SOI: 1.1/TAS DOI: 10.15863/TAS

International Scientific Journal

**Theoretical & Applied Science**

**p-ISSN:** 2308-4944 (print) **e-ISSN:** 2409-0085 (online)

**Year:** 2023 **Issue:** 10 **Volume:** 126

**Published:** 05.10.2023 **http://T-Science.org**


Issue Article


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# THE EFFECTIVENESS OF STRATEGIC HUMAN RESOURCES MANAGEMENT FOR THE SUCCESSFUL IMPLEMENTATION OF PROGRAM DEVELOPMENT OF THE ARCTIC ZONE OF THE RUSSIAN FEDERATION. MESSAGE 1


***Abstract**: in the article, the authors analyze the need to manage labor resources for the development of the Arctic zone, sinceThe 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 living and working effectively in extreme*

*natural and climatic conditions 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, but it is obvious that that this demand cannot be satisfied only by graduates of universities located in the AZ 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 looking for employment opportunities in other regions of the country. The underdeveloped intellectual infrastructure of the Arctic regions provokes an outflow of population. The quantitative and qualitative imbalance in the labor market threatens the implementation of mega projects and national projects in the Arctic zone of the Russian Federation. The need for staffing in the AZ of the Russian Federation is predicted on the basis of surveys of employers, however, this is a very limited and unstrategic approach. A forecasting and strategic model of personnel reproduction is needed, taking into account all the main processes and trends in the economy, technology, management and social sphere. Mechanisms of personnel reproduction require verification, clarification and optimization based on modern methods of forecasting and strategizing.*

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

***Language**: English*

***Citation**: Rumyanskaya, N. S., Kravtsova, F. G., Blagorodov, A. A., Prokhorov, V. T., & Volkova, G. Yu. (2023). The effectiveness of strategic human resources management for the successful implementation of program development of the Arctic zone of the Russian Federation. Message 1. *ISJ Theoretical & Applied Science, 10 (126)*, 45-76.*

***Soi**: http://s-o-i.org/1.1/TAS-10-126-6 **Doi**: https://dx.doi.org/10.15863/TAS.2023.10.126.6*

***Scopus ASCC**: 2000.*

## Introduction

**UDC 332.19:339.73**

Issues of human resource development, especially in terms of personnel training in the AZ RF subjects and Russia as a whole, are being actively studied by many researchers. The role of higher education in replenishing the human resources potential of enterprises in the Russian Arctic is being studied by fellow scientists. Features of the labor market in the Russian Arctic and the training of specialists in the interests of developing cargo transportation along the Northern Sea Route are analyzed by E.A. Smyaglikov and I.I. Kostylev. Many domestic experts and researchers highlight a list of key personnel problems currently inherent in the Arctic territories of Russia:

outflow of economically active population;

harsh natural and climatic conditions;

prolonged demographic crisis;

imbalance in the personnel training system;

low attractiveness of the Arctic regions for young professionals.

Issues of interaction between human resources and the spatial organization of the Russian Arctic space are considered in the works of a number of authors, who draw attention to the need to form compensation costs as a source of development of human resources in the region (including small peoples of the North. Issues of the influence of migration, identification of a set of problems and scientific justification of directions for the formation of the system strategic management of the development of human resources in the Arctic zone of the Russian Federation. To achieve the goal of the study it is necessary, namely:

selection and justification of theoretical concepts for the development of human resources, allowing for the implementation of a strategic approach to the management of such resources in the Russian Arctic;

assess the labor and demographic potential in the Arctic zone of the Russian Federation;

to form a problem field for the strategic development of human resources in the Arctic;

assessment of the personnel situation in certain sectors of Arctic development and Arctic regions;

assessment of global processes and trends and international experience in working with personnel in the Arctic;

analysis of the migration situation in the Russian Arctic in comparison with other regions of the country;

justify the need for qualitative intensification of scientific, educational and innovation policy in the region;

establish the impact of digital transformation on the employment structure of the Arctic population;

to form educational technologies for human resource management in the Russian Arctic.

**Object of study** are the human resources of the Arctic region involved in staffing the implementation of Arctic development programs.

**Subject of research** are managerial and social-labor relations that arise in the mechanisms of expanded reproduction of human resources to meet the needs in the implementation of development programs of the Russian Arctic.

**Theoretical and methodological basis** research is the works of Russian and foreign scientists on management theory, strategy development and strategizing methodology, theory of labor potential and personnel potential management. The following scientific research tools were used: general scientific methods of analysis and synthesis, comparative analysis, mathematical analysis, statistical analysis, and analysis of expert assessments.

**Information base for scientific research** are data from Rosstat and its territorial divisions, monographs, scientific articles, materials of international and all-Russian conferences, regulatory legal acts of the Russian Federation, and other information resources. state management of socio-economic processes. State policy, mechanisms and methods of its development and implementation in various historical and country conditions. Theoretical and methodological foundations of personnel management. Economic and social challenges of human resource management. Human resource management technologies.

**Scientific novelty** The research is to develop theoretical and methodological principles for the formation of strategic priorities in human resource management in the Russian Arctic.

The most significant results include the following:

- it is substantiated that in the context of the implementation of strategic development programs of the Russian Arctic, it is necessary to use the category “human resources” as an integrated concept that combines such more specific categories as “human capital”, “labor resources”, “labor potential” within the framework of the corresponding theoretical concepts and methodological approaches, which is associated with the special conditions of activity in the Arctic regions;
- it has been proven that modern human resource management is associated with the need to expand strategic tools that take into account the unique features of the macroregion (identified based on the study of the Arctic problem field formed in the work), in which such management is implemented, which made it possible to develop the concept of strategic human resource management and justify key areas of research , including digitalization, education, science and innovation and industry specifics;
- the need to ensure (at the level of state policy) a strategic balance of demographic, labor and resource potentials has been established, which is confirmed by a comparative statistical analysis of these types of potential and has made it possible to establish the contribution of each potential to the strategic development of human resources;
- it is shown that the migration balance of the Arctic regions of Russia is critical for the labor potential of the Arctic, taking into account not only the number, but also the human capital of migrants and their age, which made it possible to clarify that the migration outflow of the population does not always have a negative impact on the size of the labor force, subject to replacement earlier working age;
- based on the confirmed conclusion that Arctic development programs are determined not only by government decisions, but also by the contribution of industry projects, strategic directions for industry development of human resources in the Arctic oil and gas industry, the Northern Sea Route and maritime transport in general have been identified;
- based on three established scenarios of demographic and personnel transformation of the macroregion in the Arctic, the need for a qualitative intensification of scientific, educational and innovation policy in the region is substantiated, promoting, 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”;
- it has been proven (including on the basis of a generalization of foreign experience) that significant changes in the employment structure of the Arctic population are brought about by digital transformation, which made it possible to identify strategic directions of development in this area in the form of three large groups: digitalization of work processes, advanced analytics, robotics and remote control , reducing the direct participation of labor resources as performers of technological processes to a minimum;
- It has been established that the insufficient effectiveness of state employment policy for the Arctic zone of the Russian Federation is determined by attracting additional labor resources without paying attention to their qualification characteristics, which requires turning to educational technologies for the reproduction of human resources;
- It has been proven that it is educational technologies that form the basis for targeted management of the expanded reproduction of human resources in the implementation of Arctic development programs, which allows us to form a different institutional view on solving the problem of staffing Arctic programs and form an integrated vision of various potentials (demographic, labor, migration) and their growth.

The scientific novelty of the research is revealed and specified in the following results, namely:

1. Justification for the choice in the context of the implementation of strategic development programs of

the Russian Arctic as the basic category of "human resources" as a generalization of such more specific categories as "human capital", "labor resources", "labor potential" within the framework of relevant theoretical concepts and methodological approaches.

It has been determined that strategic management of the development of the Russian Arctic appears to be an important state task, one of the necessary conditions for solving which is work on long-term planning of staffing for this process. The Arctic, being a zone of strategic interests of the economically leading countries of the world, 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 plots of farming 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.

The study of issues related to the development of the Russian Arctic and the practical implementation of fundamental projects for the development of the Russian Arctic, planned in strategic regulatory documents, made it possible to clarify that the state and problems of personnel development in the Arctic must be considered both in the context of the human resources of the entire country, and in the light of global trends and processes, as well as in light of the socio-economic problems of the Arctic macro region itself. The main content of the problem field is that there is a shortage of personnel for the implementation of existing and planned Arctic development projects, which can lead to their slowdown.

It has been established that the category of human resources potential is often used to analyze the human resources of an organization, but it is also applicable at the meso level - the level of regions and regional economies, while a single established definition of this category has not yet been developed. At the same time, feedback is also objective through assessing the effectiveness of using human resources as one of the key elements of human capital. The category of human potential is inextricably linked with the Human Development Index, which is calculated annually within the framework of the UN Development Program and is based on three indicators - life expectancy, literacy level and gross national income per capita. During the analysis of scientific publications, it was established that that a single point of view on the similarities and differences between the categories "human capital" and "human potential" has not been developed. A significant part of researchers agree that innate characteristics represent only part of human potential, while most of it is acquired during life, education and socialization. Human capital is considered as the resulting product of the education system or with the integrated influence of education, health and motivation - therefore, in human resource management, an approach that takes into account investments in human capital is justified. In humanitarian studies, the categories of human capital and human potential are not distinguished and are used as interchangeable concepts. Labor potential, in turn, is considered by researchers or as an element of human potential that allows for creative and cost-effective activities. In a narrow sense, the category of labor potential includes educational and qualification indicators; in broader interpretations, it can cover other groups of indicators and, in its definition, approach the category of human potential. At the same time, the position on the identity of personnel potential and the total labor potential in the economic system is correct. Statistical analysis of the data shows that most Arctic and sub-Arctic regions have a mortality rate in working age that is higher than the Russian average, which is determined by a lower quality of life - this is a marker of the general unattractiveness of the conditions for working and living in them.

We have concluded that human resources should be considered as a fundamental factor in the strategic development of the Arctic regions of Russia due to the ambiguity of the concepts of personnel potential, labor potential, human potential and human capital, therefore it is reasonable to use the category "human resources" to identify problems and implement areas of strategic development both individual regions of the Russian Arctic and the Russian Arctic as a whole.

2. Modern human resource management is associated with the need to expand strategic tools that take into account the unique characteristics of the macro region (as part of the formation of the problem field). The analysis of regulatory legal documents approving the priorities and objectives of the Arctic policy of Russia in general and the staffing of the Russian Arctic, in particular, starting in 1997 and the adoption of the Federal Law "On the fundamentals of state regulation of the socio-economic development of the North of the Russian Federation", shows the insufficient complexity of aspects , which can and do arise during long-term planning of its development. Thus, it was envisaged to allocate budgetary allocations including targeted training of personnel from among the indigenous peoples of the North to work in government agencies, which ensured the solution of two tasks - ensuring the development of indigenous peoples and personnel policy, but limited the scope of application of development support and did not affect the processes of staffing in the oil and gas sector , in education and health care. At the same time, the issues of human capital formation in the Russian Arctic were initially in some contradiction with demographic policy measures, when it was supposed to support (with housing, financial, credit and other measures) the population leaving the North. Over time, the consolidation of the population in the Russian Arctic began to be considered as one of the

key strategic factors, including the development of measures, aimed at increasing natural population growth in the Arctic regions (increasing the birth rate, decreasing mortality), which, together with the support of migration outflow, created extremely unfavorable conditions for the accumulation of human capital in the Russian Arctic. It was revealed that no attention is paid to the need to adjust the state employment policy, which has proven to be insufficiently effective. To a large extent, this policy comes down to attracting additional labor resources, although the existing labor resources may be sufficient in quantitative terms - but they do not have the required qualifications. Little attention is paid to the low effectiveness of career guidance activities. Often such a situation arises, in which the local labor market experiences a shortage of labor resources of a certain qualification, which are available in neighboring territories, but does not have channels for informing these workers about vacancies. This requires an in-depth analysis of the state and dynamics of the issue of staffing the development of the northern territories of Russia, which are difficult to develop, in the conditions of new industrialization and difficulties with the demographic situation in the macroregion and in Russia as a whole. It is concluded that achieving the goals of comprehensive Russian policy in the Arctic territories and the full implementation of a mega project for the development of the Arctic is impossible without scientific and technological support and training of appropriate personnel. Defined, that a significant update of priorities took place in 2018 with the adoption of the Strategy for the development of the Arctic zone of the Russian Federation and ensuring national security for the period until 2035, when it was recognized that there were problems in the labor force, namely, a shortage of workers and engineers and an oversupply of unclaimed specialists. The implementation of the state program "Socio-economic development of the Arctic zone of the Russian Federation for the period until 2035" since 2020 was aimed at creating new jobs with state support.

It has been established that the development of the Arctic personnel policy of the AZ of the Russian Federation should be based on the principle of integration into the personnel policy of the country as a whole, otherwise the training and attraction of personnel for the Arctic can lead to imbalances in other regions that also require development. It is important to assess the real level of personnel shortage in the Arctic in comparison with all-Russian trends.

At the same time, the tasks of maintaining a high population of the North and reducing population outflow must take into account the following determining circumstances:

1) The Arctic is a large area with complex communications;

2) the state of the infrastructure, either absent or insufficient to meet the minimum needs of the population, which leads to an increase in the cost of almost any economic activity;

3) expenses for maintaining the population in the North, which becomes the basis for ensuring a quality of life that is specific to difficult climatic conditions.

It is concluded that human resource management in the Arctic will differ from region to region due to significant differences in their condition and dynamics between the Murmansk and Arkhangelsk regions, the Republic of Karelia, the Komi Republic, as well as the Nenets Autonomous Okrug, the Yamalo-Nenets Autonomous Okrug, Norilsk, the Yakut Arctic territories and Chukotka. High values of migration indicators are associated with problems of ensuring the quality of life in the Arctic, which, in turn, are reflected and interconnected with indicators of the region's scientific and educational potential and the level of healthcare.

3. Ensuring (at the level of state policy) a strategic balance of demographic, labor and resource potentials of territories with difficult natural conditions.

It has been established that while there are differences in the definitions of labor potential in the works of Russian researchers, their main unifying feature is the recognition of the totality of quantitative and qualitative characteristics of the economically active population (or "labor resources") as the basis for the formation of labor potential.

Using the index method to measure and compare the levels of labor potential of regions, taking into account life expectancy, employment levels and GRP per capita, shows the best integral indicator for the Nenets Autonomous Okrug and Yamalo-Nenets Autonomous Okrug, the Khanty-Mansi Autonomous Okrug was in third place, all other regions considered were approximately at the all-Russian level. It was concluded that a number of indicators for which the Arctic regions have the most serious problems, which also affect the labor potential of the population, were not taken into account in this index. When such groups of indicators as the demographic component, health, education, welfare and material security of the population, the intellectual component, and the psychophysical state were included in the index, results were obtained according to which many regions, whose territories are now included in the AZ of the Russian Federation, received fairly high places in the ranking and were included in the group of regions with high labor potential - these are the Yamal-Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug, Chukotka Autonomous Okrug and the Murmansk Region. This is explained by high labor incomes (Yamalo-Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug), the size of the labor potential (Chukchi Autonomous Okrug), as well as the role of a transport hub of international importance (Murmansk region).

To measure the contribution of the demographic potential of the AZ of the Russian Federation to the formation of labor potential, the population indicator was used as a base indicator (Rosstat separately provides data on the population of the AZ of the Russian Federation as an independent zone from 2014 to the present). From 2014 to 2023, the population remains stable, the Krasnoyarsk Territory, the Republic of Sakha (Yakutia), the Nenets Autonomous Okrug, the Chukotka Autonomous Okrug and the Yamalo-Nenets Autonomous Okrug demonstrate steadily positive population growth; in 2020, there was a fairly noticeable increase from 2.4 up to 2.6 million people due to the inclusion of a number of municipalities in the AZ of the Russian Federation, the most significant natural population decline in terms of per 1000 population is observed in the Republic of Karelia. The migration balance of the Arctic regions of Russia is also critical for the labor potential of the Arctic, and we are talking not only about the quantity, but also about the "quality" of migrants, their human capital.

It was revealed that, against the background of natural growth, the population of the Arctic territories was characterized by such signs of demographic disadvantage as a significant gap in life expectancy between men and women (up to 14 years in favor of women) and between the urban and rural populations, increased mortality from external causes compared to the all-Russian level, extremely high mortality among men of working age. Consequently, aspects of healthcare should be highlighted separately when assessing the directions of human development in the AZ of the Russian Federation.

Based on the analysis of statistical data, a decrease in the absolute number of the labor force was established, namely in the Republics of Karelia and Komi, the Arkhangelsk and Murmansk regions, and the Krasnoyarsk Territory. It is concluded that if at the federal level this is associated, first of all, with the aging of the population, then in the Arctic regions, along with aging, the migration outflow of the population may also influence the size of the workforce, but this influence will not necessarily be negative, since people come to the Arctic regions predominantly the population is of working age, and the population of older ages is leaving, wanting to spend their old age in more favorable living conditions.

The structure of labor distribution across economic sectors remains relatively stable in the AZ regions of the Russian Federation, but the structure of the need for workers of different professional groups varies. The most in demand professional group as of October 2022 in the Republics of Karelia and Komi, the Arkhangelsk Region, Khanty-Mansi Autonomous Okrug, Chukotka Autonomous Okrug and the Krasnoyarsk Territory were specialists of the highest level of qualifications, in the Nenets Autonomous Okrug - operators of production plants, in the Murmansk Region and Yamal-Nenets Autonomous Okrug - skilled production workers, builders and drivers in the Republic of Sakha (Yakutia) are both specialists of the highest level of qualification and operators of production plants. The presence of higher education among representatives of the labor force in all Arctic regions, except for the Chukotka Autonomous Okrug, significantly reduces the risk of unemployment, although the problem of the discrepancy between the quality of the professional and qualification structure of personnel and the current needs of the economy remains relevant. It is concluded that, despite the structural imbalance of labor supply and demand by specialty, the mere presence of a higher education has a significant positive effect on the likelihood of employment, although the scale of this effect differs by industry and specialty.

4. The criticality of the migration balance of the Arctic regions of Russia for the labor potential of the Arctic.

The formulation of the problem of studying the impact of migration on the quality of the labor potential of the Arctic is associated with the presentation of its personnel potential as a combination of three components: workers of the Arctic region, workers from other regions and workers who are citizens of other states. At the same time, for many years there has been an outflow of population and negative migration growth in almost all Arctic regions. The absolute record for the share of population growth over 5 years due to migrants from the CIS was set by the Chukotka Autonomous Okrug - 3.4%, followed by the Republic of Sakha (Yakutia) - 2.9%, Nenets Autonomous Okrug - 1.4%, Yamalo-Nenets Autonomous Okrug - 1.1 %, Murmansk region – 1.1%.

The construction of a correlation matrix of migration growth and indicators of economic, scientific and educational development of Russian regions allowed us to draw the following conclusions:

- Only GRP per capita has significant positive significance for ensuring migration growth, but this applies only to the migration influx of citizens of the post-Soviet space, while the Arctic regions attract quite a lot of migrants, and the Yamal-Nenets Autonomous Okrug and the Nenets Autonomous Okrug as a whole determine the positive trend of migration to regions with high GRP by per capita;
- the higher the average January temperature, the higher the migration increase of people with higher education, while GRP per capita had virtually no effect on this process;
- The greater the concentration of personnel from the fields of science and education in the regions, the lower the number of arrivals and departures with higher education, while the higher GRP per capita attracts more migrants with higher education, but the

outflow of people with this level of education from the region also turns out to be expressed.

- the indicators of the Arctic regions are above the trend line, which means a greater value of migration flows than can be expected based on all-Russian patterns, which indicates that the migration situation in the Arctic is highly problematic for the implementation of personnel policy, which makes its staffing management unpredictable.

An assessment of the impact of wages in attracting personnel to the Arctic shows that in almost all regions with Arctic territories, it was significantly higher than the Russian average, but there are a number of regions (mainly the Northwestern Federal District) where it is comparable to or lower than the Russian average. At the same time, the territories that are part of the Russian Arctic differ in the level of socio-economic development, which is due to unsatisfactory socio-economic, cultural and living conditions, features of the conditions of socialization and self-realization in the region - this can be considered the main reasons for the decline in population in these regions, i.e. It is natural for people to strive to improve living conditions, including the environmental situation. Over the past 20 years, the main reasons for leaving the Far North include personal and/or family reasons (56%), returning to their previous place of residence (13%), due to study (12%), and due to work (12 %).

It is concluded that high wages are undoubtedly a significant factor in attracting personnel to the Arctic. However, due to the significant share of temporary, rotational work in the regions, as well as due to the processes of active transformation of their economies, a significant outflow of population is observed in them. This determines the validity and feasibility of developing directions for retaining the population in the Arctic, especially in light of new, large-scale tasks for the development of the macroregion.

5. Arctic development programs are determined not only by government decisions, but also by the contribution of industry projects; strategic directions for industry development of human resources in the Arctic oil and gas industry, the Northern Sea Route and maritime transport in general have been established.

Modernization and development of the infrastructure of the Arctic transport system are identified as strategic priorities of the state policy of the Russian Federation in the Arctic, and the Northern Sea Route (NSR) is one of the key projects, the implementation of which will ensure the transportation of goods, including oil and gas products, while the development of transport is of great importance and to ensure food security of the Arctic macroregion. The Strategy for the Development of the Arctic Zone of Russia and Ensuring National Security until 2035 sets the task of organizing training and retraining of personnel in terms of the personnel needs of the NSR, including training in the most in-demand specialties in the mining and manufacturing industries, in engineering and communications and developing or updating related professional standards. A separate task is in terms of staffing ports connected to the Northern Sea Route, which requires the training of highly qualified specialists in the design and construction of water transport infrastructure, taking into account the opening of several new unique Arctic ports, where the total length of the berthing front can be tens of kilometers. At the moment, basic training is carried out on the basis of two specialized universities (North-Eastern Federal University named after M.K. Ammosov in Yakutsk, Northern (Arctic) Federal University named after M.V. Lomonosov in Arkhangelsk), and must be worked out educational programs in Russian technical, construction and transport universities in areas related to hydraulic engineering construction of ports and inland waterway structures. The National Arctic Scientific and Educational Consortium, which has been operating since 2016, uniting 14 scientific and educational organizations to cooperate in the field of training personnel for Arctic projects, including the NSR, is also important.

It is concluded that the personnel supply system for maritime transport is highly globalized, which poses certain problems for maintaining the level of personnel supply for the sea and river fleet in Russia in general and the Arctic in particular due to the high gradient of wages towards work on foreign ships for high-quality Russian specialists.

To solve the problems of developing maritime transport, it is necessary to provide the fleet with sailors and naval officers (the projected need is at least 40 thousand people per year), on whose qualifications safety, accident-free operation and protection of the marine environment depend. At the same time, it is also important to create working conditions and appropriate wages that are competitive in comparison with work in foreign companies. At the same time, the projected growth in port cargo turnover in the context of the growing importance of national security issues in Russia will inevitably lead to an increase in the need for domestic maritime transport and its personnel, but the number of this personnel has been declining in recent years. The problematic field of staffing for maritime transport in the Arctic and the Far East is aggravated by the difficult demographic situation in the region compared to the average Russian one, i.e. a relatively low proportion of young people with a high educational migration to the central regions of the country and the development of other types of population migration, which does not give the region the opportunity for rapid innovative development. The problems of maritime transport in the region are complicated by the unclear prospects for its

development, as well as in Russia as a whole, tied to the situation in the commodity markets. It has been established that the requirements for staffing EMS are not limited to professional specializations alone - psychological preparation is also important (psychological endurance, ability to act competently in emergency situations), and health indicators (for working in extreme climatic conditions of the Far North). The most optimal option is justified for the training of Arctic personnel, starting with training in secondary educational institutions on the basis of career guidance activities on the part of potential employers - leading state corporations, resource mining, manufacturing and transport companies operating in the Arctic. Recommendations are proposed to improve the quality of staffing for Russian maritime transport (using the example of the Arctic and the Far East): the formation of a system for strategic planning of the personnel needs of Russian maritime transport, based on long-term forecasts for exports, construction and acquisition of ships, increasing port capacity; increasing the flexibility of the personnel training system for maritime transport (in terms of interaction between leading universities in the region, up to their merger with the possibility of any students receiving maritime specialties as additional ones); increasing the level of attraction of schoolchildren from the interior regions of the country into maritime professions through early career guidance with benefits for studying at specialized universities; increasing the level of digitalization of the educational process; the formation of career guidance and pre-university training programs for migrants promising in relation to maritime professions; introduction of a system of restrictive measures for Russians to work for foreign maritime transport companies immediately after graduating from universities; increasing control automation,

*6.* Based on three established scenarios for the demographic and personnel transformation of the macroregion in the Arctic, the need for a qualitative intensification of scientific, educational and innovation policy in the region is substantiated.

The demographic personnel transformation of the macroregion identified during the study made it possible to identify its three main scenarios:

1) Arctic resources are being developed more intensively than indicated in the strategic plans;

2) resource development is proceeding in accordance with plans;

3) there is some stagnation in the demand for resources (it may be associated with geopolitical turbulence).

It has been established that for each scenario it is advisable to model, linked to the personnel needs of the country, while the training of specialists must be carried out in various areas of training in the field of secondary vocational and higher education with the possibility of practice in the Arctic with the prospect of employment, taking into account the insufficient effectiveness of the influx of specialists from other regions of the country and abroad.

An analysis of statistical indicators of scientific, educational and innovative development of the Russian Arctic shows positive trends in the growth of the number of graduate students and doctoral students, but the graduation rates from graduate school in 2019 and 2020. did not reach even 1% of the all-Russian number of postgraduate graduates. With approximately comparable per capita costs in the Arctic Zone of the Russian Federation and Russia as a whole, the Russian Arctic was able to attract only 3 times fewer workers into science than expected based on the proportional population size, which indicates some inefficiency in spending these funds. The share of added value of high-tech and knowledge-intensive sectors of the economy in the GRP of the AZ RF is 3 times lower than the all-Russian level, and the share of advanced production technologies developed in the AZ RF does not exceed 1.15% of the all-Russian figure, At the same time, the number of advanced production technologies used in the Russian Arctic in recent years has been increasing at approximately the same rate as in Russia as a whole.

For the full development of the Russian Arctic, the successful implementation of investment projects in the mining industry and the creation of transport infrastructure, a high-quality intensification of scientific, educational and innovation policy in the region is necessary, promoting, 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, including corporate programs in the field of education and development of scientific and applied developments, on the other hand, the development of “Arctic intellectual service” with specific research areas that are significant for the development of the Arctic. It is proposed to strengthen the “Arctic intellectual service” as a set of activities for the development of the Arctic Zone of the Russian Federation based on the restructuring of its scientific sphere while simultaneously strengthening its connection with various sectors of the economy and increasing the demand for research results by enterprises of the Arctic Zone of the Russian Federation.

*7.* Digital transformation is making significant changes to the employment structure of the Arctic population, which has made it possible to identify strategic directions for development in this area in the form of three large groups:

digitalization of work processes,

advanced analytics,

robotics and remote control.

It has been established that the Arctic region is important for the world in general and for the Arctic states, in particular, not only due to its strategic

location, which allows large trade flows to pass through it in a warming climate, but also due to significant oil and gas reserves. In program documents defining the regional development strategy (for example, in the Strategy for the socio-economic development of the Murmansk region, the Norwegian technological strategy for the 21st century), emphasis is placed on "unmanned" technologies for the "conquest" of the Arctic continental shelf in terms of research and involvement in the development of natural resources.

Trends in recent years indicate the displacement of human resources, providing monitoring and control of the condition of objects during the development of oil and gas resources, complex intelligent systems that monitor and control in real time by receiving operational data from a variety of sensors. At the same time, the role of personnel capable of acting as operators and dispatchers of such systems is increasing. There is also an increasing need for IT personnel capable of developing such systems, including those involving the Internet of Things, cloud analytics, artificial intelligence and machine learning on high-resolution data. The direct participation of personnel as performers of technological processes is reduced to a minimum, but at the same time the need for personnel increases.

Three key aspects of the impact of digitalization on the development of hydrocarbon resources of the Arctic continental shelf are substantiated:

1) Digitalization of workflows – Many areas of the complex hydrocarbon production process involve repetitive manual tasks. Digital solutions can reduce the time spent on non-value-added tasks (such as searching for data or moving information from one system to another);

2) advanced analytics - the modern oil and gas industry generates large volumes of data, so using analytical data processing and machine learning, it is possible to improve the understanding of many significant issues;

3) robotics and remote control - in the near future, an increasing expansion of the use of robotics and remotely controlled technological solutions for various physical and mechanical processes (automatic drilling, the use of unmanned aerial vehicles for inspection and completely unmanned fields) is expected, which will contribute to improving employee safety, creating added value and reducing the carbon footprint of the company.

This determines the focus of Russia's preparation for the development of hydrocarbon deposits on the Arctic continental shelf towards the development of "unmanned" technologies. For their successful implementation, it is necessary to anticipate some structural changes in the needs of oil and gas production for personnel in various specialties.

8. The insufficient effectiveness of state employment policy for the Arctic zone of the Russian Federation is determined by attracting additional labor resources without paying attention to their qualification characteristics.

An analysis of the problems of personnel potential in the Arctic and the problems of staffing the implementation of projects for the development of the Russian Arctic shelf based on the results of research by Russian scientists and the provisions of strategic documents made it possible to establish the need to increase the number of specialists with both higher and secondary specialized education in working specialties, while the share of qualified workers as part of the personnel needs of the Russian Arctic will only increase as the projects for the development of the Arctic territories of Russia planned in regulatory strategic documents are deployed.

Determined that:

- a comparison of the personnel needs stated in strategic documents and the projected number of graduates of secondary vocational education institutions revealed significant differentiation in the projected supply of regions with personnel with secondary vocational education;
- there is a disproportionately high share of humanitarian and pedagogical specialties, as well as insufficient (only 20-60%) coverage by graduates of the relevant specialties of the personnel needs of the priorities of the strategic development of the Arctic, and in the specialties important for the Arctic, secondary vocational education institutions located in the AZ of the Russian Federation do not provide training specialists;
- decisions to increase enrollment targets in educational institutions by the Ministry of Education and Science of the Russian Federation for technical (engineering) and natural science areas of training, as well as in the field of healthcare and education are significant;
- student practice should be considered as the main way to form a personnel reserve in the scientific field and overcome the lack of practical skills among young specialists in order to reduce the replacement rate and staff turnover rate;
- there is an objective need to increase the attractiveness of the Arctic for work, since in certain regions (the Republic of Sakha (Yakutia)) there is an acute problem of the reluctance of newly trained specialists to take jobs in the Arctic regions if there is a sufficient number of specialists in the required professions;
- factors of quality of life, education, culture and health (taking into account life in the northern territories) determine the effects of the use of human capital;
- It is advisable to implement projects for the evolutionary development of vocational education institutions in the Arctic regions, to qualitatively improve their level based on network, remote and online technologies, to develop a research base and

organize interaction with potential employers, including the organization of internships and internships.

It has been proven that due to the influence of high migration and imbalance of demand and supply of labor in the regional and professional context, a list of professions for the Arctic should be formed, which will make it possible to make adjustments to the structure of personnel training, the opening of new specialties and areas of training, educational resources in other regions of Russia and interregional attraction of foreign and labor migrants.

The analyzed array of studies devoted to personnel potential and human capital of the Russian Arctic convincingly shows that the main and most discussed problems in the scientific discussion for the development of personnel potential and human capital remain disproportions between the distribution of graduates of the education system by educational specialties, on the one hand, and the structure labor market 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 similar effective mechanisms that can replace it are practically not considered.

9. Educational technologies form the basis for targeted management of the expanded reproduction of human resources in the implementation of Arctic development programs, ensuring the formation of a new institutional view on solving the problem of staffing.

It has been determined that there is a 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 regions of the Russian Arctic. This shortage occurs against the backdrop of a stable or even growing demand for labor, the cause of which is primarily due to migration outflow, which should be counteracted by the development of settlement systems and the attraction of young people for permanent residence. In addition to the lack of attractiveness of the Arctic regions for young professionals, even in the context of the implementation of mega projects, the development of the Northern Sea Route and LNG projects, other key personnel problems currently inherent in the Arctic territories of Russia are also highlighted:

outflow of economically active population;

harsh natural and climatic conditions;

prolonged demographic crisis;

imbalance in the personnel training system;

the decreased level of provision of public health services as a result of the "optimization" of the regional health care system;

under development of targeted training (only 3.4% of students in Arctic programs), lack of a system for assessing the needs for specialists and current personnel potential, as well as a system for monitoring personnel needs in the system of executive authorities in the regions of the Russian Federation.

It has been established that only 30 out of 203 Russian universities implement 227 Arctic programs for 62.5 thousand students, while 24 out of 30 universities are located outside the Russian Arctic, and 30 areas of training are a kind of "exclusive" of universities located in the Arctic RF. Only 31% of graduates remain working in the AZ RF (for comparison, among graduates of AZ RF universities in general, the same figure is 71%). The majority (72%) of "Arctic" programs are carried out by universities in cooperation with various enterprises of the Russian Arctic. The most common form of cooperation is organizing and conducting practices (74%), closely followed by cooperation agreements (23%).

Taking into account the problem of staffing in the AZ of the Russian Federation, the importance and role of continuing education, which, in turn, also needs monitoring and forecasting of the labor market, is substantiated. Currently, the industries prevailing in the structure of the economy of the territories of the Russian Arctic determine the demand for professions; 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.

The results of the study have both theoretical and practical significance. The theoretical significance of the results obtained lies in the expansion of methodological tools for analyzing the personnel situation in the regions, as well as for the process of strategic planning for their development, taking into account the situation in the country as a whole and a number of global trends.

The practical significance of the results obtained lies in specific assessments of the state and dynamics of the human and personnel potential of the region, the conditions for its development, and the identification of specific priorities for the socio-economic policy of the regions of the Russian North. The work obtained practically significant indicators of the comprehensive attractiveness of regions that are strategically important for national development as a whole in terms of the quality of life in them, which expands the list of necessary approaches for the formation and implementation of personnel policy in the Arctic.

The dissertation materials can be used in practical work by the Ministry of the Russian Federation for the Development of the Far East and the Arctic, the Ministry of Industry and Trade of the Russian Federation, the Ministry of Economic Development of the Russian Federation, the Ministry

of Energy of the Russian Federation, and other authorities and departments.

**Main part**

Research into the labor potential of Russian regions and attempts to quantify it have attracted considerable attention from scientists in recent years. One of the first definitions of labor potential belongs to I.S. Maslova - in her 1987 work, she noted that labor potential is "a general characteristic of the measure and quality of the totality of abilities for socially useful activities, which determine the capabilities of an individual, groups of people, the entire working population for their participation in work." In more modern works, labor potential was defined as follows:

"a complex socio-economic category, which is a generalizing (integral) assessment of the quantitative and qualitative characteristics of the ability of the economically active population to do creative work."

"quantitative and qualitative characteristics of the existing and potential capabilities of the economically active population of the region, which are used and can be used in labor activity in the conditions of the achieved level of development of the productive forces, scientific and technological progress and socio-economic relations."

"the total social ability to work, i.e. potential working capacity of society, its labor resources. The labor potential of the country and its regions is the corresponding labor resources, considered in terms of the unity of their qualitative and quantitative aspects."

We can talk about some differences in definitions, but their main unifying feature is the recognition of the totality of quantitative and qualitative characteristics of the economically active population (or "labor resources") as the basis for the formation of labor potential.

The index approach is very popular for measuring and comparing the levels of labor potential of regions. For example, L.A. Popov and M.A. Terentyev in their calculations of the labor potential of the northern regions use the assessment methodology of G.V. Yakshibaeva. This technique is based on the index approach, with the integral labor potential index assessed by Yakshibaeva based on five subindices, namely:

1) the share of the working-age population in the total population;

2) the level of education, professional training and retraining, qualifications and work experience that contribute to increasing the employee's capacity;

3) salary level;

4) the employee's labor equipment with the necessary means and tools;

5) level of employment, labor activity."

Popova and Terentyeva slightly changed the composition of the subindices, taking as basic indicators "working life expectancy in the region, the level of employment of the population, the level of professional education of the employed population, the capital-labor ratio and the gross regional product per capita" (listed from the one with the greatest weight in the integral index to having the least weight).

Table 1 presents the values of all subindices and the integral index for the regions whose territories are currently included in the AZ of the Russian Federation, as of 2020.

Of all the regions considered, the best integral indicator was observed in the Nenets Autonomous Okrug and Yamal-Nenets Autonomous Okrug, with Khanty-Mansi Autonomous Okrug in third place. All other regions considered were approximately at the all-Russian level. In terms of working life expectancy and level of professional education, only Chukotka Autonomous Okrug was noticeably behind. In terms of employment levels, the regions under consideration were either approximately at the all-Russian level, or noticeably higher. In other words, this index paints a fairly good picture. This suggests that a number of indicators for which the Arctic regions have the most serious problems, which also affect the labor potential of the population, were not taken into account in this index.

**Table 1. Labor potential development index according to L.A. Popova and M.A. Terentyeva in the constituent entities of the Russian Federation, whose territories are currently included in the AZ of the Russian Federation, as of 2020, in percentage terms**

| Регион | Продолжительность трудовой жизни | Занятость | Уровень профессионального образования | Фондовооруженность | ВРП на душу населения | Интегральный показатель. |
|---|---|---|---|---|---|---|
| Архангельская область | 92,2% | 68,0% | 67,9% | 8,8% | 8,2% | 49,0% |
| Мурманская область | 92,9% | 76,1% | 73,6% | 9,2% | 8,3% | 52,0% |
| Ненецкий автономный округ | 86,9% | 73,9% | 68,1% | 50,7% | 98,9% | 75,7% |
| Республика Карелия | 89,7% | 67,0% | 70,0% | 5,8% | 5,6% | 47,6% |
| Республика Коми | 90,2% | 70,0% | 70,3% | 13,3% | 11,0% | 51,0% |
| Республика Саха (Якутия) | 89,8% | 67,3% | 71,1% | 8,1% | 11,4% | 49,5% |
| Ханты-Мансийский автономный округ | 97,0% | 77,7% | 76,9% | 35,6% | 36,9% | 64,8% |
| Чукотский автономный округ | 73,5% | 87,7% | 63,0% | 10,6% | 23,6% | 51,7% |
| Ямало-Ненецкий автономный округ | 96,0% | 80,6% | 79,1% | 63,9% | 42,0% | 72,3% |
| Российская Федерация (справочно) | 94,4% | 68,1% | 73,7% | 6,9% | 7,4% | 50,1% |

Index developed by N.M. Rimashevskaya and colleagues, includes the following groups of indicators: demographic component, health, education, welfare and material security of the population, intellectual component, psychophysical state, social and personal component (number of people motivated to work).

Table 2 presents the ranks and values of labor potential for the regions whose territories are currently included in the AZ of the Russian Federation, as of 2021.

**Table 2. Rank according to the labor potential development index according to N.M. Rimashevskaya, L.A. Migranova and M.S. Toksanbaeva in the constituent entities of the Russian Federation, whose territories are currently included in the AZ of the Russian Federation, as of 2021**

| Region | Rank |
|---|---|
| Arkhangelsk region (including Nenets Autonomous Okrug) | 37 |
| Krasnoyarsk region | 28 |
| Murmansk region | 7 |
| Republic of Karelia | 43 |
| Komi Republic | 17 |
| The Republic of Sakha (Yakutia) | 27 |
| Khanty-Mansiysk Autonomous Okrug | 4 |
| Chukotka Autonomous Okrug | 6 |

| | |
|---|---|
| Yamalo-Nenets Autonomous Okrug | 3 |

You can see that in the index N.M. Rimashevskaya and colleagues, many regions whose territories are now included in the AZ of the Russian Federation received fairly high places in the ranking and were included in the group of regions with high labor potential - these are the Yamal-Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug, Chukotka Autonomous Okrug and the Murmansk Region. The compilers of the rating themselves attribute this fact to high labor incomes (Yamalo-Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug), the size of the labor potential (Chukchi Autonomous Okrug), as well as the role of a transport hub of international importance (Murmansk Region). Index G.V. Leonidova and A.M. Panova was built on the basis of "aggregation of data on health status, professional education, material well-being and opportunities for realizing labor potential" (Table 3.)

As can be seen from Table 3, the most favorable situation is in the Yamal-Nenets Autonomous Okrug and Khanty-Mansi Autonomous Okrug, which have high rating values not only for the integral index, but also for all its components. The lowest value of the integral index of all the regions under consideration has the Chukotka Autonomous Okrug, which has a catastrophically low indicator for the health component. In terms of other components, the situation in this AO looks rather average, and in terms of the labor market component, the Chukotka AO demonstrates a fairly high value of the indicator, which determined its high place in the rating of Rimashevskaya and colleagues, discussed above.

**Table 3. Rank and value of the Labor Potential Development Index (LDI) according to G.V. Leonidova and A.M. Panov in the constituent entities of the Russian Federation, whose territories are currently included in the AZ of the Russian Federation, as of 2021, in terms of percentages**

| Регион | Ранг по ИРТП | ИРТП региона | Индексы регионов по показателям развития ТП | | | |
|---|---|---|---|---|---|---|
| | | | Здоровье | Образование | Благосостояние | Рынок труда |
| Архангельская область | 22 | 58,4% | 56,3% | 66,6% | 36,4% | 85,3% |
| Красноярский край | 23 | 58,3% | 61,1% | 58,8% | 37,8% | 85,0% |
| Мурманская область | 12 | 62,8% | 63,8% | 65,7% | 44,5% | 83,6% |
| Ненецкий автономный округ | 5 | 68,0% | 44,7% | 57,4% | 96,1% | 86,8% |
| Республика Карелия | 59 | 51,0% | 49,4% | 61,7% | 29,7% | 74,9% |
| Республика Коми | 17 | 59,7% | 56,1% | 62,9% | 46,7% | 77,2% |
| Республика Саха (Якутия) | 26 | 58,0% | 57,5% | 63,2% | 39,9% | 78,3% |
| Ханты-Мансийский автономный округ | 4 | 71,2% | 74,0% | 66,8% | 62,7% | 83,0% |
| Чукотский автономный округ | 78 | 39,0% | 8,4% | 62,0% | 52,4% | 85,1% |
| Ямало-Ненецкий автономный округ | 2 | 81,0% | 78,3% | 73,3% | 83,0% | 90,2% |

Index compiled by T.Yu. Kryshtaleva, includes 5 components - demographic, economic, educational and qualification, psycho-physiological and innovative. The ranks of the regions of the Russian Arctic according to each of the five subindices and the integral index of Kryshtaleva are presented in Table 4.

**Table 4. Rank for each subindex and integral index of labor potential development according to T.Yu. Kryshtaleva in the constituent entities of the Russian Federation, whose territories are currently included in the AZ of the Russian Federation, as of 2021**

| Регион | Демографический | Экономический | Образовательно-квалификационный | Психофизический | Инновационный | Интегральный |
|---|---|---|---|---|---|---|
| Архангельская область | 64 | 40 | 21 | 39 | 62 | 51 |
| Красноярский край | 22 | 45 | 8 | 31 | 27 | 15 |
| Мурманская область | 40 | 11 | 49 | 22 | 39 | 21 |
| Ненецкий автономный округ | 10 | 5 | 28 | 82 | 74 | 14 |
| Республика Карелия | 63 | 64 | 57 | 81 | 58 | 80 |
| Республика Коми | 41 | 29 | 38 | 61 | 64 | 50 |
| Республика Саха (Якутия) | 9 | 16 | 19 | 29 | 57 | 10 |
| Ханты-Мансийский автономный округ | 5 | 8 | 17 | 14 | 68 | 5 |
| Чукотский автономный округ | 16 | 1 | 53 | 48 | 8 | 4 |
| Ямало-Ненецкий автономный округ | 6 | 2 | 61 | 57 | 59 | 7 |

It can be seen that according to Kryshtaleva's integral index, as well as other integral indices, an already familiar picture emerges - the Chukotka Autonomous Okrug, Khanty-Mansi Autonomous Okrug and Yamal-Nenets Autonomous Okrug are at the top of the ranking, occupying 4.5 and 7th places, respectively. Such a high place of the Chukotka Autonomous Okrug is associated with its absolute leadership among all regions in the economic sub-index; It also took a relatively high place in the sub-index of innovation. At the same time, in terms of educational qualifications and psychophysiological components, this region is below the median, which is associated with low educational indicators and extremely low life expectancy (for this last indicator, the Chukotka Autonomous Okrug remains one of the anti-record holders among Russian regions). Khanty-Mansi Autonomous Okrug has a relatively favorable situation in all components, except for the innovation subindex, where it is among the outsiders. At the same time, the rating of Khanty-Mansiysk Autonomous Okrug in the demographic subindex turned out to be even higher than in the economic subindex. However, this situation stems largely from the "export of mortality" - older people, having left working age and completed their working career, migrate to regions with better living conditions (primarily in terms of climate), and their morbidity and mortality rates are no longer included in the statistics for Khanty-Mansi Autonomous Okrug. A similar situation is observed in the Yamal-Nenets Autonomous Okrug, which occupied the top lines of the demographic and economic rankings, but seriously lagged behind in terms of such components of labor potential as educational, psychophysiological and innovative. A good situation is developing with the labor potential of Yakutia (seriously lagging behind only in the innovation component) and the Krasnoyarsk Territory (where a serious lag is observed in the economic component). Below the median according to the integral index were the Arkhangelsk Region, the Komi Republic and the Republic of Karelia, and the latter is an absolute outsider, being in one of the last places among all regions of Russia as a whole. In general, it can be noted that a number of subjects whose territories are part of the AZ of the Russian Federation are likely to have a relatively good situation in terms of economic indicators, most of them are above the median (except for the Republic of Karelia and the Krasnoyarsk Territory), as well as in terms of demographic indicators, where only the Republic of Karelia and the Arkhangelsk region were below the median - however, it should be remembered that the demographic situation seems more prosperous than it actually is due to the "export of mortality." In terms of the educational and qualification component, 3 of the subjects under consideration are below the all-Russian median, in the psycho-physiological component – 5 subjects, in the innovative component – 7 subjects. Thus, to increase the labor potential of the population of the Russian Arctic, it is necessary to concentrate on innovative development, as well as on the development of education and healthcare.

Based on the results of the research, the dynamics of a number of basic demographic indicators that are directly related to the formation of the labor potential of the Russian Arctic were considered. First of all, let us turn to the results of the analysis of 52 government

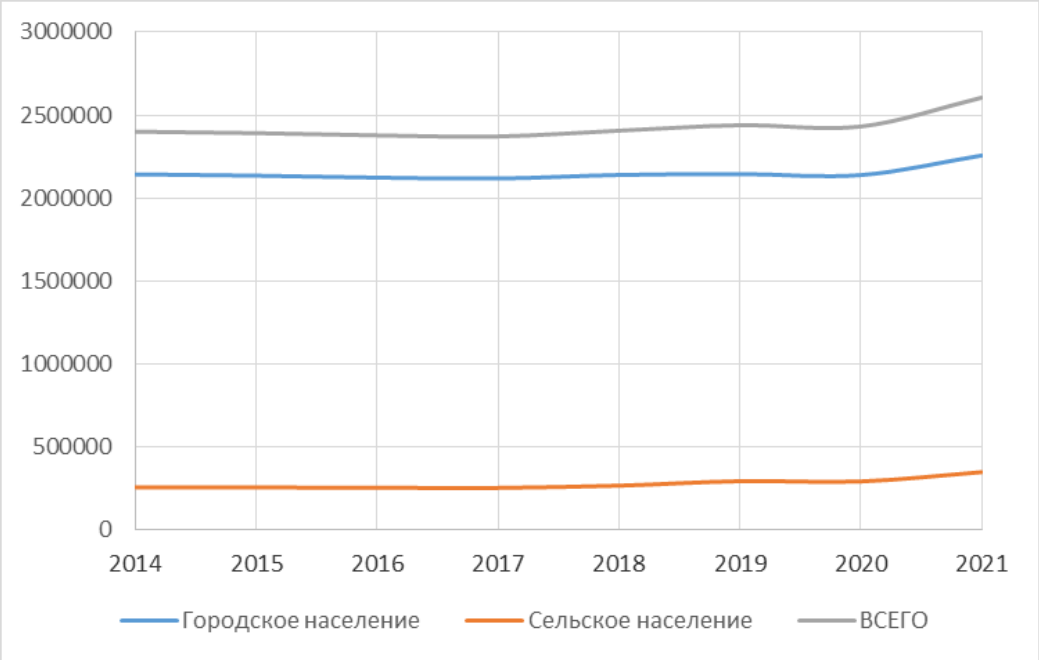
programs and development strategies in the Russian Arctic as of 2022, namely:

1) there are no specific methodological approaches to assessing the results of demographic processes and corresponding methods for assessing the impact of government policy instruments on these results;

2) requires improvement of a set of tools for regulating the demographic situation and, accordingly, the state of demographic potential, taking into account the effectiveness of their impact on the results of demographic processes.

The first attempt to apply the concept of demographic potential to study the state of affairs in the Russian Arctic was made in 2018-2019. It seems appropriate to conduct a new assessment of the demographic potential of the Russian Arctic, which will take into account the demographic dynamics of recent years.

The basic indicator for assessing demographic potential is population size. Rosstat provides data on the population of the AZ of the Russian Federation as an independent separate zone from 2018 to the present. Figure 1 shows the population dynamics of the Russian Arctic for the period from 2018 to 2022. Throughout most of this period, the population of the Russian Arctic remained stable, and only in 2020 there was a rather noticeable increase from 2.4 to 2.6 million people. This rise should be almost entirely attributed to the growth of the urban population due to the inclusion of a number of municipalities in the AZ of the Russian Federation that previously did not belong to it; the size of the rural population remains practically unchanged (Figure 1).




**Picture 1. Population dynamics in the Arctic zone of the Russian Federation.**

For greater clarity, the increase in the population of the AZ of the Russian Federation by 185.6 thousand people in 2021 due to the urban districts and municipalities of the Republic of Karelia, the Komi Republic, the Krasnoyarsk Territory and the Arkhangelsk Region is shown in Figure 2.

Let us now consider such a basic indicator of demographic dynamics as natural population growth per 1000 population. It has been measured in the Rosstat database since 2018. For the period 2018–2022 Steadily positive population growth is demonstrated by the Krasnoyarsk Territory, the Republic of Sakha (Yakutia), the Nenets Autonomous Okrug, the Chukotka Autonomous Okrug and the Yamalo-Nenets Autonomous Okrug. It should be noted, however, that in all these regions the value of natural increase fell over the period under review.

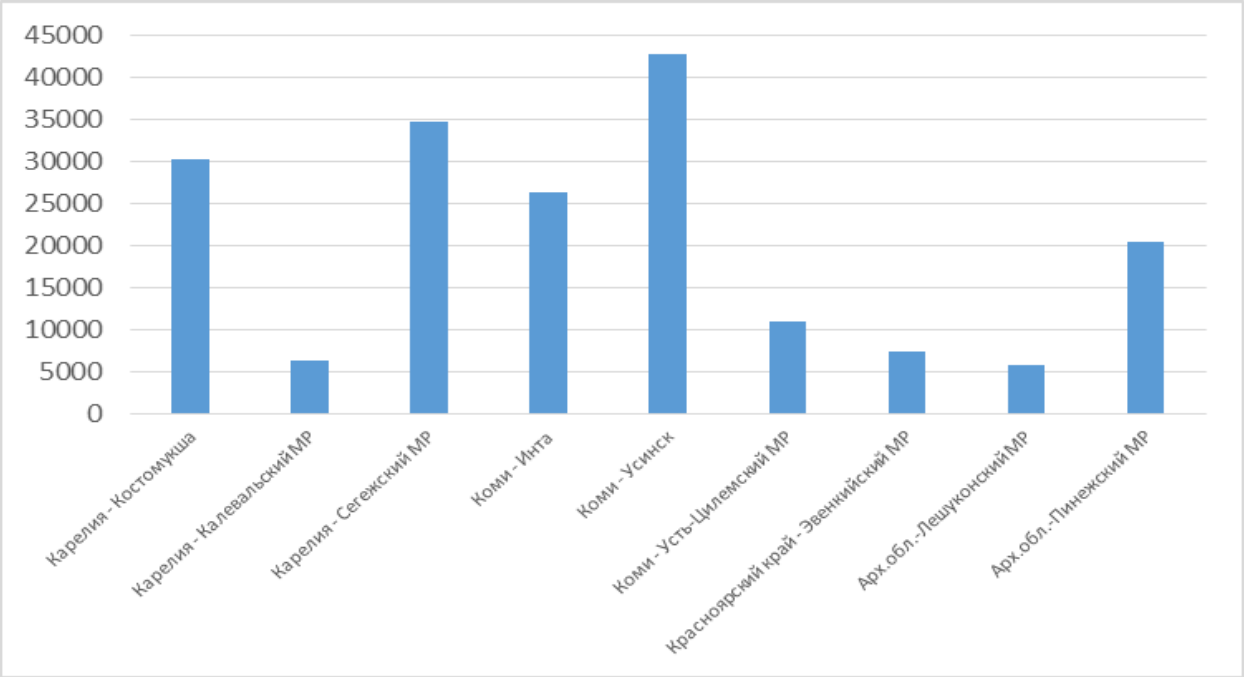



**Figure 2. Population growth in the Russian Arctic in 2022.**

In three subjects, namely the Komi Republic, the Arkhangelsk region and the Murmansk region, positive values of natural increase gave way to negative ones, i.e. natural decline. The most significant natural population decline per 1000 population during the period under review was demonstrated by the Republic of Karelia (Table 5).

Researchers note a noteworthy phenomenon of demographic dynamics that was observed back in the 1990s. in certain Arctic territories of Russia. Its essence was that in certain years, against the background of Russian depopulation in these territories (Nenets Autonomous Okrug, Khanty-Mansi Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Republic of Sakha, Chukotka Autonomous Okrug), steady natural growth remained. The authors identify three factors that gave rise to this phenomenon, namely:

(1) a younger age structure of the population of these regions, associated with the peculiarities of the age structure of migration flows (mainly people of working age with good health come to the north to work);

(2) the persistence of elevated birth rates among the majority of indigenous northern ethnic groups;

(3) “export of mortality” (the latter was especially relevant for the Khanty-Mansi Autonomous Okrug and Yamal-Nenets Autonomous Okrug).

**Table 5. Natural population growth rate for the Arctic zone of the Russian Federation (per 1000 population)**

| | 2015 г. | 2016 г. | 2017 г. | 2018 г. | 2019 г. | 2020 г. |
|---|---|---|---|---|---|---|
| Арктическая зона Российской Федерации | 3,9 | 3,1 | 2,2 | 1,5 | 0,7 | -1,0 |
| в том числе: | | | | | | |
| Красноярский край | 8,3 | 7,3 | 6,6 | 6,3 | 6,0 | 5,0 |
| Республика Карелия | … | … | -10,7 | -13,0 | -12,5 | -15,2 |
| Республика Коми | 3,6 | 0,9 | 1,3 | 0,6 | -1,1 | -2,5 |
| Республика Саха (Якутия) | 6,0 | 7,0 | 5,2 | 4,5 | 3,3 | 2,8 |
| Архангельская область | 0,3 | -0,5 | -1,3 | -2,3 | -3,3 | -5,5 |
| Мурманская область | 0,3 | -0,3 | -0,8 | -1,5 | -2,4 | -4,7 |
| Ненецкий авт. округ | 8,4 | 9,6 | 6,6 | 5,1 | 4,7 | 3,4 |
| Чукотский авт. округ | 4,1 | 3,6 | 3,7 | 1,6 | 1,4 | 0,4 |
| Ямало-Ненецкий авт. округ | 11,3 | 10,1 | 9,1 | 8,7 | 7,9 | 6,9 |
| **Справочно:** Российская Федерация | 0,3 | -0,01 | -0,9 | -1,6 | -2,2 | -4,8 |

These features, to a certain extent, persist today. Thus, in the Russian Federation as a whole, in 2020 the population under working age accounted for 18.7% of the total population of the country; at the same time, in the Komi Republic it accounted for 20.0% of the total population of the region, in the Chukotka Autonomous Okrug - 22.2%, in the Khanty-Mansi Autonomous Okrug - 22.9%, in the Yamal-Nenets Autonomous Okrug - 23.8%, in the Republic of Sakha (Yakutia) - 24 .2%, Nenets Autonomous Okrug – 24.3%. Slightly below the all-Russian indicator were the Murmansk region (18.4%) and the Arkhangelsk region (18.4%).

The working-age population in 2020 amounted to 56.0% of the total population of Russia, while in the Komi Republic it accounted for 57.0% of the total population of the region, in the Nenets Autonomous Okrug - 56.5%, in the Murmansk region 59.3%, in the Khanty-Mansi Autonomous Okrug – 60.6%, in the Yamal-Nenets Autonomous Okrug – 63.6%. The excess of the all-Russian indicator can be associated with the age structure of migration flows. However, it should be noted that, although the share of the population of working age remains higher than the national figure in many Arctic regions, over the period since 2005 it has decreased significantly both in the Russian Federation as a whole (from 63.0 to 56.0%), and in Arctic regions; for example, in the Arkhangelsk region - from 64.4 to 54.8%; in the Nenets Autonomous Okrug from 65.8 to 56.5%, in the Khanty-Mansi Autonomous Okrug from 71.9 to 60.6%, in the Yamal-Nenets Autonomous Okrug from 72.6 to 63.6%

This suggests that the Arctic regions are also facing the problem of an aging population. Indeed, although the proportion of people over working age remains in many Arctic regions still below the all-Russian level (which amounted to 25.3% in 2020), for the period from 2005 to 2020. these shares increased significantly - for example, from 14.8 to 23.0% in the Komi Republic, from 15.2 to 22.1% in the Murmansk region, from 7.8 to 16.5% in the Khanty-Mansi Autonomous Okrug, from 5.5 up to 12.6% in the Yamal-Nenets Autonomous Okrug. In some Arctic regions, the proportion of people over working age has already exceeded the all-Russian level (27.1% in the Republic of Karelia, 26.5% in the Arkhangelsk region without the Nenets Autonomous Okrug). At the same time, it is noticeably lower than in Russia as a whole. the proportion of people over working age in the Khanty-Mansi Autonomous Okrug and Yamal-Nenets Autonomous Okrug indicates the persistence of the phenomenon of “export of mortality”, noted above - this is further confirmed by the fact that the overall mortality rate in these two subjects in 2020 was almost 2 times (KhMAO - 7.6 per 1000 population) or even more than 2 times (Yamalo-Nenets Autonomous Okrug - 6.0 per 1000 population) 1000) is lower than the all-Russian indicator (14.6 per 1000). Positive values of natural increase indicators, observed in certain Arctic regions in those years when depopulation occurred in Russia as a whole, were not a sign of a favorable demographic situation in the Russian Arctic. On the contrary, against the background of natural growth, the population of the Arctic territories was characterized by such signs of demographic disadvantage as a colossal gap in life expectancy between men and women (up to 13–14 years in favor of women), as well as a significant gap in life expectancy between the urban and rural

populations, increased mortality from external causes compared to the national level, extremely high mortality among men of working age. With a high degree of probability, we can assume that there is a significant gap in life expectancy between representatives of indigenous peoples and the rest of the population of the Arctic - this problem is also relevant for other Arctic states, for example, in the United States for the period 1990-2015. The life expectancy of the Alaska Native population increased from 68.0 to 69.7 years, while the life expectancy of the rest of the population increased from 75.2 to 78.1 years, that is, the gap between these population groups remained extremely high - more than 8 years. In 2020, the life expectancy of men in Russia as a whole was 66.49 years, and the life expectancy of women was 76.43 years. It is easy to calculate that the gender gap in life expectancy was almost 10 years (9.94 years). However, the 2020 numbers may be skewed quite significantly by COVID-19 deaths; the impact of the pandemic on the gender gap in life expectancy should be the subject of a separate study. For these reasons, we use data for 2021. Calculations of the scale of the gender gap in life expectancy for regions whose territories are included in the Russian Federation are presented in Table 6.

**Table 6. Gender gap in total life expectancy (LE) for regions whose territories are included in the AZ of the Russian Federation, 2005–2021, years**

| Region | 2005 year | | | 2021 | | |
|---|---|---|---|---|---|---|
| | Life expectancy of men | Life expectancy of women | Life expectancy gap | Life expectancy of men | Life expectancy of women | Life expectancy gap |
| Chukotka Autonomous Okrug | 54.36 | 63.5 | -9.14 | 64.37 | 72.77 | -8.4 |
| KHMAO | 62.13 | 74.01 | -11.88 | 70.6 | 79.28 | -8.68 |
| Yamalo-Nenets Autonomous Okrug | 61.99 | 73.72 | -11.73 | 69.39 | 78.61 | -9.22 |
| The Republic of Sakha (Yakutia) | 58.66 | 71.54 | -12.88 | 68.14 | 77.87 | -9.73 |
| Murmansk region | 57.65 | 70.46 | -12.81 | 66.49 | 76.57 | -10.08 |
| Krasnoyarsk region | 56.58 | 70.35 | -13.77 | 65.83 | 76.3 | -10.47 |
| Nenets Autonomous Okrug | 55.59 | 72.43 | -16.84 | 67.68 | 78.4 | -10.72 |
| Komi Republic | 55.82 | 69.46 | -13.64 | 65.78 | 76.68 | -10.9 |
| Arhangelsk region | 56.18 | 71.08 | -14.9 | 66.77 | 77.68 | -10.91 |
| Republic of Karelia | 55.03 | 69.85 | -14.82 | 65.73 | 76.88 | -11.15 |
| Russian Federation (for reference) | 58.92 | 72.47 | -13.55 | 68.24 | 78.17 | -9.93 |

As can be seen from Table 6, a steady excess of the all-Russian indicators of life expectancy for both men and women was observed in the Khanty-Mansi Autonomous Okrug and the Yamal-Nenets Autonomous Okrug, however, this fact should largely be attributed to the above-mentioned phenomenon of “mortality export” rather than to real demographic well-being these regions. For 2005-2021 The gender gap in life expectancy in Russia as a whole decreased by 3.62 years. Among the subjects under

consideration, the most significant reduction (by 6.12 years) was observed in the Nenets Autonomous Okrug, the Arkhangelsk region was in second place (by 3.99 years), and the Republic of Karelia was in third place (by 3.67 years). However, in most of the subjects under consideration, the gender gap in life expectancy is higher than the national average, which indicates the persistence of an unfavorable situation with indicators of health and mortality among men.

Speaking about indicators of life expectancy and mortality of men, we should especially highlight studies devoted to indicators of mortality and morbidity of the population of the Arctic territories of Russia. Thus, the analysis of the mortality rates of the urban population of the Murmansk, Arkhangelsk, Magadan regions and the Republic of Sakha (Yakutia) for 2018-2022 revealed an increased value of these indicators for all these regions compared to all-Russian values, while in the central cities of the studied regions the situation improved compared to the overall regional picture was insignificant. However, at the same time, there was a decrease in mortality, which was traced in the Arctic territories synchronously with the all-Russian decrease that began in 2018. Moreover, mortality among men living in the central cities of the Arctic regions decreased twice as fast as than the national average. The main contribution to the observed dynamics of life expectancy growth in men was made mainly by those over 30 years of age, and in 2003–2009. "30–40% of the increase in their life expectancy was due to a decrease in mortality in working ages from 45 to 59 years." Analyzing the dynamics of population mortality in nine territories of the Arctic and sub-Arctic regions, the results confirmed that the decline in mortality continued to occur faster among men than among women; However, the mortality rates of the male population of the Arctic regions remained below the national average, with the exception of the Khanty-Mansi Autonomous Okrug and the Yamal-Nenets Autonomous Okrug, which, according to researchers, is explained by "migration of the population to mid-latitudes with the burden of accumulated northern pathology." This assumption was put forward by other researchers, speaking about the quality of the labor force in the Arctic territories, studies the HDI indicators in the Arctic regions of the Russian Federation and comes to the conclusion that the most problematic component of the HDI in these territories is the low life expectancy rates resulting from problems in the healthcare system. In turn, assessing the socio-economic policy of the Arctic region, he attributes "a high level of morbidity, a decrease in the number of hospitals, small living spaces, high unemployment, negative migration growth" to the identified imbalances in the regional economic system. In more recent studies, the authors assess the health indicators of the population in the Arctic and note that they are significantly "inferior to the all-Russian ones: the incidence rate of the main classes of diseases and mortality are, respectively, five and nine times higher." The current situation with mortality in working age among the population of the constituent entities of the Russian Federation, whose territories are included in the AZ of the Russian Federation, continues to cause concern. The anti-record here belongs to the Chukotka Autonomous Okrug, where the mortality rate of the population of working age in 2019 was 801.3 per 100 thousand population, the worst indicator among all Russian regions (with the all-Russian level of 470 per 100 thousand). The most significant successes in reducing this indicator were achieved by the Republic of Karelia and the Arkhangelsk region (by about 2 times) (Table 7).

**Table 7. Mortality rates for the working age population and the scale of decline in this indicator in 2005–2021, cases per 100 thousand population**

| Region | 2005 year | 2021 | Change |
|---|---|---|---|
| Republic of Karelia | 1191.9 | 618.7 | -573.2 |
| Arhangelsk region | 1057 | 560.7 | -496.3 |
| Komi Republic | 1069.3 | 608.3 | -461 |
| Krasnoyarsk region | 970.7 | 550.8 | -419.9 |
| Murmansk region | 927.9 | 556.2 | -371.7 |
| Russian Federation (for reference) | 827.8 | 470 | -357.8 |
| Nenets Autonomous Okrug | 893.9 | 578.3 | -315.6 |

| | | | |
|---|---|---|---|
| The Republic of Sakha (Yakutia) | 773.6 | 465.2 | -308.4 |
| Chukotka Autonomous Okrug | 1030.1 | 801.3 | -228.8 |
| Yamalo-Nenets Autonomous Okrug | 555.2 | 336 | -219.2 |
| KHMAO | 571.5 | 360.9 | -210.6 |

However, despite the fact that in all Arctic regions of the Russian Federation the mortality rate among the working-age population has noticeably decreased over the period under review, the current situation can hardly be characterized as prosperous. This mortality rate fell below the all-Russian level only in the Khanty-Mansi Autonomous Okrug and the Yamal-Nenets Autonomous Okrug, which, as noted, is explained by the migration of the population to other regions "with the burden of accumulated northern pathology." Finally, perhaps the most well-known demographic problem in the Arctic regions is the significant migration outflow of the population, which creates a significant threat to the demographic security of the Russian Arctic. If during the Soviet period, population migration to the Arctic territories contributed to their settlement, then after the collapse of the USSR, migration became a powerful factor in the loss of its population in the Arctic regions. The authors note that from 1991 to 2021 Russia had an average annual mechanical increase of 354.0 thousand people. During the same period, the Russian North lost 80.6 thousand people per year, including the European North - 41.0 and the Asian North - 39.6 thousand people. Negative migration growth was characterized in 2020 and 2021. Republic of Karelia (-21 and 12 per 10 thousand population), Republic of Komi (-111 and -94), Arkhangelsk region (-61 and -28), Murmansk region (-59 and -65), Yamal-Nenets Autonomous Okrug (-32 and - 24), Krasnoyarsk Territory (-1 and -10), the Republic of Sakha (-31 and -2). In the Nenets Autonomous Okrug in 2021, the relative migration growth was negative (-89), and in 2022 positive (18), the same in the Khanty-Mansi Autonomous Okrug (-21 and 1, respectively). A significant positive migration increase was observed only in the Chukotka Autonomous Okrug (48 in 2019 and 111 in 2021, respectively) Thus, Multidirectional dynamics persist - migration growth in Russia as a whole remains consistently positive, while the Russian Arctic continues to suffer from migration population decline. It is shown that migration dynamics in the Arctic regions of Russia significantly undermine their demographic stability. An analysis of population exchange by educational level showed that the northern territories receive less qualified personnel and send more educated ones. The massive outflow of population also creates the preconditions for the expansion of Siberia and the Far East by neighboring states. It should also be noted the phenomenon of "hidden" labor migration, which is "the movement of the working-age population from one constituent entity of the Russian Federation to another for the purpose of carrying out labor activities without official registration at the place of residence." It is noted that this phenomenon is based on interregional differences in wages. "Hidden" labor migration should be taken into account in the sense that the actual migration outflow from the Arctic regions (including young, well-educated personnel) is apparently on a larger scale than official migration statistics show. Thus, the following conclusions can be drawn. The contribution of demographic potential to the labor potential of the Russian Arctic is currently ambiguous. On the one hand, an active policy in the field of development of the Arctic territories produces results in the form of a reduction in the scale of a number of negative demographic phenomena that have a negative impact on the labor potential of the territories - for example, the development of healthcare has contributed to a fairly noticeable decrease in mortality in working ages. On the other side, the remaining "baggage" of negative demographic phenomena does not allow the demographic potential of these regions to be fully realized.

The demographic processes and phenomena that shape the demographic and labor potential of the AZ of the Russian Federation were discussed in the previous paragraph. In this section, we will focus on a group of indicators that characterize the dynamics of one of the most important categories that determine the state of the region's labor potential, namely labor resources. Let us turn to both quantitative and qualitative characteristics of the labor resources of the Russian Arctic. Quantitative characteristics depend primarily on the size of the labor force, defined as "persons aged 15 years and over who are considered to be employed or unemployed during the period under review (the survey week). Labor force participation rate 2010–2021 decreased in Russia as a whole (from 67.7 to 62.3%), and in all Arctic regions, with the exception of the Yamal-Nenets Autonomous Okrug and the Chukotka Autonomous Okrug. Yamalo-Nenets Autonomous Okrug in the early 2000s. was the record holder among the Arctic regions

for this indicator (80.1% in 2001), by the end of the 2000s. leadership passed to the Chukotka Autonomous Okrug, where the labor force participation rate was 79.8% in 2019. As for the Chukotka Autonomous Okrug itself, here the level of labor force participation for 2010–2021 is. not only did not decrease, but even increased by 0.7%. During this period, the Yamal-Nenets Autonomous Okrug also showed growth, even more significant than the Chukotka Autonomous Okrug - by 1.3% (from 74.6% to 75.9%). The remaining regions showed negative dynamics, with the Republic of Karelia experiencing a particularly strong decline - by 9.1% (from 68.5 to 59.4%) and the Komi Republic - by 8.4% (from 71.4 to 63%). The decrease was also very significant in the Murmansk region - by 7% (from 74.9 to 67.9%). In all likelihood, this phenomenon should be largely attributed to the aging population,

The shift of a large proportion of the population into older age was accompanied by the expected cessation of their participation in the labor force. Another powerful factor in the reduction in the absolute size of the labor force was the migration of the population from the Arctic regions to regions with a more favorable climate.

The distribution of the labor force in the Arctic regions of the Russian Federation by age groups generally corresponds to that of Russia as a whole. What is noteworthy is that the share of the older population in the labor force in a number of Arctic regions is slightly lower than the Russian average - for example, the share of employed people aged 50–59 years in Russia as a whole is 21.0%, while while in the Republic of Karelia 17.9%, in the Komi Republic 17.8%, in the Arkhangelsk region 17.6%, in the Murmansk region 18.2%. The share of employed people aged 60–69 years in Russia as a whole is 6.3%, while in Khanty-Mansi Autonomous Okrug it is 3.3%, in Yamal-Nenets Autonomous Okrug 2.2%.

The unemployment rate in 2021 in Russia as a whole was 4.6% of the labor force, and the combined indicator of unemployment and potential labor force was 6.5%. The Yamal-Nenets Autonomous Okrug was located noticeably below these indicators - 1.9% and 2.5%, respectively; Khanty-Mansi Autonomous Okrug – 2.5% and 3.1%; as well as Chukotka Autonomous Okrug – 3.8% and 4.4%, respectively. Unemployment rates in the Krasnoyarsk Territory were approximately at the national level - 4.5% and 6.1%. The remaining Arctic regions lagged behind the all-Russian level - these are the Republics of Karelia (7.4% and 11.6%) and Komi (6.8% and 9.6%), Nenets Autonomous Okrug (7.9% and 11.5%), Arkhangelsk region (6.2% and 9.5%), Murmansk region (5.4% and 8.1%), and the Republic of Sakha (6.9% and 10.2%). E.A. Korczak, assessing the degree of social sustainability of the Arctic regions, draws attention to the phenomenon of so-called “northern unemployment” (a high proportion of unemployed citizens in the structure of the economically active population). In her other work, she notes such an important phenomenon as significant territorial differentiation of unemployment within the Arctic regions.

The authors point out that the most tense employment situation is developing in single-industry single-industry towns, of which there are 14 in the Arctic zone of the Russian Federation (half of them in the Murmansk region) and almost 14 million people live in them. Special study by E.A. Korczak, dedicated to the industrial cities of the Arctic, many of which are single-industry towns, shows that unemployment, especially youth unemployment, which increases with a decline in the economic activity of the city-forming enterprise, entails a whole complex of negative social and economic phenomena. At the same time, a seemingly paradoxical situation may arise, such as a combination of a low level of registered unemployment with a low level of employment of the population, primarily young E.I. Klemasheva points out the need to change the negative dynamics of involving human capital in key areas and economic development. Associated with the above problem is a fairly large-scale discrepancy between the specialties obtained by university graduates and the needs of the labor market - for example, a survey conducted in the Murmansk region revealed that, as of 2021, there was a shortage of specialists with engineering education, but among the specialties of graduates Universities in the region were dominated by economics and management (42.6%) and humanities (20.6%). Exploring 5 Arctic regions of Russia, namely the Republics of Karelia and Komi, Arkhangelsk and Murmansk regions, as well as the Nenets Autonomous Okrug, V.I. Sinitsky and D.N. Baskakov singles out “the discrepancy between the quality of the professional and qualification structure of personnel and the current needs of the economy” as critically important qualitative characteristics of the labor potential of these regions, along with negative demographic phenomena and a low standard of living. At the same time, H.A. Konstantinidi, revealing the functions of expanding the resource base for the development of the socio-economic system, classifies “attracting labor without designing changes in the level of its training” to inertial approaches. Let us consider the overall distribution of the employed population by industry. In 2021, in the Nenets Autonomous Okrug, the main sectors in terms of the share of the workforce employed in them were mining (23.5% of all employment in the Nenets Autonomous Okrug), education (10%), transportation and storage (9.9%), construction (8.6%). In the Arkhangelsk region, excluding the Nenets Autonomous Okrug, the key areas in terms of employment were manufacturing (17.7%), as well as trade (16.4%) and education (10.1%). In the Yamal-Nenets Autonomous Okrug, the highest employment is represented in the mining

industry (17.2%), followed by construction (16.2%), transportation and storage (14.3%). In the Murmansk region, the largest share of employment was in trade (15.7%), as well as manufacturing (10.6%), and transportation and storage (9.6%). Chukotka Autonomous Okrug had the largest share of employment in mining (15.5%), providing electricity and gas (13.9%), and in trade (10.3%).

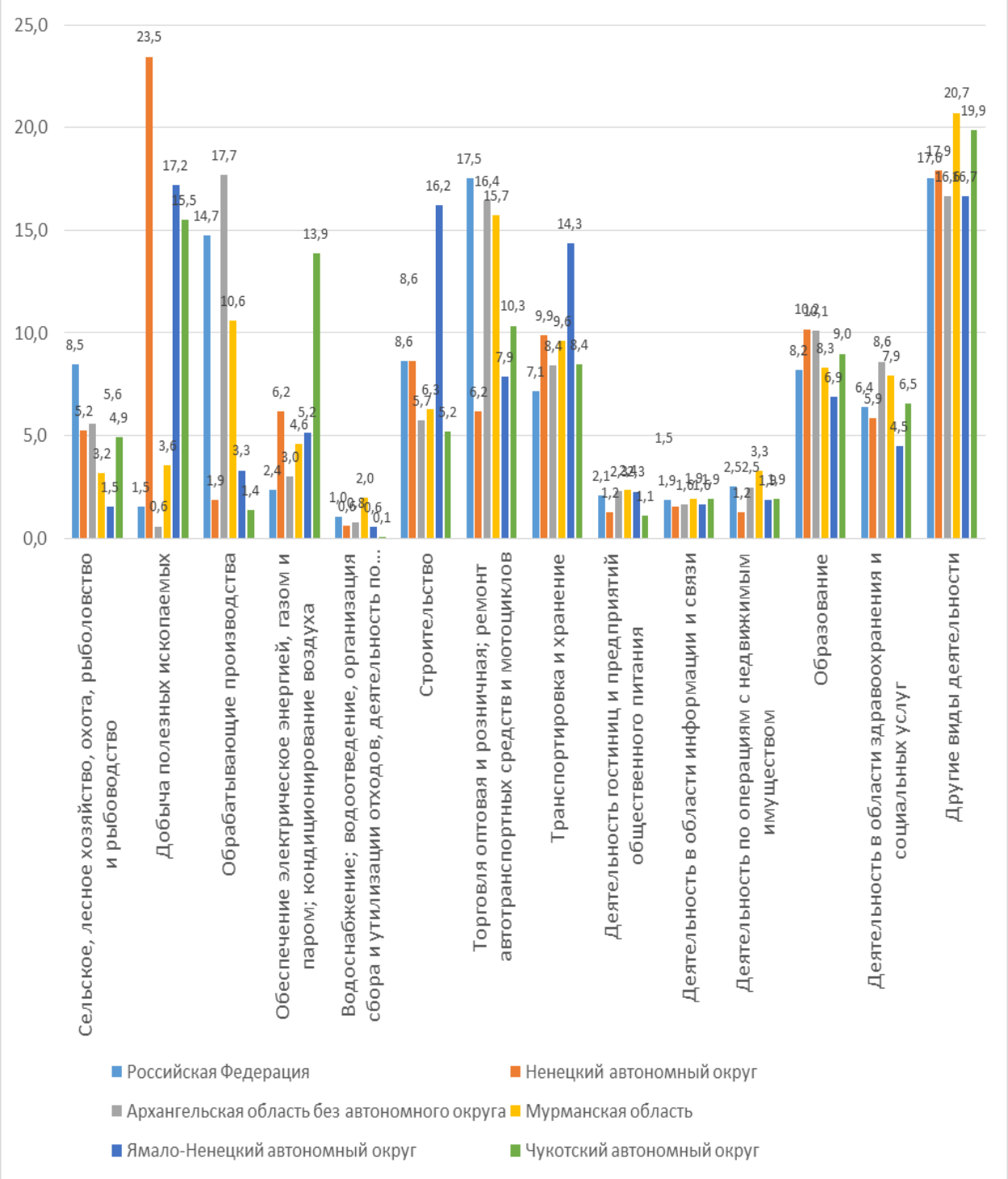



**Figure 3.Employment structure of the population of some constituent entities of the Russian Federation included in the AZ of the Russian Federation, by economic sector, 2020, %**

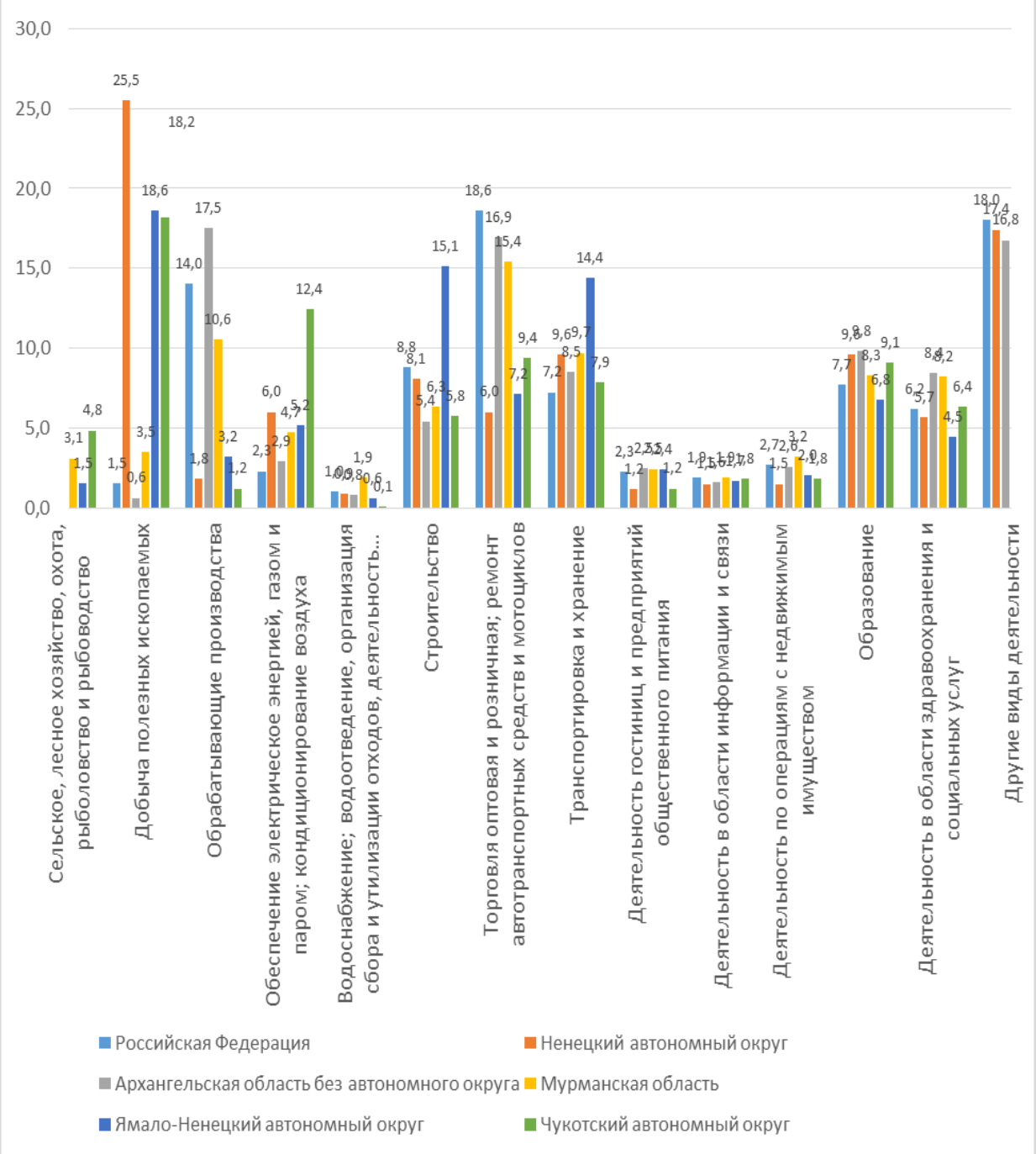



**Figure 4.Employment structure of the population of some constituent entities of the Russian Federation included in the AZ of the Russian Federation, by economic sector, 2020, %**

The predominance of the manufacturing industry in the structure of the regional economy makes it possible to obtain significant effects from investments in "education capital". Let us now consider the distribution of the need for workers of various professional groups in each Arctic region as of October 31, 2023 (Table 8).

**Table 8. Distribution of organizations' needs for workers to fill vacant jobs**

| Subjects of the Russian Federation | Including by professional groups: | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | managers | specialists of the highest level of qualification | mid-level specialists | employees involved in the preparation and execution of documentation, accounting and maintenance | workers in the service and trade sectors, protection of citizens and property | skilled workers, agriculture and forestry, fish farming and fishing | skilled workers in industry, construction, transport and related occupations | plant and machine operators, assemblers and drivers | unskilled workers |
| Rep. Komi | 5.4 | 29.4 | 15.7 | 4.0 | 16.8 | 0.6 | 11.3 | 10.7 | 6.2 |
| Rep. Karelia | 4.6 | 27.3 | 15.8 | 1.3 | 11.5 | 0.2 | 19.7 | 13.0 | 6.7 |
| Nenets Autonomous Okrug | 4.9 | 9.6 | 14.8 | 0.6 | 8.5 | - | 13.4 | 44.4 | 3.9 |
| Arhang. region | 3.4 | 30.2 | 13.3 | 3.2 | 9.9 | 0.2 | 21.7 | 8.6 | 9.6 |
| Murman. region | 2.0 | 20.2 | 12.8 | 1.7 | 7.5 | - | 46.9 | 4.1 | 4.9 |
| KHMAO | 3.7 | 22.8 | 8.2 | 3.2 | 21.3 | 1.2 | 20.4 | 12.3 | 6.8 |
| Yamalo-Nenets Autonomous Okrug | 5.6 | 22.9 | 10.3 | 2.8 | 7.2 | 0.2 | 23.9 | 18.2 | 9.0 |
| Krasnoyarsk region | 4.9 | 27.0 | 13.1 | 3.8 | 13.8 | 0.2 | 14.1 | 15.4 | 7.7 |
| Rep. Sakha | 3.0 | 21.9 | 13.1 | 1.6 | 13.0 | 1.0 | 19.2 | 22.0 | 5.2 |
| Chukotka Autonomous Okrug | 4.6 | 20.5 | 11.1 | 2.8 | 4.7 | 13.0 | 19.5 | 13.3 | 10.5 |
| Russia | 4.8 | 24.7 | 11.6 | 4.4 | 13.3 | 0.9 | 17.4 | 12.1 | 10.9 |

Analysis of the distribution of the need for workers allows us to characterize this distribution as quite heterogeneous; There is no need to talk about some kind of universal pattern of demand for workers by professional groups that is common to all Arctic regions. However, certain common features can still be noted.

Thus, in all Arctic regions, as well as in Russia as a whole, there is a relatively small need for such groups as “skilled workers in agriculture and forestry, fish farming and fishing” (with the exception of the Chukotka Autonomous Okrug, where the need for these specialists exceeds the all-Russian level by more than than 13 times); “employees involved in the preparation and execution of documentation, accounting and maintenance” (the need for this category is small in Russia, but in all Arctic regions it is even lower); The need for managers is also small - at the level of the Russian Federation, the need for managers is 4.8% of the total need for workers, while in the Arctic regions this share varies from 2.0% (Murmansk region) to 5.6% (Yamalo-Nenets Autonomous Okrug). The need for unskilled workers in the Arctic regions is approximately at the all-Russian level (Chukchi Autonomous Okrug, Arkhangelsk Region, Yamal-Nenets Autonomous Okrug), or noticeably lower. A more heterogeneous picture is observed when assessing the need for workers in the following professional groups. The need for specialists of the highest level of qualification was much lower than the all-Russian level in the Nenets Autonomous Okrug and somewhat lower in the Murmansk region and Chukotka Autonomous Okrug, but noticeably higher than this level in the Arkhangelsk region, the Komi and Karelia republics. The need for mid-level specialists is noticeably lower than the all-Russian level in the Khanty-Mansi Autonomous Okrug, but noticeably higher in the Republics of Komi and Karelia. The need for workers in the category “service and trade workers, protection of citizens and property” was significantly higher than the all-Russian one in the Khanty-Mansi Autonomous Okrug and the Komi Republic, but significantly lower in the Chukotka, Nenets and Yamalo-Nenets

administrative districts. The need for such a group as "skilled workers in industry, construction, transport and workers in related occupations" was highest (by a wide margin) in the Murmansk region, and also noticeably exceeded the all-Russian level in the Yamal-Nenets Autonomous Okrug, the Arkhangelsk Region and the Khanty-Mansi Autonomous Okrug; below the average level for the Russian Federation – in the Komi Republic, Nenets Autonomous Okrug and Krasnoyarsk Territory. The need for such a group as "operators of production plants and machines, assemblers and drivers" was highest (by a wide margin) in the Nenets Autonomous Okrug, and also exceeded the all-Russian level in the Republic of Sakha, Yamal-Nenets Autonomous Okrug and Krasnoyarsk Territory; it turned out to be noticeably lower than the Russian level in the Arkhangelsk and Murmansk regions. Let us now move on to consider the qualitative characteristics of the labor potential of the Russian Arctic. Table 9 presents the distribution of the employed population and the unemployed population of the Arctic regions by level of education. It is easy to notice a pattern that the share of people with basic general education among the unemployed population of the Arctic regions turns out to be 2-3 times higher than the share of people with the same level of education among the employed population of these regions (in Russia as a whole it is 2 times higher). This indicates relatively low employer demand for labor with such a low level of education. The share of people with secondary general education among the unemployed population of the Arctic regions turns out to be 1.5-2 times higher than the share of people with this level of education among the employed population, which also indicates a reduced demand for the population group with such education in the labor market. Among the employed, the share of people with secondary vocational education turns out to be significantly higher than among the unemployed in almost all the regions considered, except for the Murmansk region (where the share of people with such education is higher among the unemployed than among the employed), as well as the Arkhangelsk region and the Krasnoyarsk Territory (where they are approximately equal). To confirm the conclusions obtained from the analysis of statistics in Table 9, unemployment rates were calculated for population groups in the Arctic regions with different levels of education, according to 2019 data (Table 10).

**Table 9. Shares of the employed population and the unemployed population of the Arctic regions by level of education (basic general and higher, % of the total employed population), 2021**

| Регион | Основное общее | Среднее общее | Среднее проф. | Высшее |
|---|---|---|---|---|
| Республика Карелия | **6**<br>*17,5* | **13**<br>*21,8* | **52**<br>*44,3* | **28**<br>*15,9* |
| Республика Коми | **5**<br>*13,5* | **14**<br>*18,2* | **51**<br>*47,0* | **31**<br>*20,7* |
| Ненецкий АО | **6**<br>*20,0* | **10**<br>*20,2* | **50**<br>*43,3* | **33**<br>*13,6* |
| Архангельская область | **4**<br>*8,1* | **11**<br>*22,0* | **56**<br>*54,4* | **28**<br>*13,5* |
| Мурманская область | *3*<br>*10,1* | *14*<br>*19,9* | *46*<br>*52,0* | **37**<br>*17,5* |
| Ямало-Ненецкий АО | *1*<br>*3,1* | *18*<br>*36,7* | *36*<br>*30,2* | **44**<br>*27,8* |
| Ханты-Мансийский АО | **3**<br>*8,5* | **20**<br>*27,3* | **44**<br>*39,3* | **33**<br>*24,8* |
| Красноярский край | **6**<br>*12,1* | **20**<br>*23,5* | **40**<br>*40,8* | **34**<br>*22,6* |
| Республика Саха (Якутия) | **3**<br>*8,7* | **20**<br>*35,2* | **41**<br>*34,3* | **36**<br>*21,3* |
| Чукотский АО | -<br>- | **8**<br>*13,6* | **56**<br>*27,6* | **36**<br>*57,3* |
| Российская Федерация | **4**<br>*8,7* | **16**<br>*26,8* | **45**<br>*39,9* | **35**<br>*24,0* |

Shares of the employed population are shown in bold. Shares of the unemployed population are in italics. Calculations presented in Table 10 show that the most tense employment situation for people with basic general education is in the Nenets Autonomous Okrug, where every fifth participant in the labor force with this level of education is unemployed. The situation in the republics of Karelia and Sakha remains extremely tense, where approximately every sixth participant in the labor force with basic general

education is unemployed. The employment situation for people with secondary general education also remains the most tense in these three regions, as well as in the Arkhangelsk region.

**Table 10. Unemployment levels of population groups with different levels of education (basic general and higher)**

| Регион | Основное общее | Среднее общее | Среднее профессио-нальное | Высшее |
|---|---|---|---|---|
| Республика Карелия | 17,1 | 10,8 | 5,9 | 4,0 |
| Республика Коми | 14,8 | 8,4 | 5,9 | 4,4 |
| Ненецкий АО | 19,9 | 14,0 | 6,3 | 3,1 |
| Архангельская область без Ненецкого АО | 10,5 | 11,1 | 5,7 | 2,9 |
| Мурманская область | 14,7 | 7,3 | 5,8 | 2,5 |
| Ямало-Ненецкий АО | 5,2 | 3,7 | 1,6 | 1,2 |
| Ханты-Мансийский АО | 6,9 | 3,3 | 2,1 | 1,8 |
| Красноярский край | 8,6 | 5,0 | 4,4 | 2,9 |
| Республика Саха (Якутия) | 17,6 | 10,7 | 5,4 | 3,9 |
| Чукотский АО | | 6,3 | 1,9 | 5,8 |
| Российская Федерация | 10,0 | 7,2 | 3,9 | 3,0 |

The presence of higher education among representatives of the labor force in all Arctic regions, except for the Chukotka Autonomous Okrug, significantly reduces the risk of unemployment - in the Republics of Sakha and Karelia, for example, the unemployment rate among people with higher education is more than 4 times lower than among people with a basic education. general education, and in the Murmansk region - almost 6 times. Thus, despite the presence of a structural imbalance in labor supply and demand by specialty, we can conclude that the mere presence of a higher education still has a significant positive effect on the likelihood of employment, although the scale of this effect may vary for different industries and specialties. In summary, the alarming trend is a decline in the absolute size of the labor force in many Arctic regions, namely in the republics of Karelia and Komi, Arkhangelsk and Murmansk regions, as well as the Krasnoyarsk Territory. Let us also note that this trend is observed in Russia as a whole; at the federal level it is associated primarily with the aging population. In the Arctic regions, along with aging, the size of the labor force may also be influenced by migration outflow of the population, however, this influence will not necessarily be negative, since predominantly working-age people come to the Arctic regions, and older people who want to spend their old age in more favorable conditions leave conditions. The structure of labor force distribution across economic sectors remains relatively stable in the regions considered. Regarding the structure of the need for workers of various professional groups, it varies from one Arctic region to another. The most in demand professional group as of October 2021 in the Republics of Karelia and Komi, the Arkhangelsk Region, Khanty-Mansi Autonomous Okrug, Chukotka Autonomous Okrug and the Krasnoyarsk Territory were specialists of the highest level of qualifications, in the Nenets Autonomous Okrug - operators of production plants, in the Murmansk Region and Yamal-Nenets Autonomous Okrug - skilled production workers, builders and drivers in the Republic of Sakha (Yakutia) are both specialists of the highest level of qualification and operators of production plants. The presence of higher education among representatives of the labor force in all Arctic regions, except for the Chukotka Autonomous Okrug, significantly reduces the risk of unemployment, although the problem of the inconsistency of the quality of the professional and qualification structure of personnel with the current needs of the economy remains relevant. Problems, created by the peculiarities of migration dynamics for the personnel situation in the Arctic regions are significant and therefore they become the subject of research in scientific publications. Thus, the effective fulfillment of the role of human capital in the development of the socio-economic system of a number of regions is hampered by two main problems, namely:

1) significant unevenness in the distribution of human capital, which predetermines the differentiation of regions;

2) the observed long-term negative migration growth of human capital holders.

A number of works are devoted to the issues of migration management as a mechanism for sustainable development of territories. Research has been devoted to the situation of migrants in the labor market of the host country, including issues of international migration. In Russia, “regions have emerged that form a labor core, attracting migration and investment resources, and periphery regions.” According to the authors, human resources “are formed from three sources, namely:

*workers of the Arctic region;

*involved workers from other regions of the country;

*Foreign citizens".

In our case, migration dynamics will be assessed integrally over several years, in comparison with the all-Russian situation. As can be seen from the data in Table 11, almost all Arctic regions experienced an outflow of population. At the same time, in almost all regions there was an increase in numbers due to citizens of post-Soviet countries, and only in the Krasnoyarsk Territory, Chukotka and the Republic of Sakha (Yakutia) there was even a small migration increase due to foreigners from foreign countries. The absolute record for the share of population growth over 5 years due to migrants from the CIS was set by the Chukotka Autonomous Okrug - 3.4%, followed by the Republic of Sakha (Yakutia) - 2.9%, Nenets Autonomous Okrug - 1.4%, Yamalo-Nenets Autonomous Okrug - 1.1 %, Murmansk region - 1.1% and Yamal-Nenets Autonomous Okrug (0.55%).

**Table 11. Total percentage changes in population in the Arctic regions of the Russian Federation and some other regions and federal districts of Russia from 2015 to 2021 (percentages of population loss/gain calculated for each year were summed up over 6 years)**

| | From other regions i.v. other regions | From beyond the limits Russia / behind limits Russia | From countries CIS/in countries CIS | From others foreign countries/others foreign countries | From beyond the limit V regions /A region limits | Higher professional (higher education | Doctors of Science | Candidate of Sciences |
|---|---|---|---|---|---|---|---|---|
| Moscow | 3.05 | 0.34 | 0.33 | 0.01 | 3.39 | -0.15 | -0.0003 | 0.002 |
| Northwestern Federal District | 1.86 | 0.77 | 0.77 | 0.005 | 2.63 | 1.08 | 0.001 | 0.008 |
| Republic of Karelia | -0.89 | 0.2 | 0.39 | -0.19 | -0.69 | -0.39 | 0 | -0.002 |
| Komi Republic | -6.44 | 0.51 | 0.52 | -0.01 | -5.95 | -1.87 | -0.003 | -0.004 |
| NAO | -2.07 | 1.43 | 1.41 | 0.03 | -0.64 | -0.18 | -0.005 | -0.009 |
| Arkhangelskaya area without NAO | -3.6 | 0.34 | 0.38 | -0.03 | -3.18 | -1.16 | -0.001 | -0.006 |
| Murmansk I area | -4.61 | 0.76 | 0.78 | -0.03 | -3.86 | -1.64 | -0.003 | -0.013 |
| Saint-Petersburg | 3.62 | 0.25 | 0.26 | -0.01 | 3.87 | 2 | 0.003 | 0.016 |
| Ural Federal District | -0.9 | 1.51 | 1.49 | 0.02 | 0.61 | -0.16 | 0.0006 | -0.002 |
| KHMAO | - 1.2 | 3.16 | 3.14 | 0.03 | 1.96 | -0.68 | 0.004 | -0.003 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Yamalo-Nenets Autonomous Okrug | -1.9 | 1.1 | 1.11 | -0.01 | -0.8 | -1.06 | 0.006 | -0.012 |
| Tyumen region without joint stock company | 1.42 | 2.57 | 2.57 | 0.005 | 3.99 | 1.08 | 0.002 | 0.003 |
| Siberian Federal District | -1.67 | 1.08 | 1.07 | 0.01 | -0.58 | -0.43 | -0.001 | -0.003 |
| Krasnoyarsk region | -0.83 | 1.5 | 1.44 | 0.06 | 0.67 | -0.24 | -0.0007 | -0.003 |
| Far Eastern Federal District | -2.69 | 1.06 | 1.08 | -0.02 | -1.63 | -0.79 | -0.00001 | -0.004 |
| The Republic of Sakha (Yakutia) | -3.21 | 2.88 | 2.8 | 0.08 | -0.33 | -0.81 | -0.00001 | -0.002 |
| Chukotka Autonomous Okrug | -5.82 | 3.43 | 3.21 | 0.22 | -2.39 | -1.34 | 0.00009 | -0.002 |

The anti-record for migration population decline was set by the Komi Republic (-6%), in second place is the Murmansk region (-3.9%), in third place is the Arkhangelsk region (-3.2%), in fourth place is the Chukotka Autonomous Okrug (-2.4 %). The Yamal-Nenets Autonomous Okrug also lost its population due to migration (-1.1%). It is interesting that the Khanty-Mansi Autonomous Okrug and the Tyumen Region, located to the south of the Yamal-Nenets Autonomous Okrug, increased due to population migration over 6 years by 2 and 4%, respectively, and the Tyumen Region - both due to the influx of foreigners and due to the influx of migrants from other regions of the Russian Federation. Essentially, the characteristics of migration growth can be the most important indicator of the health of the economy of any region in general and the Arctic regions in particular. Let's consider the correlation matrix of migration growth and indicators of economic, scientific and educational development of Russian regions. Only GRP per capita has significant positive significance for ensuring migration growth, but this only applies to the migration influx of citizens of the post-Soviet space

A decrease in January temperatures leads to an increase in the relative influx of adults into the regions. Arctic regions tend to be above the trend line, indicating that migration there is higher than expected given temperature patterns.

Similar to the analysis of immigration to Russian regions, the study of patterns associated with population departure also indicates a significant influence on these patterns of economically successful Arctic regions (Yamalo-Nenets Autonomous Okrug and Nenets Autonomous Okrug). At the same time, in other regions of the Arctic one can witness a higher rate of population departure (per capita) than would be expected based on their GRP indicators.

In connection with the above, let us clarify the role of wages in attracting personnel to the Arctic regions of Russia. We will also consider these regions in the context of compliance with the all-Russian cross-regional trends in the correlation of migration and wage indicators identified in the framework of the work.

Currently, the Russian Arctic is faced with the task of becoming one of the locomotives of domestic economic growth. First of all, we mean the use of the natural resources of the macroregion, as well as the creation of conditions for the formation of a global transport artery in it - as part of the development of the Northern Sea Route. The success of these strategic plans largely depends on staffing for the development of the Arctic economy. At the same time, it has been noted more than once that in the Arctic macro-region there has been a “stable” shortage of personnel for a long time. Among the key factors of this problem is the insufficient level and gradient of wages in the region.

First of all, it should be noted that the territories included in the Russian Arctic differ in the level of socio-economic development, which is due to unsatisfactory socio-economic, cultural and living conditions, features of the conditions of socialization and self-realization in the region - this can be considered the main reasons for the decline in population in these regions, because It is natural for people to strive to improve living conditions,

including the environmental situation. In general, during the 1990s there was a more than 33% decrease in the population of regions belonging to or having territories in the Arctic zone of the Russian Federation. The population of the Chukotka Autonomous Okrug has decreased by more than three times, and the Arkhangelsk, Murmansk regions and the Komi Republic have lost a quarter or more in population. The Arctic regions, as a rule, consistently rank among the top regions of Russia in terms of migration outflow. This situation threatens the implementation of strategic plans for the development of the macroregion.

As a rule, unsatisfactory socio-economic, cultural and living conditions, as well as people's natural desire to improve them, are cited as the main reason for outflow. In the first decade of the new millennium, personal and family reasons were recorded as the main reasons for leaving the Far North - 56%; return to previous place of residence – 12.6%; in connection with studies – 12.3%; in connection with work – 12.1%.

In order to measure the migration attitudes of residents of northern cities, a survey of the population living in five cities of the Komi Republic (Usinsk, Pechora, Vorkuta, Ukhta, Syktyvkar) was conducted in 2018. Answering the survey question: "Would you like to leave the locality where you live?", 45.5% of respondents answered affirmatively "yes, we would like to"; 35.6% answered "no, we wouldn't like to," and 18.9% "we don't know yet." In addition, the research materials showed that the main reasons things that make the population think about leaving are: "the desire to change the climate, place of residence, North to South or the middle zone" - 46.9%; "the desire to return to their homeland, to their parents, relatives" - 12.4%; "the lack of prospects for the development of the settlement in which they live, there is no future, since production is not developing" - 10.3%; "there is no way to financially provide for the family" – 8.1%; "there is no opportunity to educate children and find them work in their place of residence" – 5.7%; "threat of job loss and lack of opportunity to find a job" – 5.5%; "for family reasons" – 4.7%; "for health reasons" – 4.2%.

It should be noted that certain researchers highlight the motivational component in the structure of human capital on a par with physical condition and level of competence. However, regional studies, in particular, using the example of the Murmansk region, based on actual data on migration from 2008 to 2021, show the enormous role for young people of the availability of conditions for socialization, education and self-realization in the region, in addition to the possibility of receiving benefits from living in the North, as well as conditions life activity, safety in the conditions of the functioning of large industrial facilities and the environmental situation.

Recent statistical data confirm that an insufficient wage gradient is one of a combination of factors that "pushes" the population out of the AZ regions of the Russian Federation. As can be seen from Table 12, in all federal districts with Arctic and sub-Arctic regions, except for the Siberian Federal District, the average wage throughout the years of the new millennium remained higher than the average wage in Russia. It is expected that Moscow and, to a lesser extent, St. Petersburg, demonstrated advanced leadership in wage growth.

Wages in almost all regions with Arctic territories were significantly higher than the Russian average, but there are a number of regions (mainly the Northwestern Federal District) where they are comparable to or lower than the Russian average. In general, noteworthy is a certain tendency towards accelerating wage growth since the second half of the 2010s, characteristic of Moscow, Russia as a whole and a number of Arctic and sub-Arctic regions.

As can be seen from the data, not all Arctic and sub-Arctic regions had average wages in 2021 significantly higher than the Russian average (in Karelia they are even significantly lower); they are the highest (higher than in Moscow) only in two regions - the Chukotka and Yamalo-Nenets Autonomous Okrugs. Based on the data in Table 12, we can conclude that, firstly, the rate of wage growth for almost all 5-6-year time periods after 2000, both in Russia as a whole and in all analyzed regions and federal districts, decreased, with the main decline occurring in the first decade of the 21st century. In the 2010s it was almost constant. Secondly, only in the Republic of Sakha (Yakutia) and in the Chukotka Autonomous Okrug the rate of wage growth in the 2010s was significantly higher, than the Russian average. Thus, we can conclude that the intensification of Arctic development measures since the mid-2010s has not been supported by real wage growth.

**Table 12. Relative growth of wages in Russia as a whole, in some federal districts, in the Arctic and sub-Arctic regions, %**

| | 2005/ 2000 | 2010 / 2005 | 2015/ 2010 | 2021 / 2015 |
|---|---|---|---|---|
| Российская Федерация | 385 | 245 | 162 | 151 |
| Центральный федеральный округ | 443 | 264 | 165 | 156 |
| г. Москва | 447 | 266 | 167 | 156 |
| Северо-Западный федеральный округ | 375 | 248 | 161 | 151 |
| Республика Карелия | 341 | 230 | 153 | 151 |
| Республика Коми | 326 | 225 | 158 | 138 |
| Ненецкий автономный округ | 454 | 206 | 150 | 129 |
| Архангельская область | 359 | 225 | 174 | 148 |
| Мурманская область | 334 | 234 | 157 | 150 |
| г.Санкт-Петербург | 403 | 268 | 163 | 155 |
| Уральский федеральный округ | 335 | 214 | 156 | 140 |
| Ханты-Мансийский авт.округ - Югра | 269 | 181 | 145 | 133 |
| Ямало-Ненецкий авт.округ | 307 | 191 | 147 | 144 |
| Тюменская область без авт. округов | 390 | 234 | 161 | 144 |
| Сибирский федеральный округ | 357 | 230 | 159 | 149 |
| Красноярский край | 300 | 221 | 155 | 151 |
| Дальневосточный федеральный округ | 370 | 224 | 167 | 140 |
| Республика Саха (Якутия) | 296 | 214 | 190 | 141 |
| Чукотский авт. округ | 410 | 201 | 170 | 152 |

A big problem, as noted in the studies of Russian scientists, is the migration, as a rule, of qualified personnel, the result of which may be that the northern territories "receive less qualified personnel and send more educated ones." In addition to negative migration, we see the significant problem of reducing labor potential, which many Russian researchers highlight. If we talk about the regions themselves, then for them such migration processes are fraught with a decrease in the human potential of the northern territories, an increase in technological backwardness and a decrease in the level of cultural identity of the population 316 with an increase in the level of depression.

The de-intellectualization of the Russian Arctic should also be considered a significant problem, because along with the population decline, the Arctic regions may lose "cultural and intellectual diversity due to a reduction in the number of talented, creative people." Among other things, the negative balance of migration "reduces the hope that these territories will be support bases for the development of the North." This problem cannot be solved without adjusting the northern wage gradient.

Let's consider a nationwide pattern that reflects the mutual influence of wages and migration from/to Russian regions. At the same time, we summarize the average wages in the constituent entities of the Russian Federation for several years (starting from 2015, starting from the first year of the allocation of the Arctic zone of the Russian Federation) and compare these results with the data on the sum of relative (relative to the population of the regions) values of the number of those leaving and arriving. Let us immediately note that the total relative balance of migration over 5 years did not correlate in any way with the average wage. High wages in the regions have a very positive and equal effect on both the number of arrivals and departures, not only in the Arctic and sub-Arctic regions, but also in Moscow and St. Petersburg. R. However, unlike Moscow and St. Petersburg, Almost all Arctic and sub-Arctic regions have a negative migration balance. The level of "renewal" of the population is noteworthy: in almost 6 years (if we assume that new people come and leave each time), the population of, for example, Chukotka could "renew" by more than half.

Thus, high wages are undoubtedly a significant factor in attracting personnel to the Arctic. However, due to the significant share of temporary, rotational work in the regions, as well as due to the processes of active transformation of their economies, they are experiencing no less (and even stronger) outflow of population. This circumstance forces us to pay more attention to other factors of population retention in the Arctic, especially in light of new, large-scale tasks for the development of the macro region.

**Conclusion**

Based on the results of the study, the following main conclusions can be drawn:

It is shown that the personnel potential of the enterprises of the Arctic Zone of the Russian

Federation represents the total labor potential of the Russian Arctic, which, in turn, is one of the key systems of human potential. For this reason, human resource potential must be considered in close connection with labor potential. When analyzing personnel and labor potential, it is necessary to give priority attention to the role of the education system in the reproduction of personnel, since education is a key factor in the formation of personnel and labor potential.

It has been established that successful management of human resources should be based on strategic management tools, which in modern conditions should be based on systemic digital support (databases, analysis of human resources, etc.).

It is shown that insufficient attention is paid to the need to change the state employment policy in the Arctic, which has proven to be insufficiently effective. To a large extent, this policy comes down to attracting additional labor resources, although the existing labor resources may be sufficient in quantitative terms - but they do not have the required qualifications.

It has been revealed that a qualitative intensification of scientific, educational and innovation policy in the region is necessary, promoting, 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, and on the other hand, the development of "Arctic intellectual service".

It is shown that digital transformation can bring significant changes to the employment structure of the Arctic population. The development of remote employment using modern ICT gives residents of the Russian Arctic significantly more employment opportunities anywhere in Russia and the world without the need to leave their place of residence. Such employees can and should be trained through a distance learning system, the development of which the Arctic regions should pay more attention to.

It has been established that Norway's experience in developing the human resources potential of the Arctic territories reveals the importance of such measures as initiatives to create a competitive local and regional supplier industry for the oil and gas sector; the requirement that 70% of the employed engineering and administrative potential be located in a given region; skills development programs and programs specifically for the recruitment of young people and government subsidies for the provision of training courses for youth up to 24 years of age and other programs for youth.

It is shown that the personnel supply system for maritime transport is highly globalized, which poses certain problems for maintaining the level of personnel supply for the sea and river fleet in Russia due to the high gradient of wages towards work on foreign ships for high-quality Russian specialists. The problematic field of staffing for maritime transport in the Arctic and the Far East is complicated by the even more complex demographic situation in the region compared to the average Russian one.

It has been determined that, according to labor potential indices, a number of subjects whose territories are part of the AZ of the Russian Federation are likely to have a relatively stable situation in terms of economic indicators, most of them are above the median (except for the Republic of Karelia and the Krasnoyarsk Territory), as well as in terms of demographic indicators, where only the Republic of Karelia and the Arkhangelsk region were below the median - however, it should be remembered that the demographic situation seems more prosperous than it really is due to the so-called "export of mortality". To increase the labor potential of the population of the Russian Arctic, it is necessary to concentrate on innovative development, as well as on the development of education and healthcare.

It is shown that the contribution of demographic potential to the labor potential of the Russian Arctic is currently ambiguous. The most serious negative demographic manifestations that undermine the labor potential of the Arctic regions of Russia include the aging of the population and the growing proportion of the population older than working age against the backdrop of continued high mortality in working age. The migration balance of the Arctic regions of Russia is also critical for the labor potential of the Arctic, and we are talking not only about the quantity, but also about the "quality" of migrants, their human capital.

It is shown that one of the most problematic modern trends in the socio-economic development of the Arctic territories is a decrease in the absolute size of the labor force in many Arctic regions, namely in the Republics of Karelia and Komi, the Arkhangelsk and Murmansk regions, as well as the Krasnoyarsk Territory. In the Arctic regions, along with aging, the size of the labor force may also be influenced by the migration outflow of the population, however, this influence will not necessarily be negative, since the population of working age mainly comes to the most successful Arctic regions, and the population of older ages leaves, wishing to spend their old age in more favorable conditions.

It has been revealed that the experience of the Soviet Union, as well as foreign Arctic countries, indicates the success of the development of remote regions through a systematic increase in the level of their scientific and innovative potential.

Currently, trends in the number of scientific and innovative personnel (including higher education) directly in the AZ of the Russian Federation indicate an increasing insufficiency of this potential (its personnel component), which cannot ensure the economic and personnel security of the region in the long term and will affect its development.

It is shown that the personnel and demographic situation in the Arctic regions and regions with Arctic territories, associated both with problems of natural reproduction and with the outflow of the population (as well as with a significant influx with a positive balance, especially for the most economically successful regions), could be called quite natural and not requiring special measures to support the human resources potential of the Arctic macro-region, however, the author has established that the level of migration (balance) depends not so much on the economy as on integral indicators of the quality of life, as well as the level of scientific and educational development of the regions of the country as a whole.

A reasonable assumption has been made that the most promising approach to the strategic management of staffing in Russia's Arctic policy will be its implementation within the framework of digital management of the personnel system of the entire country, with an emphasis for the Arctic regions on the desire to achieve indicators that determine the quality of life as central to the sustainability of their staffing management in the Arctic. long-term period in conditions of strategic geopolitical turbulence.

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