employers, representatives of executive authorities” The method of forecasting the level of satisfaction of future personnel needs based on a comparison of the personnel needs stated in strategic documents, on the one hand, and the projected number of graduates of educational institutions, on the other hand, was used by the authors for personnel with higher education. The results of the study showed that due to full-time graduates, the maximum value of covering the needs of the Russian Arctic for personnel with higher education will be only 30% (with a colossal range of values across regions, from 80% in the Arkhangelsk region to 5% in the Yamal-Nenets Autonomous Okrug), due to graduates of full-time and evening education – up to 65% on average in the Russian Federation. According to data for 2021, there was a significant overproduction of university graduates in economics and law in the Russian Federation. A later study by the authors found that this disproportion persisted - “with a shortage of engineering personnel and an overabundance of specialists in the field of management and services,” the Ministry of Education and Science of the Russian Federation began to reduce the target numbers for admission to universities in the region in the areas of training “Management”, “Management” and increased enrollment by technical (engineering) and natural scientific areas of training. A number of researchers have examined the state and

problems of human resources in individual Arctic regions of Russia. For example, the authors’ study in the Arkhangelsk region revealed the problematic state of such indicators as the staff replacement rate and the staff turnover rate. In another work dedicated to the city of Arkhangelsk, a conclusion was formulated about student practice as the main way to form a personnel reserve in the scientific field, as well as a way to overcome the lack of practical skills among young specialists. For Yakutia, in the early 2010s, a decrease in potential in general and a deterioration in all its most important components (in particular, the size of the economically active population and unemployment rates, including hidden unemployment) were revealed. The proposed measures to combat these negative phenomena mainly included increasing the competencies of the unemployed population (training, retraining), combining the vacancy databases of all employment centers of individual uluses, as well as reducing various barriers to firms creating new jobs. Another study on Yakutia at the same time notes that “The main reason for the lack of demand for local labor is the shortage of workers and specialized specialists in the regional labor market.” However, a later study made it possible to make significant adjustments to this statement - the Arctic regions needed mainly workers in engineering, healthcare and education, while these needs were quantitatively fully covered by applicants from these regions, enrolling in these specialties at the North-Eastern Federal University named after. M.K. Ammosova. Thus, on the scale of the Sakha Republic, the problem was not the absence or shortage of specialists in these areas, but the reluctance of newly trained specialists to take jobs in the Arctic regions of the republic. Accordingly, the solution to these problems lay, first of all, in increasing the attractiveness of these regions for work. In other regions of the Russian Arctic (with the exception of the Arkhangelsk region and the Republic of Karelia), the incoming flow of university graduates as of 2021 exceeded the outgoing one, and the level of outgoing migration among university graduates generally corresponded to the all-Russian value of this indicator (30–33%). Analysis of existing interpretations of the concept of “human capital” showed that historically education is the main and decisive element in the structure of human capital. Education is the basis for the formation of knowledge and skills - human competencies - for further implementation in the labor market. Elements such as quality of life, culture and health are considered by researchers as auxiliary elements in the formation of human capital. Living in the northern territories greatly affects health, while in other territories this factor is not critical. Russian scientists, in relation to the study of the Arctic, use the concept of human capital in a number of studies and, as a rule, touches

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on such issues as the provision of qualified labor, unemployment and life expectancy of the population of the Arctic territories (note that that some works equate the concepts of human capital and human potential of the Arctic regions). The authors point out that the current goal of increasing the efficiency of using human capital in the Russian Arctic is to smooth out imbalances in territorial labor markets; socio-demographic, professional-qualification and territorial-sectoral imbalances are highlighted, as well as counteracting the negative impact of the outflow of qualified personnel. The authors also point out that the implementation of economic and infrastructure projects in the Arctic at the new stage of its development will be determined by the potential of domestic science and industry, their ability to create competitive products. The use of all other development resources depends on human capital. Continuing the analysis, the authors emphasize that “during the period of new development of the Russian Arctic, a central place in the formation of human capital will be played by the system of secondary, higher and additional education for adults, allowing future specialists to master working professions at an intermediate stage of training.

The authors note that, despite the high level of economic activity and employment, there are two serious threats to the development of human resources in the Russian Arctic territories. This is high migration and imbalance of demand and supply of labor in the regional and professional context (both in quantitative and qualitative parameters). Based on a comparative analysis and structure of teaching specialties, vocational training programs, professions based on statistics from the Arctic territories of Russia, a basic list of in-demand professions has been developed. The designated list of professions for the Arctic is the basis for adjusting the structure of personnel training, opening new specialties and areas of training, educational resources in other regions of Russia and interregional attraction of foreign and labor migrants. The authors also note that the demand for human capital in the labor market characterizes the level of employment of the population. In the Arctic regions, this indicator exceeds the national level and shows positive dynamics. The highest level of employment is in the Chukotka Autonomous Okrug (75.4%) and the Yamalo-Nenets Autonomous Okrug (74.5%), as well as in the Murmansk region (63.2%). The lowest employment rate is in the Arkhangelsk region (56.1%) as of 2018. An important aspect of studying the demand for the regional population in the labor market is the structure of employment by level of education. Thus, in 2000, the most in demand on the labor market in all regions under consideration were workers with secondary general and secondary vocational education. The structure of the employed population is completely different in 2018 - the largest share of

the labor market is occupied by workers with secondary vocational education (45%) and higher education (34.2%). On the contrary, among the unemployed, workers with secondary general education (29.4%) and secondary vocational education (39.4%) predominate. The most educated workers live in the Yamalo-Nenets Autonomous Okrug (45.8% of employed and 25.9% of unemployed), which belongs to the regions of new industrial development and is relatively more attractive for people to live in. An unemployment rate that exceeds the employment rate is typical for the population of the Arctic regions who have a lower level of education (basic general and secondary general education), as well as those who have no education.

It should be noted that although the Arctic economies are constantly dependent on resources and the public sector, globalization has brought new opportunities and challenges to Arctic communities in the new knowledge-based global economy. Northern regions can become “learning” regions that adopt and adapt innovations while developing their own economically relevant knowledge and skills based on local experience and traditions. In this regard, a development strategy based on empowering local human potential to contribute to economic development is attractive. However, the Arctic faces enormous challenges to become such a region: domestic growth is constrained by limited local capabilities (institutional, financial and infrastructural) and, most importantly, a lack of human capital. There is a conceptual argument for why human capital plays a central role in achieving sustainable economic development in the Arctic and other peripheral regions of the world. This is typical of peripheral regions that rely heavily on resources or the public sector, developing a culture of dependency that discourages local entrepreneurship and innovation, and regions are forced to follow rigid techno-economic trajectories. All of these structural conditions impede the acquisition of knowledge and capabilities necessary to achieve sustainable development in the face of the knowledge-based, hyper-competitive, globalized economy of the present (and future). The authors claim that at present, the development of intellectual capital through the creation of classical universities in Arctic cities is futile, since it requires large expenditures both in capital costs and in operating costs associated with the formation and retention of a talented team of scientific and pedagogical personnel. It seems more promising to consider the evolutionary development of vocational education institutions in the Arctic regions, the qualitative improvement of their level based on network, remote and online technologies, the development of a research base for the formation of new generation colleges “College 3.0”, which

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assumes the continuity of increasing competencies through education - research - implementation. The organization of regional innovation and technology centers based on colleges in cooperation with small and medium-sized businesses will form a favorable innovation ecosystem and will allow the use of new technologies in the interests of business and society. The undeveloped intellectual infrastructure of the Arctic regions provokes an outflow of population. On the one hand, young people who have lost contact with their small homeland prefer to stay in big cities, even having problems with employment; on the other hand, specialists from the central and southern regions come to the Arctic region on a temporary basis; they are not adapted to local climatic conditions, which entails negative social, environmental and economic consequences for the recipient region. At the same time, transaction costs associated with moving and living in a new place are increasing for both categories of the population (migrants and immigrants). To date, no studies have been conducted on the costs that organizations incur to attract specialists from other regions and the level of qualifications of these specialists. The question remains whether the attracted specialists will become patriots of the region, whether they will work with full dedication for its development or will be guided only by economic interests. A significant negative consequence of young people leaving their small homeland is the subsequent departure of their parents, which leads to the withdrawal of both human and property capital accumulated over all the years of living in the North, which reduces the economic potential of the region. So, the analyzed body of research devoted to personnel potential and human capital of the Russian Arctic, convincingly shows that the most controversial issues on the agenda in these two paradigms are very close, and some even completely coincide. The main and most discussed problems in the scientific debate for the development of personnel potential and human capital remain the disproportions between the distribution of graduates of the education system in educational specialties, on the one hand, and the structure of the labor market's needs for specialists; as well as the loss of valuable personnel and their human capital due to migration outflow. The proposed measures to combat these negative phenomena are quite diverse, however, in the context of developing personnel potential and human capital in the Arctic regions, the issues of the "northern wage gradient" and any more effective mechanisms that can replace it are practically not considered. Human resource management in the context of the socio-economic development of the Russian Arctic is objectively connected with improving the quality of human capital, which is determined by the system of higher and secondary vocational education, attention to representatives of the indigenous population and

the preservation of the unique natural complex of the Arctic with the careful development of natural resources and the creation of new transport infrastructure. Such factors can create a strategic mechanism for achieving a synergistic effect in the implementation of development priorities of the Russian Arctic. One of the elements of such a mechanism is the system of personnel training in the higher education system, which is the object of constant scientific research by Russian scientists and specialists who affirm the importance of matching the education system with the tasks of industrial development of the region, as well as the expert community - for example, the Arctic Council annually publishes a report on the state, socio-economic and demographic characteristics of human capital in the Arctic. As shown above, the shortage of personnel is most acutely manifested in the Arctic agenda, which becomes a real threat to the implementation of mega projects and national projects in the AZ of the Russian Federation, and it is this that hinders the sustainable socio-economic development of not only the Far North and the Arctic, but also the entire state. State corporations in the mining industry, transport companies, scientific and educational organizations, as well as government bodies in the Arctic regions face a shortage of personnel. It is noteworthy that, taking into account the complex and sometimes climatically extreme conditions of the Arctic and the corresponding living conditions, requiring not only to be qualified, but also psychologically and physically stable, the problem of personnel shortage cannot be unambiguously solved through the influx of specialists from other regions of the country and from foreign countries. For example, N.G. Lesser states the existence of two groups of tasks necessary to solve the problem associated with training in the interests of the Russian Federation: "The first group is ensuring the innovative nature of basic education, updating the structure of the network of educational institutions, the formation of integrated scientific and educational structures; ensuring a competency-based approach, understood through strengthening the relationship between theoretical knowledge and practical skills; development of variability of educational programs, including the creation of a system of applied bachelor's degrees. The second group of tasks is the creation of a system of continuous education, training and retraining of personnel, including: the creation of a support system for consumers of continuing professional education services; support for corporate training and retraining programs for professional personnel; creation of a support system for organizations providing continuous professional services. Analyzing the features of the Arctic labor market and training specialists in the interests of developing cargo transportation along the Northern Sea Route, the authors emphasize that training in the

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AZ RF subjects is in demand taking into account the activities of Russia and foreign countries in the extraction of resources on the shelves of the Arctic Ocean, construction of infrastructure, development SMP. The authors provide examples of partnerships at the national and international levels in the field of staffing sustainable socio-economic development of the northern territories; There is also a reasonable approach to organizing a network form of training to achieve special competencies according to professional standards.

At the same time, there are opinions about the introduction of “a training program in two specialized specialties, one of which will be in demand in the Arctic,” proposed by the authors, as well as the importance of having “the ability to perform work at the intersection of professions,” which, according to the authors, is especially relevant in the digital economy. In general, as noted, the gap between the content of training at the university and the future personnel needs of the economy should be reduced as much as possible. For the effective development of the education system in the Arctic, it is objectively necessary to both analyze the potential of educational institutions capable of training specialists to solve the problems facing the development projects of the Russian Arctic, as well as the requests of potential

employers - state corporations in the mining industry, transport companies, service organizations. So, based on the research results of A.V. Simakov, I.S. Stepus, E.A. Pitukhin compiled a list of professions, the value of which lies in its focus on professions obtained in the system of secondary vocational education, which are in demand for the general directions of development of the Russian Arctic. A significant drawback has been identified that many of these professions are not adequately trained. Researchers propose organizing international cooperation programs between universities and enterprises of the Republic of Karelia within the Barents Euro-Arctic region in order to develop advanced professional competencies among Russian graduates. The authors consider the relationship of higher education with the possibilities of implementing public policy in the North and AZ of the Russian Federation at the present stage. Among the factors preventing effective training of personnel in the Arctic regions, there is an imbalance between supply and demand in territorial and professional terms.

Let us turn to the statistical indicators characterizing the scientific, educational and innovative development of the Russian Arctic (Tables 6 and 7).

Table 6. Indicators of development of postgraduate studies in the AZ of the Russian Federation, people

	Graduation from graduate school		Graduation from graduate school with the defense of a dissertation		Admission to graduate school		Number of graduate students at the end of the year	
	2020	2019	2020	2019	2020	2019	2020	2019
Arctic zone of the Russian Federation	79	81	-	-	183	162	664	624
For reference: Russian Federation	13,957	15453	1 245	1629	27 710	24912	87 751	84265

Table 7. Indicators of development of doctoral studies in the AZ of the Russian Federation, people

	Graduation from doctoral studies		Admission to doctoral studies		Number of doctoral students at the end of the year	
	2020	2019	2020	2019	2020	2019
Arctic zone of the Russian Federation	3	2	-	1	1	4
For reference: Russian Federation	339	356	351	386	979	955

From a relative perspective, let us take into account that the population of the Arctic zone of the

Russian Federation makes up 1.67% of the population of Russia as a whole. Accordingly, the situation with

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the development of postgraduate and doctoral studies in the AZ of the Russian Federation could be characterized as positive if the indicators of the number of postgraduate and doctoral students, admission and graduation were at least not lower than this level. However, graduate school graduation rates in 2019 and 2020 did not reach even 1% of the all-Russian number of postgraduate graduates; admission rates and the number of graduate students were 2–2.5 times lower than the share of the population of the AZ RF in the population of Russia as a whole. This situation indicates a critical lag in the educational and scientific sphere of the AZ of the Russian Federation from the all-Russian one, and records the existing imbalances (which, according to the authors, must be leveled to ensure the required quality of labor resources) and dictates the need to intensify educational and research policies in the Arctic space. In particular, joint research and scientific events,

exchange of students, graduate students and doctoral students with leading Russian universities located outside the AZ of the Russian Federation seem promising. As for priority scientific areas, we agree with other authors who emphasize the expediency of the priority development of the “Arctic intellectual service.” It covers economic activities including polar hydrography, monitoring climate change and ice conditions, modernization and development of a network of ground-based and space-based satellite observations of climate and the state of Arctic ecosystems.” However, these measures may not be enough if the scientific sphere of the RF AZ is not radically restructured, its connection with various sectors of the economy is strengthened and, in particular, the demand for research results by RF AZ enterprises is not strengthened.

Table 8. Internal costs for research and development, million rubles.

	2018	2019	2020	2021
Arctic zone of the Russian Federation	4,396.2	3,545.2	4,749.6	4,896.5
<u>For information:</u> Russian Federation	943,815.2	1,019,152.4	1,028,226.1	1,134,786.7

Above, we noted the need for a qualitative intensification of scientific and educational activities in the AZ of the Russian Federation. However, qualitative measures must go simultaneously with measures aimed at increasing the quantitative indicators of the scientific sphere of the Russian Arctic - first of all, the actual number of workers

performing scientific research and development. As of 2019, the share of such workers in the AZ RF in the total number of such workers in Russia as a whole did not even reach 0.5%, that is, it was more than 3 times lower than the share of the population of the AZ RF in the population of Russia (Table 9).

Table 9. Number of employees performing scientific research and development (excluding part-time workers and persons working under civil contracts), people.

	2018	2019	2020	2021
Arctic zone of the Russian Federation	3 615	3,023	3 291	3 302
For reference: Russian Federation	722 291	707 887	682 541	682 464

It should be noted that the per capita volume of internal expenditures on scientific research and development relative to the number of workers performing such research and development was relatively lower in the Russian Federation than in Russia as a whole - 1.48 ml. versus 1.66 million. This difference does not seem to be as critical in size as the differences in other indicators characterizing the scientific sphere of the Russian Federation in comparison with Russian science as a whole. However, the fact that, with approximately

comparable per capita costs in the AZ of the Russian Federation and Russia as a whole, the Russian Arctic was able to attract only 3 times fewer workers to science than expected based on the proportional population size, indicates some inefficiency in spending these funds. On the other hand, the fact that the per capita volume of internal costs for scientific research and development relative to the number of workers who performed them was relatively lower in the Arctic Zone of the Russian Federation than in Russia as a whole, suggests that in the scientific

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sphere of the Russian Arctic the role of “northern allowances”, most likely, is very large, if it occurs at all. Let us now turn to the indicators of innovation

activity in the AZ of the Russian Federation (Tables 10 – 11).

Table 10. Share of added value of high-tech and knowledge-intensive sectors of the economy in the gross regional product of the Arctic zone of the Russian Federation (in percent)

	2018	2020	2022
Arctic zone of the Russian Federation	7.5	7.1	6.1
For reference: The share of products of high-tech and knowledge-intensive industries in the gross regional product, obtained as the sum of the gross regional products of the constituent entities of the Russian Federation.	19.7	19.6	19.3

Table 11. Number of advanced production technologies developed, units

	2018	2019	2020	2021
Arctic zone of the Russian Federation	16	18	20	23
For reference: Russian Federation	1402	1565	1620	1989

Table 12. Number of advanced production technologies used, units

	2018	2019	2020	2021
Arctic zone of the Russian Federation	7570	7719	8470	8248
For reference: Russian Federation	240054	254927	262645	242931

From the above tables 11 and 12, there is a fairly noticeable lag of the Russian Federation in terms of relative indicators of innovation activity from the all-Russian level. Thus, the share of added value of high-tech and knowledge-intensive sectors of the economy in the gross regional product of the Russian Arctic was three times lower than the all-Russian level in 2021, while in 2018–2020. showed a decrease. The number of advanced production technologies developed in the Russian Arctic in recent years has increased at approximately the same rate as in Russia as a whole; The share of advanced production technologies developed in the Russian Arctic remains approximately stable, amounting to 1.14–1.16% of the all-Russian figure. The number of advanced production technologies used in the Russian Arctic in recent years has also increased at approximately the same rate as in Russia as a whole.

Let us now consider the dynamics of the share of knowledge-intensive innovative goods, works (services) of organizations in the Russian Arctic and its individual constituent regions. In the AZ of the Russian Federation as a whole, this indicator decreased significantly in 2021 compared to 2018; the decline was due to a sharp drop in this indicator in the Murmansk region. Then, throughout 2018–2019, this indicator remained almost consistently low in the Russian Arctic with minor fluctuations. Not a single region of the Russian Arctic under consideration was

able to achieve the all-Russian level of the share of knowledge-intensive innovative goods and works (services) in the total volume of goods shipped and works (services) performed; in most cases, the regions of the AZ RF had 2 or more times lower values of this indicator. In other words, according to the effectiveness of innovation activities, created and implemented advanced production technologies, in terms of inventive activity, the regions of the AZ RF significantly lag behind the all-Russian level. So, for the full development of the AZ RF and the successful implementation of mega projects for the new development of the Russian Arctic, a high-quality intensification of scientific, educational and innovation policy in the region is necessary, promoting, with on the one hand, the integration of the Russian Arctic regions into the scientific space of Russia and sustainable and productive scientific contacts with leading scientific institutions of Russia, on the other hand, the development of “Arctic intellectual service” with specific research areas that are significant for the development of the Arctic. Features of Arctic employment and development of hard-to-reach Arctic territories have attracted the attention of a number of researchers in recent years.

- outflow of economically active population;
- harsh natural and climatic conditions;
- prolonged demographic crisis;
- imbalance in the personnel training system;

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- the decreased level of provision of public health services as a result of the “optimization” of the regional health care system;
- low attractiveness of the Arctic regions for young professionals.

By analyzing trends in changes in the personnel composition of the Russian Arctic and assessing the degree of staffing sufficiency, the study confirms the labor shortage in the Russian Arctic - already observed in one part of the regions and predicted in the immediate future for another part of the Russian Arctic regions. This shortage occurs against the backdrop of a stable or even growing demand for labor. Among the identified reasons for the observed and predicted deficit, the first place is occupied by migration outflow, which should be counteracted by the development of settlement systems and the attraction of young people for permanent residence. The authors note the need to use three approaches simultaneously - process, deterministic and functional, while noting that the components of the regional innovation complex necessarily include human resources (namely, “quality education, direct connections between educational institutions and the economy, attracting personnel (the ability to attract and retain)”), which also speaks of the importance of the efficiency of the service sector in the reproduction of human potential, which indicates that the reproduction of human capital serves as the basis for “innovative economic development ” A study

conducted by employees of Northern (Arctic) Federal University named after. M.V. Lomonosov, offers a forecast calculation of personnel requirements based on a survey of 127 enterprises/companies indicated by the Arctic regions as key employers, among which there were 50 large and large companies (Figure 4). What can we also talk about the importance of the efficiency of functioning of the service sector in the reproduction of human potential, which indicates that the reproduction of human capital serves as the basis for “innovative economic development”. A study conducted by employees of Northern (Arctic) Federal University named after. M.V. Lomonosov, offers a forecast calculation of personnel requirements based on a survey of 127 enterprises/companies indicated by the Arctic regions as key employers, among which there were 50 large and large companies (Figure 4). What can we also talk about the importance of the efficiency of functioning of the service sector in the reproduction of human potential, which indicates that the reproduction of human capital serves as the basis for “innovative economic development”. A study conducted by employees of Northern (Arctic) Federal University named after. M.V. Lomonosov, offers a forecast calculation of personnel requirements based on a survey of 127 enterprises/companies indicated by the Arctic regions as key employers, among which there were 50 large and large companies (Figure 4).

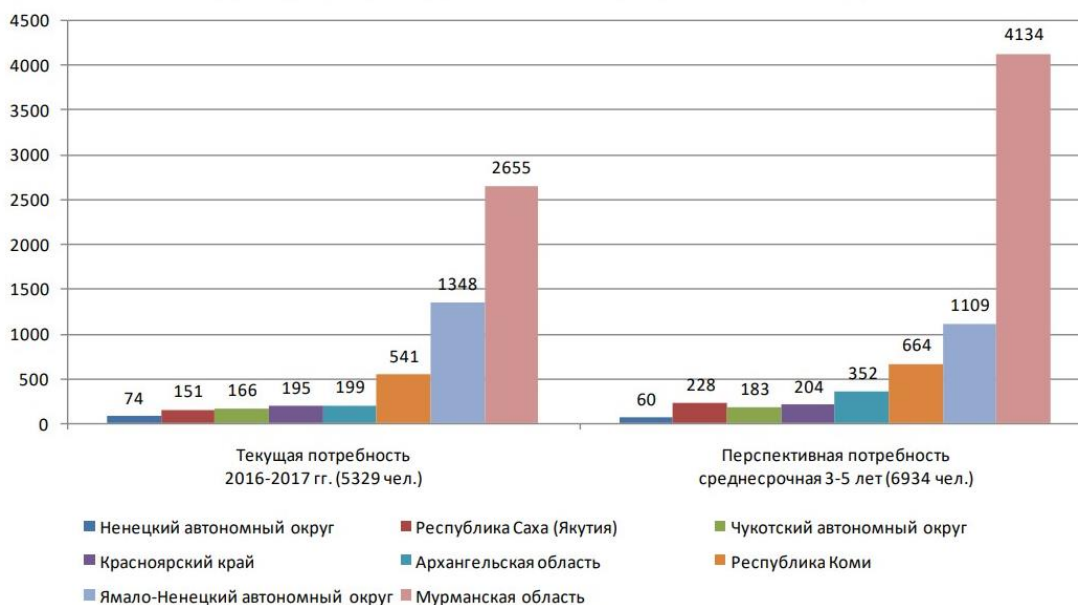


Figure 4. Assessment of personnel needs in the Arctic regions for 2016-2018. and 2019-2022

As part of the same study, 203 Russian universities were surveyed regarding the presence of Arctic programs; similar programs were present in 30 universities, most of which (24) were located outside the Russian Arctic. In total, the study counted 227

“Arctic” programs with the number of students 61,424, and 30 areas of training were a kind of “exclusive” of universities located in the Arctic Zone of the Russian Federation (see Figures 5 – 6).

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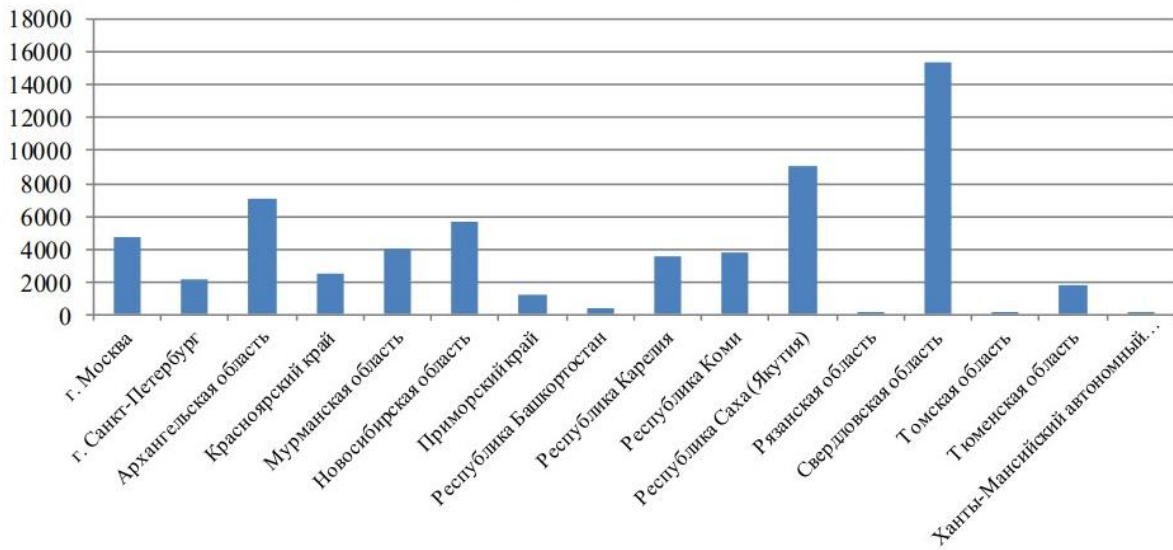


Figure 5. The number of students enrolled in “Arctic” programs in universities of various constituent entities of the Russian Federation.

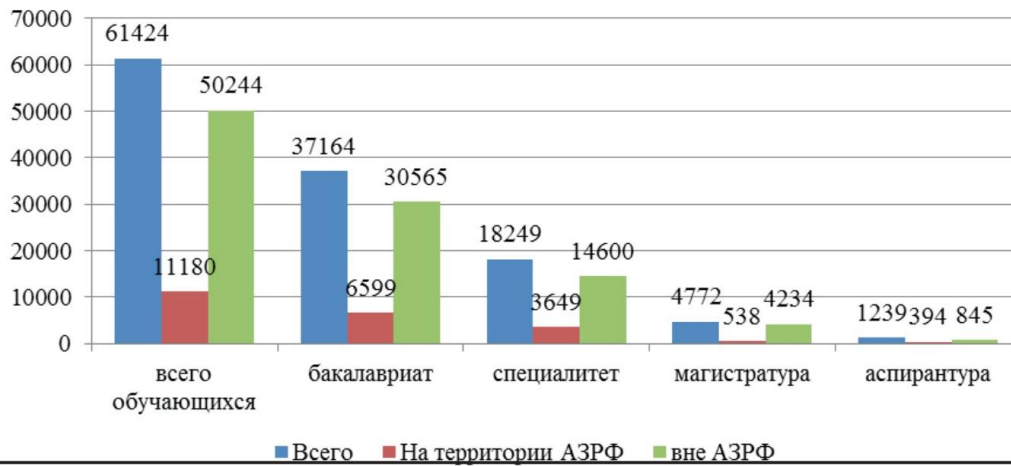


Figure 6. Number of students enrolled in educational programs with an Arctic focus at universities.

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Figure 7. Top 10 universities implementing Arctic programs and the number of students enrolled in them.

In addition to a quantitative survey of “Arctic” programs, NArFU specialists monitored the trajectories of graduates of these programs. It was found that only 31% of such graduates remain to work in the Russian Federation; for comparison, among graduates of universities in the Russian Arctic as a whole, the same figure is 71%. In terms of diversification of the geography of employment in the AZ RF subjects, universities in Moscow take first place, universities in the Arkhangelsk region take the second place, and the Republic of Karelia takes the third place. The majority (72%) of “Arctic” programs are carried out by universities in cooperation with various enterprises of the Arctic Zone of the Russian Federation. The most common form of cooperation is organizing and conducting practices (73.6%), closely followed by cooperation agreements (23.3%). In addition to educational programs related to the Arctic as a whole, special mention should be made of a group of programs aimed at training personnel for “Arctic” mega projects. There were 204 of these and only 24% of the “Arctic” programs. For example, universities in the Arkhangelsk, Murmansk, Novosibirsk, Tyumen regions and Primorsky Krai are participating in offshore projects of Rosneft. As for the scientific side of the activities of universities, in the interests of the Russian Federation, research is carried out in 160 areas by 30 universities in the country (no more than 20% of the total number of universities). In terms of content, these areas are distributed as follows: “45% of research topics implemented by universities in the interests of the development of the Russian Arctic belong to the natural sciences, 41% to the technical and 14% to the humanities.”

- the lack of an effective system for monitoring and assessing the current and future personnel needs of the leading sectors of the economy of the territories of the AZ RF at the regional executive authorities of the AZ RF subjects;
- decrease in investment activity of companies in the Russian Arctic;
- negative balance of labor migration in all regions;
- extreme imbalance of the labor market, a shortage of engineering professions and a surplus of specialists in the field of services and management, which are not in such demand in the Arctic regions;
- insufficient prevalence of the organization of targeted training (only 3.4% of students in Arctic programs);
- lack of reflection in the educational programs of universities of competencies that are necessary for the successful implementation of promising mega projects.

We especially note the role of continuing education, which also requires monitoring and forecasting of the labor market. It is obvious that there are so-called popular professions of the current time on the market, and there is no reason to assume that this dependence will weaken in the future - which means that in order to understand the projected dynamics of demand for professions, it is necessary to analyze the list of development priorities for the Russian Arctic. In turn, such a forecast of the dynamics of demand for professions can become the basis for the development of regional systems of continuing education. Thus, in the study by I.S. Stepus and S.V. Shabaeva analyzed the array of vacancies of

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state employment services in the regions of the Arctic of the Russian Federation and compiled a list of the most widespread skilled professions - a total of 130 unique items. Regional lists vary depending on the specialization of the region - fishing regions, oil and gas producing regions, etc. At the same time, in the Russian Arctic as a whole, the need for personnel in blue-collar professions prevails: “the need for personnel with higher education is estimated at 6-8 thousand people annually, and with secondary vocational education – at the level of 25 thousand people.” Personnel with higher education are required, first of all, for the implementation of innovation and research projects. In particular, “There is a shortage of such very rare professions as oceanologists, permafrost specialists, cryologists, the absence of which does not allow solving pressing problems of the Arctic territories.” The availability of detailed and reliable data on the structure of personnel needs of the economies of the Arctic regions of Russia is necessary for the development of the sphere of lifelong education, including in the formats of “early career guidance” and “lifelong career guidance”. This will significantly correct the imbalance in the Arctic labor market. In their work, the authors explore the regional context set by Arctic conditions for the socialization of youth, and the implementation of life strategies of representatives of the younger generation in this context. Data were collected during a questionnaire survey in the Murmansk region in 2020–2022. Their study reveals a key contradiction between the strategic priorities for the development of the Russian Arctic and the actually observed trends in the Russian Arctic - despite the declared refusal of rotational development in favor of integrated development and attracting the population, in reality the Arctic is unable to cope with the outflow of the population. The increased economic attractiveness of the region through the Northern Sea Route and LNG projects is not sufficiently reflected in the increased attractiveness of the region as a place to live in the eyes of local youth. Macro factors that encourage the population to look for another place of residence instead of settling in the AZ of the Russian Federation can be considered extreme climate, the focal nature of the development of territories and remoteness from industrial and other centers of Russia.

The relatively high expectations of young people are met not only by these macro factors, but also by the discrepancy between these expectations in the educational and professional sphere (the latter, including in terms of expected income) of regions that are peripheral in their status. The authors see a potential solution to the problem of inconsistencies in territory branding and the creation of educational

clusters. The origin of the problem of the discrepancy between expected income and desired income may seem unclear, because throughout a significant part of the history of the development of the Soviet Arctic, significant financial incentives were provided to personnel attracted there (the so-called “northern allowances”). However, the remaining advantages in wages are currently practically leveled out by the virtually equal ratio (depending on the areas of employment) with other regions of Russia. Moreover, the current peripheral position of the Arctic regions does not allow one to reduce the motives for leaving to a financial motive alone - “the remoteness of the Arctic regions is associated with the main characteristics of the periphery, such as backwardness and stagnation, which initially sets the direction in life planning for finding a better place of self-realization.” We also note the historically weak self-identification of a significant part of the local population (of course, excluding the ethnic minority of the indigenous peoples of the North) with the Arctic territories - neither in the early USSR, when the Arctic was developed mainly through forced migration, nor in the second half of the 20th century, when material incentives and incentives were introduced for work in the Arctic territories, there was no emphasis on the formation of regional identity. It is important that modern researchers draw attention to the need to create compensation costs for the indigenous peoples of the North, which, in the opinion of O.A. Krivoshapkina, could also be aimed at developing human resources in the region. The current situation in the Russian Arctic is characterized by the need for tens of thousands of qualified specialists with higher and secondary vocational education. The above figures are consistent with the statement of the former Minister of Education and Science of the Russian Federation D. Livanov, who estimated “the average annual staffing requirement for specialists with secondary vocational education for projects in the Arctic zone at approximately 25 thousand per year.”

Now this problem is being recognized much more acutely and measures are being taken to combat it. A striking example here is the strategic plan of the Government of the Murmansk region until 2035 “Living in the North”. However, the question of how this plan relates to the actually observed life attitudes of young people remains open and requires further study. It should be noted the influence of the COVID-19 factor on the development of this area. Due to the pandemic, funding for many activities has been reduced, which increases the volatility and unpredictability of the future trend in Arctic staffing.

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